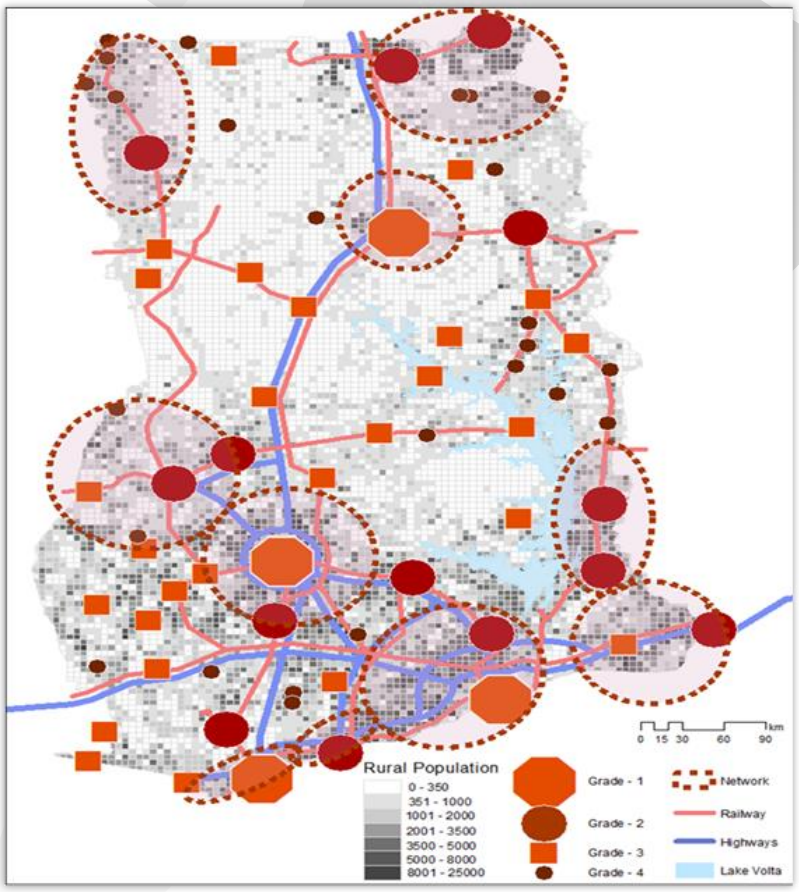
REPUBLIC OF GHANA

GHANA NATIONAL SPATIAL DEVELOPMENT FRAMEWORK (2015-2035)

Volume I: Conditions and Main Issues



GOVERNMENT OF GHANA

MINISTRY OF LAND AND NATURAL RESOURCES
MINISTRY OF ENVIRONMENT, SCIENCE, TECHNOLOGY AND INNOVATION
TOWN AND COUNTRY PLANNING DPARTMENT
NATIONAL DEVELOPMENT PLANNING COMMISSION

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Government of Ghana
Ministry of Lands and Natural Resources
Ministry of Environment, Science, Technology and Innovation
Town and Country Planning Department
National Development Planning Commission

Ghana National Spatial Development Framework 2015-2035

Space, Efficiency and Growth

Volume I:

Conditions and Main Issues

FINAL REPORT

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Land Administration Project II
Funded by the International Development Association (IDA)

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Land Administration Project II

Ghana National Spatial Development Framework 2015-2035

Space, Efficiency and Growth

Volume I:

Conditions and Main Issues

FINAL REPORT

THE FINAL REPORT CONSISTS OF THREE VOLUMES:

Volume I: Space, Efficiency and Growth

Volume II: Overall Spatial Development Strategy

Volume III: Executive Summary of Vol I and Vol II

Annexes:

Annex 1: MS Excel Sheet for the NSDF Phasing Cost Estimates
Annex 2: Strategic Environmental Assessment of NSDF

TOWN AND COUNTRY PLANNING DEPARTMENT GHANA

COWIORGUT

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Acronyms and Abbreviations

ADT	Average Daily Traffic
AGC	Associated General Contractors of America
ASDP	Atlantic Spatial Development Perspective
AUE	Atlas of Urban Expansion
BRT	Bus Rapid Transit
CBD	Central Business District
CBO	Community Based Organisation
CCTV	Closed Circuit Television
CERGIS	Centre for Remote Sensing and Geographic Information Services
CET	Central European Time
CHAG	Christian Health Association of Ghana
CIDA	Canadian International Development Agency
CMC	Commercial Metals Company
CRC	Coastal Resource Centre
CSIR	Council for Industrial and Scientific Research
CSO	Civil Society Organisation
DFO	Direct Factory Outlets
DRF	Daily Racing Form
ECOWAS	Economic Commission of West African States
EPA	Environment Protection Agency
ERP	Enterprise Resource Planning
ESPON	European Spatial Planning Observation Network
ETLS	ECOWAS Trade Liberalisation Scheme
EU	European Union
FAO	Food and Agricultural Organisation
FASDEP	Food and Agricultural Sector Development Policy
FCUBE	Free Compulsory Universal Basic Education
FDI	Foreign Direct Investment
GAMA	Greater Accra Metropolitan Area
GCAP	Ghana Commercial Agricultural Project
GDP	Gross Domestic Product
GHA	Ghana Highways Authority
GIDA	Ghana Irrigation Development Authority
GIN	Group Interactive Network
GIPC	Ghana Investment Promotion Council
GIS	Geographic Information Systems
GKUDP	Greater Kumasi Urban Development Plan
GLDP	Greater London Development Plan
GLSS	Ghana Living Standard Survey
GNP	Gross National Product
GPS	Global Positioning System
GREL	Ghana Rubber Estates Limited
GRMP	Ghana Railway Master Plan
GSGDA	Ghana Shared Growth and Development Agenda
GSS	Ghana Statistical Service

GWCL	Ghana Water Company Limited
ICFG	Integrated Coastal and Fisheries Governance Initiative
ICT	Information and Communication Technology
IIASA	International Institute for Applied Systems Analysis
IMF	International Monetary Fund
IPCC	International Panel of Climate Change
IS	Information System(s)
ISSER	Institute of Statistical, Social and Economic Research, University of Ghana
ITP	Integrated Transportation Plan
JV	Joint Venture COWIOrgut TA team
KIA	Kotoka International Airport
KVIP	Improve Ventilated Pit Latrine
LAP	Land Administration Project
LED	Local Economic Development
LPG	Liquified Petroleum Gas
LULUCF	Land use, land use change and forestry
LUPMIS	Land Use Planning and Management Information System
LUPMP	Land Use Planning and Management Project
LUSPA	Land Use and Spatial Planning Act
LUSPB	Land Use and Spatial Planning Bill
MDA	Ministries, Departments and Agencies
MDG	Millennium Development Goals
MESTI	Ministry of Environment, Science, Technology and Innovation
METASIP	Medium Term Agricultural Sector Investment Plan
MGI	McKinsey Global Initiative
MLNR	Ministry of Lands and Natural Resources
MMDA	Metropolitan, Municipal and District Assembly
MMT	Multimedia Technology
MOFA	Ministry of Food and Agriculture
MSE	Mean Squared Error
MTDP	Medium-Term National Development Plan
MTNDPF	Medium-Term National Development Policy Framework
MW	Mega Watt
NDP	National Development Plan
NDPC	National Development Planning Commission
NGO	None Governmental Organisation
NIP	National Infrastructure Plan
NITA	National Information Technology Agency
NLTDS	National Long-Term Development Strategy
NPC	National Population Council
NPDP	National Physical Development Plan
NPF	National Planning Framework
NPP	New Patriotic Party
NSDC	National Security and Defence Council
NSDF	National Spatial Development Framework
NSDI	National Spatial Data Infrastructure
NSDP	National Spatial Development Perspective
NTC	National Technical Committee
NTP	National Transport Plan

NUP	National Urban Policy
ODA	Official Development Assistance
RCC	Regional Coordinating Council
RD	Registered Dieticians
ROC	Regional Oversight Committee
RPCU	Regional Planning and Coordinating Units
SADA	Savannah Accelerated Development Authority
SAP	Systems Applications and Products
SDF	Spatial Development Framework
SfDR	Support for Democratic Reforms (a GIZ project)
SFIP	Small Farms Irrigation Project
SFIP	Standard Flood Insurance Policy
SHS	Senior High School
SIP	Social Investment Project
SRI	Soil Research Institute
SSIDP	Small Scale Irrigation Development Project
SSIDP	South Sudan Institute of Democracy and Peace
STMA	Sekondi-Takoradi Metropolitan Area
TA	Technical Assistance
TCPD	Town and Country Planning Department
TOD	Transit Oriented Development
TSIP	Traffic Safety Improvement Program
UAE	United Arab Emirates
UEMOA	West African Economic and Monetary Union
UNCTAD	United Nation Conference on Trade and Development
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNU	United Nations University
UTM	Universal Transverse Mercator
UTP	Unlisted Trading Privileges
VKT	Vehicle kilometres travelled
WBGUR	World Bank Ghana Urbanisation Review
WC	Water Closet
WDR	World Development Report
WFP	World Food Programme
WRSDF	Western Region Spatial Development Framework
YIAP	Youth in Agriculture Programme

Foreword by the Hon. Minister, MESTI

The central purpose of the Government of Ghana is to harness the enormous potential of the country for sustainable and equitable socio-economic transformation, and provide, opportunities for all to progress and enjoy a good quality of life. Our new land use and spatial planning system, and soon to be approved Land Use and Spatial Planning Bill are geared towards the accomplishment of this purpose.

The National Spatial Development Framework (NSDF), at the apex of our spatial planning system, is a long-term, 20-year strategy for the spatial development of Ghana. It has been informed by: (i) our Medium-Term National Development Policy Frameworks, the Ghana Shared Growth Development Agenda's I and II, which set out the overall measures we are taking to accelerate Ghana's development; (ii) our sectoral plans and policies in areas such as economy, transport, education, health, environment, energy, climate change and land use; and (iii) the views of several government agencies at the national, regional and district levels, particularly those that participated in the country-wide consultations undertaken by the NSDF team.

Now that NSDF is completed, I would expect it will contribute to the National Long-Term Development Strategy (NLTDS), currently being prepared under the leadership of the National Development Planning Commission. NSDF is an important document, one that will influence orderly development plans across the country and provide guidance to deliver the change that the country yearns for. By providing a comprehensive analysis of the existing situation and trends, the document can be used to guide future development and decisions.

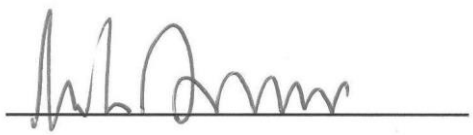
NSDF will play a key role in guiding local authorities in preparing regional, sub-regional and district level spatial development frameworks and lower level plans. Each part of the country must use its strengths to build a prosperous, healthy and sustainable future with optimal impact on the livelihoods of people and their surroundings. This NSDF seeks to harness these strengths, foster collaboration and ensure spatially integrated development throughout Ghana.

NSDF is aligned to our existing development policies and trajectory. It supports sustainable economic growth and a transition to a low-carbon economy. Ghana has a high-quality environment, many good places to live in and visit, and abundant natural resources. These physical assets – natural and cultural - underpin our economy and quality of life. Facilitating much needed new development and investing in modernizing our infrastructure, while maintaining and creating distinctive, sustainable and healthy places is, in my view, essential.

Ghana must provide nurturing and rewarding environments for its people while maximising its attraction to investors and visitors in what will increasingly be a global economy. We need to capitalise on our position in the centre of West Africa, one of the fastest growing and urbanizing regions of the world, and as the main port for the vast land locked countries to the north. Ghana must ensure that economic growth increases cohesion—reducing inequalities between different areas of Ghana. The NSDF shows how we can do this at a national level, regional level, and within urban networks.

While this document sets out our preferred spatial strategy and a number of national development initiatives to support it, in some areas it also identifies alternative approaches, which have been considered in the formulation process. We welcome all views in support of the NSDF but also recommendations on how it might be improved.

My sincere thanks go to all those who have worked on and engaged with the NSDF. The creativity, thoughtfulness, expertise and knowledge which has informed the project have been crucial in shaping the result.



Hon. Akwasi Opong-Fosu MP
Minister, Ministry of Environment, Science, Technology and Innovation

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Special appreciation goes to the Commissioners and Senior Staff of the National Development Planning Commission (NDPC) for the strong collaboration during the formulation of the framework. The enthusiasm and personal commitment of the Director General, Dr. Nii Moi Thompson is highly appreciated. We also acknowledge the contributions of Commissioners like Prof. Jecob Songsore, Mr. Steve Akuffo, the regional representatives on the Commission who highly patronised the regional and zonal consultations, and senior staff such as Dr. Mensah Bonsu and Mr. Kwame Awuah for their technical inputs.

We are also grateful to the Ministers and their Deputies including the Chief Directors and their Management Teams, at the Ministries, Department and Agencies, for their unlimited support, throughout the preparation of the NSDF. They include:

a) Ministry of Lands and Natural Resources (MLNR)
b) Ministry of Environment, Science, Technology and Innovation (MESTI)
c) Ministry of Transport
d) Ministry of Roads and Highways
e) Ministry of Food and Agriculture
f) Ministry of Trade and Industries
g) Department of Urban Roads
h) Ghana Statistical Service (GSS)
i) Land Administration Project (LAP II)
j) Forestry Commission
k) National Population Council (NPC)
l) National and Regional Houses of Chiefs
m) Regional Coordinating Councils (RCCs)
n) Academic Institutions
o) Chamber of Commerce and Industries
p) Civil Society and Non-Governmental Organisations, and
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Last but not the least, staff of COWI AS for the JV COWIOrgut Technical Assistance Team:

a) Taoufik Choukri: Project Director/Lead Adviser

b) Richard Geier: NSDF Project Manager
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h) Erik Lysdal: Photogrammetry and Mapping Expert
i) Kofi Kekeli: Land Use Planner
j) Akosua Asare: Land Use Planner
k) Peter Owusu Donkor: Land Use Planner
l) Oppong Peprah: Facilitator
m) Felix S.K. Agyemang: Land Use Planner

Volume I

Chapter 1

Introduction

1 Ghana Today – Conditions and Main Issues

The National Spatial Development Framework (NSDF) is prepared in two Main Volumes I and II, Volume III is a summary of both Vloume I and II. Volume I sets out the conditions and main issues facing Ghana today and those anticipated in the future. Volume II provides a brief summary of Volume I and provides the overall spatial development strategy and specific proposals. In Annex there is the envisaged Cost and Phasing Excel sheet Tables and a Strategic Environmental Assessment for the NSDF.

1.1 The National Spatial Development Framework

This section describes the key attributes of the National Spatial Development Framework. It provides a definition of spatial planning and NSDF, describes its functions, its role in and relationship to other development policies and plans, and the planning area and the plan period.

1.1.1 What is spatial planning?

There are numerous definitions of spatial planning. One of the most widely known comes from the European Regional/Spatial Planning Charter (Torremolinos Charter 1983) which states that "Spatial planning gives geographical expression to the economic, social, cultural and ecological policies of society. It is at the same time a scientific discipline, an administrative technique and a policy developed as an interdisciplinary and comprehensive approach directed towards a balanced regional development and the physical organisation of space according to an overall strategy". Another definition comes from the United Nations Economic Commission for Europe; it states that "Spatial planning is concerned with “the problem of coordination or integration of the spatial dimension of sectoral policies through a territorially-based strategy. More complex than simple land-use regulation, it addresses the tensions and contradictions among sectoral policies, for example, for conflicts between economic development, environmental and social cohesion policies".[1]

1.1.2 Institutional Framework for Spatial Planning in Ghana

In Ghana, the agency responsible for all spatial planning is the Town and Country Planning Department, under the Ministry of Environment, Science Technology and Innovation. In 2011, TCPD established a “3-tier”, hierarchical, spatial planning system that comprises (i) spatial development frameworks, or SDFs, (ii) structure plans, and (iii) local plans, with each tier having its own function and process[2].

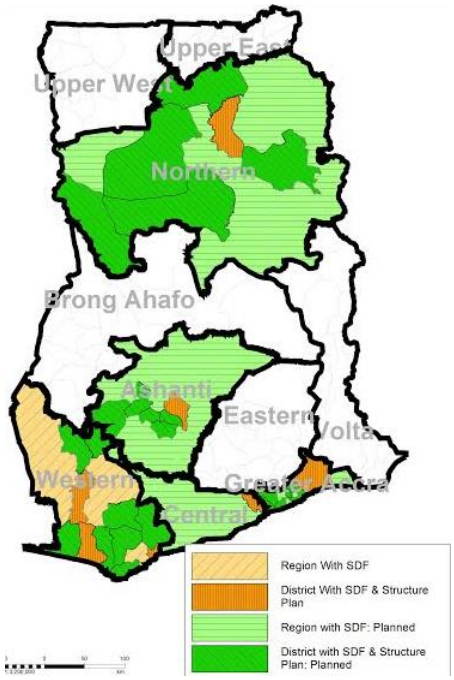
SDFs may be prepared at five geographic administrative levels: national, sub-national, regional, sub-regional and district levels. They are meant to be conceptual and strategic reflecting their long-term 20-year planning period. An important role of an SDF is to identify areas of high growth and development that require the preparation of a structure plan. Structure plans may be prepared at various levels that include a district, parts of a district, or a city or town. They are meant to follow the guidance of the SDF and identify the boundaries of development and provide a framework for preparing local plans. Local plans cover relatively small areas such as

[1] UNCEC, 2008, Spatial planning: key instrument for development and effective governance

[2] TCPD has prepared three sets of guidelines for spatial planning: New Spatial Planning Model Guidelines (2011), Manual for the Preparation of Spatial Plans (2011), and Zoning Regulations (2011). The first describes the concept of the three-tier system and has separate sections for spatial development frameworks, structure plans, and local plans. The second provides a detailed step-by-step process for preparing SDFs, structure plans and local plans. The third discusses the objectives of the planning standards and zoning regulations and provides details of development zones including, for example, zones for rural, residential, central business districts and other business centres, recreation and sports, public open space, protected coastal and water fronts, conservation, transportation and warehousing, and light industrial.

neighbourhoods, are dimensionally precise, and prescribe the development policies and restrictions at the plot level.

Figure 1.1 Areas with completed and proposed SDFs



Source: NSDF Study 2013 based on TCPD information

As of January 2015, TCPD has overseen the preparation of one regional SDF for the Western Region; a sub-national SDF for the Greater Kumasi Sub-Region; six district SDFs, a structure plan for the Greater Kumasi Conurbation as well as other structure plans, and hundreds of local plans. At least two regional SDFs are expected to start in 2015 in the Ashanti and Greater Accra regions. District SDFs are planned for over 20 districts (Figure 1.1).

1.1.3 What is a spatial development framework?

According to the TCPD New Spatial Planning Model Guidelines, a spatial development Framework is a spatial strategy for achieving defined social, economic and environmental policies. It provides a picture of the likely and preferred development pattern 20 years in the future. It may address the spatial development implications of key sectors: economic development and employment, population and urbanisation, housing and infrastructure services, education and health care, tourism and leisure, transportation, communications, culture and nature and the environment. An SDF provides a strategic vision—it is a framework, not a blue print. Accordingly, it allows for economic and spatial development to take place without stifling or constraining regional, district and local initiatives, provided they are in alignment with the framework. It provides perspectives and proposals for what kinds of development should take place, how much of it should occur, where this should happen, and how to make this happen.

Spatial development frameworks are not meant to be prepared once every 20 years. Rather they should be thought of as not just a document but also a cyclical, systematic and dynamic process that needs to be institutionalised and continually supported, maintained, monitored and upgraded by dedicated human resources in strengthened

institutions. The system must have vertical and horizontal links to all sectoral and local government agencies that must be willing and able to share data and work together for common objectives.

1.1.4 What is a National Spatial Development Framework?

A National Spatial Development Framework is the highest level SDF. The Land Use and Spatial Planning Act requires that NSDF be initiated and drawn up by the Land Use and Spatial Planning Authority (LUSPA) as part of the Long-Term National Development Plan (LTNDP) in collaboration with the National Development Planning Commission (NDPC) and approved by the NDPC, with the President as the key signatory and the Office of the President the designated appeals body. NSDFs are to identify key strategic issues related to the LTNDP.

1.1.5 Main functions of the NSDF

The main functions of the NSDF are the following:

- to strengthen national development planning, including in the medium and long term, by articulating the spatial dimensions of social, economic, environmental and other policies at the national level;
- to establish a national spatial framework that gives policy direction to land use planning and management at the national level, to guide the preparation of other lower hierarchy plans, such as regional, sub-regional and district spatial development frameworks, structure plans and local plans;
- to make explicit the spatial information from sectoral agencies—including their plans, projects, resources and assets—to enable coordinated decisions and aligned policies as well as reduced duplications, conflicts and overlaps;
- to provide spatial policies to help ensure sustainable development as well as mitigating and adapting the natural environment and human settlements to climate change.

1.1.6 NSDFs' relationship with other development policies and plans

It is intended that the NSDF is integrated into Ghana's development planning system. It was informed by and should inform all national development policies, including the Medium-Term Development Framework (GSGDA 2010-2013) as well as other relevant policies, plans and programmes. The requirements and obligations of international treaties, conventions, strategies and programmes, particularly those concerning the environment such as the Climate Change Agenda, are also followed. Nevertheless, deviations from and contradictions with any other government policy should be brought to the attention of the Town and Country Planning Department.

1.1.7 Development planning in Ghana

The National Development Planning (System) Act 1994 requires the preparation of development plans to be prepared by District Assemblies (DAs) and Sector Ministries, Departments and Agencies (MMDAs). Overall development planning is practised in all three tiers of the Government: national, regional and district. Two types of plans are to be prepared: Medium-Term Development Policy Frameworks (MTDPF), which have also been called Ghana Shared Growth and Development Agendas, and National Long-Term Development Strategies (NLTDS).

Since 1957, there have been several development plans. These include Ghana Vision 2020: the First Step 1996-2000; the First Medium-Term Plan 1997-2000; Ghana Poverty Reduction Strategy 2003-2005; the Growth and Poverty Reduction Strategy 2006-2009; and the Ghana Shared-Growth and Development Agenda I covering 2010-2013. The GSGDA II for the period 2014-2017 was completed at the end of 2014.

1.1.8 Benefits and uses of NSDF

The NSDF will benefit stakeholders at the national, regional and local levels. National level planners will be able to facilitate synergy and integration of policies, programmes and projects. Major infrastructure and projects will be guided to the most optimal locations to maximize their benefits. Sectoral agencies will be able to see how their initiatives fit within the overall framework to ensure complementarities and avoid conflicts and overlaps with other sectors. Regions will have a guide to prepare their own SDFs and regional disparities will be reduced through improved targeting of poverty reduction initiatives. They will also be able to better identify locations for rural service centres to provide social services and infrastructural development and promote agriculture and agro-based industries. Further, it can be used for monitoring and evaluation of planning within the Districts.

The environment will be improved through a protected area system that includes protected areas and buffer zones for Volta Lake, rivers and flood plains, parks, wetlands and coastal zones. Special areas will be connected through landscape corridors. Green belts will be designated to ensure against settlement amalgamation. Incompatible uses, such as land fill sites, will be guided to appropriate locations away from sensitive areas and urban populations.
There will be improved linkages between urban and rural areas. Urban areas and human settlements will be spatially integrated and form a hierarchy of human settlements in support of socioeconomic development. The functional role of cities and towns will be clarified and strengthened.

1.1.9 NSDF planning area

The NSDF planning area is mainly the national territory of Ghana. However, for some sectors and concerns—those that have international and cross border impacts or implication—the planning area is widened to include one or more of the surrounding countries. For the purposes of the NSDF, neighbouring countries are defined as those that have a border with Ghana: Côte d'Ivoire, Burkina Faso, and Togo, plus Benin and Nigeria.

For the purpose of describing and analysing the current situation and historical trends, as well as making future projections and recommendations, the NSDF makes extensive use of the existing regional and district boundaries. Data pertaining to regions are available and generally reliable. This is because the regional administrative boundaries have been fixed for several decades and four censuses have captured demographic data pertaining to these boundaries. In addition, the regions are the immediate sub-national administration level and their Regional Coordinating Committees will need to refer to the NSDF for preparing their own regional SDFs. In addition, the RCCs and Regional Oversight Committees have been engaged in the NSDF consultative process and have provided and requested information related to their respective regions. All aspects are and cannot be addressed at the National level but rather left to the Regional Spatial Development Frameworks in the pipeline.

NSDF has, to the extent possible, preferred to disaggregate its analysis to and present information at the district level. This is because the size range of regions is too wide and some regions are too large to provide a sufficiently detailed picture of spatial variations in phenomena and because regions will need a district-level understanding when preparing their SDFs. Nevertheless, the district level-presents complications related to the increase in the number of districts over time, the lack of clarity of district boundaries and multiple versions of district boundaries, combined with lack of data at the district level or the uncertainty regarding the correspondence between data sets and boundaries. As a result, NSDF has had to use several different versions of district

boundaries. The most common district boundary definition is that held by TCPD's LUPMIS system for the 171 districts that existed in 2010. NSDF will make reference to other district boundary definitions when, for example, the 110 districts in 2000 or the 216 districts that exist at the time of NSDF preparation.

1.1.10 NSDF Plan Period

The NSDF has a twenty-year planning horizon. NSDF formulation began in mid-2013 and was completed in early 2015. While the twenty-year period may be said to end between 2033 or 2035, NSDF uses 2035 as the planning period end date. Nevertheless, it is important to point out that a large part of the data sets used to formulate this document pertain to 2010 or earlier; for example, the population projection is based on trends between 2000 and 2010. This means that the projection to 2035 relates to a 25 year time span, not a 20 year period.

In addition, 2035 is not intended as the end-date by which all spatial issues identified in the NSDF can or will be resolved. There are opportunities, challenges, and interventions that have shorter, medium and longer-term perspectives. Some interventions, for example, the Ghana railroad master plan (GRMP) that has its own 35 year implementation period to almost 2050, will not be completed by 2035. The NSDF provides guidance to address the more urgent and critical national issues while ameliorating the less pressing and minor ones. Certain sectoral land allocations for the infrastructure network alignment would need to be set aside now and safeguarded for development beyond the year 2035.

1.2 Spatial dimensions of general trends and challenges

Ghana has one of the fastest growing economies (notwithstanding the recent downturn in 2014) in Africa, a stable political environment, and rich natural resources including minerals and oil and gas. Its mineral production is notable. Its oil and gas production is growing and is expected to attract over 20 million USD in investment in the foreseeable future. Its universities are highly regarded and cater to a significant number of foreign students. Yet growth in manufacturing sector is stagnant, and growth in the service sector is mainly in the lower end subsectors.
Ghana’s trunk road network is extensive and is considered largely adequate—it links all regions and all urban centres. Nevertheless, most of the network is not adequately surfaced for all weather use and in many areas maintenance is poor. Some sections, particularly along the coast west of Accra, experience congestion, particularly on weekends and in busy periods. Around Lake Volta there are four trunk road routes that rely on ferries, but these run erratically and infrequently. Important road links between Accra and Ho, the regional capital of Volta region, are impaired by the unscheduled repair of the main bridge across the Volta, and there are a number of other bridges that are not operational.

Digital connectivity is increasing but still has a long way to go. Fibre-optic digital data lines run across Ghana and all regions have internet access. There are over 5,500 telecommunication towers distributed in a pattern that mirrors the urban built-up areas and covers about 10 percent of the national territory. Nevertheless, there are gaps between the most and least connected areas, with digital access being considerably better in more accessible urban areas. Some rural areas have little or no connection.

1.2.1 Key Issues and challenges

Ghana's spatial development faces the following key issues and challenges, which are grouped by the main themes of biophysical, socio-economic, and built environment.

Biophysical

Environmental protection and conservation: Natural resources and environmental degradation and climate change have all been recognised as growing issues. Pressures on land and resources are due to un-regulated and illegal mining and quarrying; deforestation and desertification through poor farming practices, overgrazing and soil erosion; and loss of agricultural land. Sea-level rise is threatening coastal settlements and affecting their livelihoods. Poor sanitation infrastructure and practices are causing pollution of ground and surface water resources, as well as serious health issues.

Loss of valuable land cover: At the national level, there is a positive trend in the change of valuable land cover: crop, forest and wetland cover has increased over two decades. Nevertheless, some regions have recorded losses. For example, the four highly-forested regions—Western, Eastern, Central and Ashanti—experienced forest cover decline over two decades and Upper West most recently; Volta Region lost cropland between 2000 and 2010; three regions have lost wetlands, Greater Accra and Central over two periods and Western over one; and Greater Accra gained grassland over both periods and in Volta in the more recent period. Similarly, some districts lost valuable crop cover at an accelerated rate.

Low rate of cropland increase: The average hectares of cropland per person stands at just over 0.2 hectares, less than half of the (experts') minimum. While the trend in the last ten years is favourable, the net cropland-to-population increase of 0.2 percent per year is a margin that some may see as insufficient to achieve food security for Ghana, let alone contribute to global food security. From a regional perspective, some regions have higher ratios than others. Northern and Upper West regions had three times the national average, while Greater Accra, Central, Ashanti and Eastern had below average ratios. Volta, Greater Accra and Eastern regions saw their ratio's decline.
A spatially uneven distribution of wealth, welfare and opportunity, where some places need new infrastructure and development to build on their success, whilst others face the challenges of overcoming disadvantage and creating better living environments.

Socio-Economic

Rapid population increase: Based on existing trends and different assumptions regarding future changes in total fertility rate, contraceptive practices, and life expectancy, Ghana's national population may reach between 37 and about 42 million by 2035. This population will need infrastructure and services, including education and health care, decent employment opportunities, a continuous and reliable supply of nutritious food, and affordable housing. The share of younger and older people will increase. Natural growth rates are likely to remain high in three regions: Northern (4%), Central (3%) and Upper West (2.4%).

Population decrease: Despite the increase in population, some areas are experiencing population decline. Eastern region's rural population shrank in the last census period, the first instance of such a decline since Greater Accra in the 1960s. Overall population declined in seven districts (in four regions), four in Ashanti Region; urban population declined in two districts in Ashanti and Western regions; and rural populations decreased in 25 districts in all regions except Upper West. Thirty settlements have lost population between 2000 and 2010.

Existing education deficiencies and imbalances: In 2010, 23 percent of the population have never attended school, 60 percent have only a basic education, only

20 percent had reached a secondary level or higher. Southern Ghana is better educated than the north, where only 45 percent of the population had been to school. Tertiary education enrolment levels in Ghana have grown slower and remain lower than in most middle income countries. Many districts do not have enough primary and secondary schools. Where schools exist, a large share do not have drinking water or toilets.

Existing health deficiencies and imbalances: There are regional, district, and urban-rural disparities in health outcomes. While there are over 4,300 health facilities, there are large differences in access and service levels. For example, Asante Akim North in Ashanti region has over 75,000 persons per facility while Sunyani Municipal has less than 2000 persons per facility.

Built Environment

Rapid and concentrated urbanisation: With a projected annual urban growth rate of around three percent, the urban share of the population is expected to increase from 50 percent in 2010 to between 65 and 72 percent by 2035. The new urban population, with higher incomes and expectations, may require a higher level of infrastructure and services. In particular, there may be an increased demand for land and urban development that may result in higher prices that will be increasingly unaffordable to a sizable share of the population. New poorer migrants to cities may have little alternative but to move into slum areas and informal settlements with limited security of tenure.

Urban development in coastal zone: The coastal area accounts for some six percent of the total land area but about 30 percent of the national population and— with over 60 urban centres including the national capital and two regional capitals—about 40 percent of urban population. Urban development is concentrated at the coast and is increasing rapidly. Between 1990 and 2010, the built-up cover between the shoreline and a line at ten kilometres inland from the shoreline doubled at the rate of 3.6 percent per year. In addition the coastal area has a large number of assets, including ports, roads, tourist sites and fishing villages that may be vulnerable to sea-level rise.

Increasing urban sprawl: Built-up urban population density is an important indicator of the land use efficiency of urban development. It also relates to the costs of providing, operating and maintaining urban infrastructure and services. At the national level, national urban development density has decreased by about 1.1 percent per year between 2000 and 2010[3]. At the regional level, built-up densities declined in six regions: Volta, Brong Ahafo, Ashanti, Upper West, Western and Greater Accra.

Existing urban service deficiencies: All urban areas are deficient in infrastructure and basic services, although to a varying extent. In general, larger urban areas are better served than smaller ones. Some examples: about 16 percent of households do not have access to mains electricity (7% in large cities of over 500,000 people; 29% in the smallest towns of between 5 and 10,000 inhabitants); 50 percent do not have access to piped water (37% in large cities, 74% in the smallest towns); 75 percent do not have a WC (63% in largest cities, 93% in smallest towns); 78 percent do not have solid waste collection (64% in largest cities, 97% in smallest towns); 73 percent dispose of liquid waste improperly (59% in largest cities, 92% in smallest towns). Many urban roads, even in the capital, are not properly designed, lack proper drainage, are full of pot holes or remain unpaved. Faster growing urban areas are doubly challenged to address existing deficiencies while providing services to new populations.

[3] Urban population increased annually by about 4.2 percent while the built-up area increased by about 5.4 percent

Poor public transport and urban mobility: Public transport is poor, or non-existent, and is forced to use roads that are congested by private vehicles. Most people commute by walking despite the inadequacy of pedestrian sidewalks other with privately owned *trotros*. There is essentially no provision for cycling.

Inadequate rail network: Ghana's rail network, built in the colonial period, has deteriorated over time and now functions only in the Tarkwa mining area and between Accra and Tema. There are several sets of railway plans to upgrade and extend the network throughout the country, but these are not in full agreement.

1.2.2 Key opportunities

The following are key opportunities that may be exploited to strengthen Ghana's spatial development.

At the heart of an urban megapolitan region: Ghana is well-positioned in a growing urbanized region that some have termed "mega-region", "megapolitan" and "gigalopolis"[4]. For instance, by 2030, Ghana and her neighbourhood countries[5] will host 55 cities with a combined population of 120 million inhabitants, more than double their 55 million in 2010. Forty-two of these cities are in Nigeria, four in Ghana, three in Cote d'Ivoire, two each in Burkina Faso and Benin, and one each in Togo and Mali. There are long standing plans to improve multimodal connectivity, including the Trans Africa Highway, which has been a policy goal for over 35 years, but these are behind schedule[6].

Sea access for a large landlocked region: Ghana is next to one of the largest land-locked group of countries in the world—these include Burkina Faso, Mali and Niger—with a need for transport of inputs and exports to coastal ports. Other countries will compete with Ghana to provide these freight service, namely Côte d'Ivoire, Togo, Benin and Nigeria. Nevertheless, Ghana's strengths are its two ports, a relatively well maintained north-south national level trunk road, political stability, and low incidence of attack on transport facilities.

Vibrant city regions: Ghana has two large city-regions, Accra and Kumasi, these cities have shown long-term growth, it has also two other cities, Takoradi and Tamale, which are projected to exceed 500,000 inhabitants by 2030[7]. There is an opportunity for these centres to strengthen linkages and to function as a larger urban entity in order to better compete within the West African region and globally.

Existing and potential air links: Ghana has international air connections with over 25 countries including nine in Europe, seven with other ECOWAS countries, seven with other African countries, plus USA, UAE and Saudi Arabia. Several large international private firms have based their regional headquarters in Accra largely because of this air connectivity. Ghana is well positioned to take advantage and strengthen this connectivity through investing in the improvement of existing airports, developing new airports, and expanding its international air links, and promotion of tourism. The planned, new, international airport will serve to realise this potential.

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[4] http://www.scientificamerican.com/article/cities-may-triple-in-size-by-2030/

[5] In this case Ghana neighbourhood includes 8 countries: Nigeria, Ghana, Côte d'Ivoire, Benin, Burkina Faso, Mali, Togo, and Benin. The area compares favourably with other mega-regions that include: Hong Kong-Shenzhen-Guangzhou, China with 120 million people; Nagoya-Osaka-Kyoto-Kobe, Japan with 60 million; Rio de Janeiro-Sao Paolo, and Brazil, with 43 million people.

[6] Sofreco, 2010 (a)

[7] United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, CD-ROM Edition.

A long and attractive coastline: Ghana's coastal areas are among the most attractive in the world. While many countries have realised substantial economic benefits from their coastal areas, particularly beaches, this is not yet the case in Ghana.

A large and attractive lake: Ghana's Lake Volta is the largest man-made lake in the world, and it is relatively near to its major urban areas. It also stretches 520 kilometres in the north-south direction. There is great potential to realise economic benefits from investing in lake side and area development and in using the lake for freight transport.

Ports: Ghana has two main ports, Tema and Takoradi ports. These large infrastructure facilities have an economic impact on an area far larger than their footprint. Proximity to ports is typically highly-valued by several types of domestic and international businesses, and port areas could be redeveloped to create more space for these businesses.

1.3 Lessons from national and international spatial development

The NSDF is not the first initiative of this type in Ghana nor the first internationally. Several countries have embarked on national spatial planning initiatives of different types over the years. It is worth reviewing the results of these efforts to put our NSDF in an international context and to learn relevant lessons.

1.3.1 Ghanaian experience - National Physical Development Plan 1963-1970

In 1965, Ghana prepared a National Physical Development Plan (NPDP) for the period 1963-1970 that many stakeholders see as a forerunner of the NSDF. It was envisaged that the NPDP would guide stakeholders to formulate a national investment programme, prepare regional and local development plans and establish a practical system of survey and analysis. The NPDP mapped the location of selected facilities, determined potentials for key sectors, incorporated the priorities of the (non-spatial) Seven-Year Development Plan and identified potential areas for industrial development. The key sectors included agriculture, industry, infrastructure and human settlements. Regarding the latter, the NPDP raised concern about the small number (<100) of urban centres, the concentration of these centres near the coast (<150 miles) and the large number (>20,000) of small localities. It recommended that government provides support to the development of urban centres, particularly in the north which it believed would be more economical to serve than populations in scattered villages. Nevertheless, NPDP recognised that most urban centres would remain in the south.

1.3.2 International experience

There are several examples of international best practices that are relevant to the development of Ghana's NSDF. Current or contemporary spatial planning approaches draw inspiration from many sources and differ from the traditional comprehensive (and static) planning approach. The traditional approach saw planning in terms of sectors, mapped the administrative areas and sectoral facilities and/or attributes, and, based on national policies, developed a set of plans and measures to deal with each sector, often mapping the future location of sectoral facilities. Contemporary approaches avoid preparing spatial plans for sectoral facilities because practitioners have realised that social and economic development is largely market driven and hence unpredictable. Instead, these approaches establish a flexible framework that can further developmental objectives by guiding and accommodating national spatial development, and framing it at sub-national levels. The national territory is thus 'shaped' rather than 'controlled'. Within this, spatial strategy and its instruments have real effect and impact, but they are not the only factors that have influence.

The contemporary approach prepares an overall spatial concept that includes spatial planning design instruments such as growth poles and centres, development corridors and nodes. To this can be added spatially targeted investment interventions, like special economic zones, export processing zones or industrial development zones, and the projects which often anchor them, usually large-scale industrial facilities (heavy, agro-processing and assembly, all of which have different linkage patterns). Such targeted interventions can also be aimed at cities, or specific localities within them, in the form of neighbourhood regeneration or informal settlement upgrading projects, or specialised Local Economic Development (LED) programmes. In addition, state- or state-private sector designed and financed mega-projects (airports, harbours, government administrative or military facilities) are increasingly used as instruments within spatial planning strategies, as are large-scale real estate or property development formats like regional malls or the new suburban cities currently being purpose-built on metropolitan peripheries in Africa.
These spatially-specific instruments can be and are often strengthened by the effects of other government policies and investment decisions, such as those on the location of health and educational facilities and infrastructure policy and spending, transportation and telecommunications being key for the latter. The spatial arrangement of governance and administrative structures (regions, districts, etc.) is also highly influential, particularly when emplaced within well-resourced decentralisation programmes.

The 2009 World Development Report (WDR): This report, subtitled *Reshaping Economic Geography*, and documents related to it, have been particularly influential. The WDR 2009 distinguishes between two kinds of policies: (i) serving people where they live and (ii) targeting specific places. People-oriented policies would include education, health, community and social welfare programmes and investments. Place-based policies would include investments in physical and social infrastructures and institutions.

The main strategic objective of contemporary spatial planning at the national level is to achieve spatial integration of leading areas with the lagging areas across the national territory.

Leading areas are those that exhibit economic growth and dynamism; lagging areas are those that are growing slowly or are in decline. Leading areas are most likely to be city-, metropolitan- or regionally-scaled growth centres that have within them one or more "growth poles". Lagging areas may be more isolated rural districts.
Integration is pursued through two types of interventions: (i) those that connect or ease movement between leading and lagging areas and (ii) those that spatially-target either leading areas to support growth or lagging areas to improve the prospects of growth.

Connecting interventions can be policies, programmes or projects that develop or strengthen transportation systems -- like roads, railways, airports and harbours -- and telecommunications. These interventions facilitate the movement of people, goods and ideas thereby improving access to jobs, markets, services and resources.

European Spatial Development Perspective (ESDP): In 1999, regional planning ministers in the European Union signed the European Spatial Development Perspective (ESDP). The document has greatly influenced spatial planning policy in European countries and placed the coordination of EU sectoral policies on the political agenda. Initially, the ESDP had three spatial policy goals: (i) economic and social cohesion, (ii) conservation and management of natural and cultural resources, and (ii) more balanced competitiveness of the European territory. Other concerns have been

added more recently and include balanced and polycentric development; good access to regions and services; climate change; and territorial cooperation and multilevel governance.

Two major lessons were learned in developing the ESDP. First, ESDP preparation was constrained by a lack of "comparable, quantified and geo-referenced data" and by a lack of agreement on indicators for defining regions and urban areas. Second, ESDP needed to be understood as not just a planning 'document' but also as a planning 'process' that needs to be institutionalised, continuous and well-resourced to support regular updating of the ESDP.

Accordingly, the EU created the European Spatial Planning Observatory Network, or ESPON. ESPON is a research programme that supports the development of Europe-wide and national place-based policies through the provision of data, evidence, analysis, definitions of spatial terms, spatial concepts and techniques, maps and scenarios.

Poland's National Spatial Development Concept (NSDC) 2030: Poland's NSDC is a spatial framework for its national development strategy and sectoral policies. It is informed by and aligns with the long-term national development goals and by the challenges identified by analysis of current conditions and dynamics. NSDC has six strategic objectives: (i) improved competitiveness of major urban centres; (ii) a polycentric settlement structure that benefit cohesion; (iii) national internal cohesion through functional integration and development diffusion as realising the inner potential of all areas; (iv) improved accessibility through transport and telecommunications infrastructure; (v) shaped spatial structures that contribute to achieving and maintaining a high quality natural environment and landscape; and (vi) increased resilience to energy and natural threats. The main concept of the NSDC is a spatial network structured largely by the country's cities and towns as network nodes. Spatial development is meant to follow the lines, or corridors, of this network and concentrate in the network's nodes, primarily in those nodes that are cities.

Scotland's Third National Planning Framework: Scotland's Third National Planning Framework (NPF), titled *Ambition, Opportunity and Place*, aims to achieve: (i) a more successful country through sustainable economic growth, (ii) shared benefits of growth by encouraging economic development across all of Scotland's communities, and (iii) protected natural and cultural assets. The vision for Scotland is: a successful, sustainable place; a low-carbon place; a natural and resilient place; and a connected place.

Key NPF concepts include: the fair distribution of opportunities in cities, towns and rural areas; energy efficient development and decarbonised travel; environment and infrastructure more resilient to climate change impacts; universal access to high-speed fixed and mobile digital networks; better use of existing infrastructure and improved internal and international transport links.

The spatial strategy calls for: (i) focused investment in the seven most-populated city-regions; (ii) improved transport and digital links within these regions, especially to the closest and largest towns; and (iii) rural areas that are sustainable, economically active, attracting investment and creating jobs, and reversing population decline. Other important spatial interventions include a Central Scotland Green Network that promotes active travel (walking and cycling) and provides land for food production within towns and cities.

Malaysia's Second National Physical Plan (2020): Malaysia's Second National Physical Plan (NPP), prepared in 2010, aims to guide overall development towards achieving a high income and developed nation status by 2020. The NPP was prepared together with the Five Year Malaysia Plan. It sets out the national strategic spatial planning policies and measures in respect to the general direction and broad pattern of the land use and physical development and conservation. It includes policies and measures with respect to climate change, biodiversity, green and new technology, sustainable tourism, education, living standards of the poor, rural infrastructures and public transport.

The overall spatial strategy is "concentrated decentralisation". Its key sub-strategies are to: (i) focus development along potential growth corridors – including urban and industrial development, agriculture, tourism, transportation network, infrastructure and urban services; (ii) focus urban development in selected urban conurbations and key urban areas; (iii) spread development to lagging and non-urbanised regions; and (iv) provide access to ecotourism and agricultural resources.

Bulgaria National Concept for Spatial Development: Bulgaria's "National Concept for Spatial Development" (NCSD) establishes a spatial and land-use planning base to support regional planning and sectoral planning at the national level for the purposes of achieving integration. It aims to achieve the following: integration within Europe; balanced, polycentric urban development; reduced urban-rural disparities; spatial cohesion and access to education, health care, social and culture-related services; well-preserved natural and cultural heritage; and competitiveness through growth and innovation areas. NCSD (i) defines broad directions for regional policy and spatial planning, (ii) orients the national authority in the selection of the cities to be supported, (iii) coordinates sectoral policies by reorienting them with respect to the national space, with a focus on reducing disparities, and "ensuring equitable access to the most indispensable "life-saving" services".

Netherlands National Spatial Strategy: The Netherlands National Spatial Strategy (NNSS), subtitled *Creating Space for Development*, aims to: (i) strengthen the country's international competitive position, (ii) promote strong cities and a vibrant, dynamic countryside, (iii) preserve and develop important national and international spatial values, and (iv) ensure public safety and economic growth. Two key concepts in the NNSS are city-regions (networks of urban areas) and interconnected networks of green spaces in and around the urban areas to cater to the increasing demand for more open space and recreational areas.

Republic of South Africa: South Africa has an eighty year history of national spatial development planning. The most recent 'plan' is the National Spatial Development Perspective (2005). The NSDP provides: a set of principles and tools for guiding infrastructure investment and development decisions; a description of the spatial manifestations of the main social, economic and environmental trends to understand the national space economy; and an interpretation of the spatial realities and the implications for government intervention. Its main principles are expressed in five needs: (i) for rapid, sustained, and inclusive economic growth; for government to provide basic services to all citizens wherever they reside; to focus government capital spending on localities of economic growth and/or economic potential; to focus on people not places to address social inequities; and to channel development into activity corroders are near or link main growth centres.

1.4 Policy and legal framework for NSDF

1.4.1 Medium-Term Development Policy Framework

The Ghana Shared Growth and Development Agenda (GSGDA I) provides the Government's medium term development policy framework for 2010-2013. It follows several previous policies and programmes to accelerate growth which include Ghana Vision 2020: the First Step (1996-2000); the First Medium-Term Plan (1997-2000); Ghana Poverty Reduction Strategy (2003-2005); and the Growth and Poverty Reduction Strategy (2006-2009). The GSGDA I has seven main themes: (i) ensuring and sustaining macroeconomic stability; (ii) enhanced competitiveness of the private sector; (iii) accelerated agricultural modernization and natural resource management; (iv) oil and gas development; (v) infrastructure and human settlements development; (vi) human development, productivity and employment; and (vii) transparent and accountable governance. At the time of this writing, NDPC had completed but had not circulated GSGDA II for the period 2014-2017.

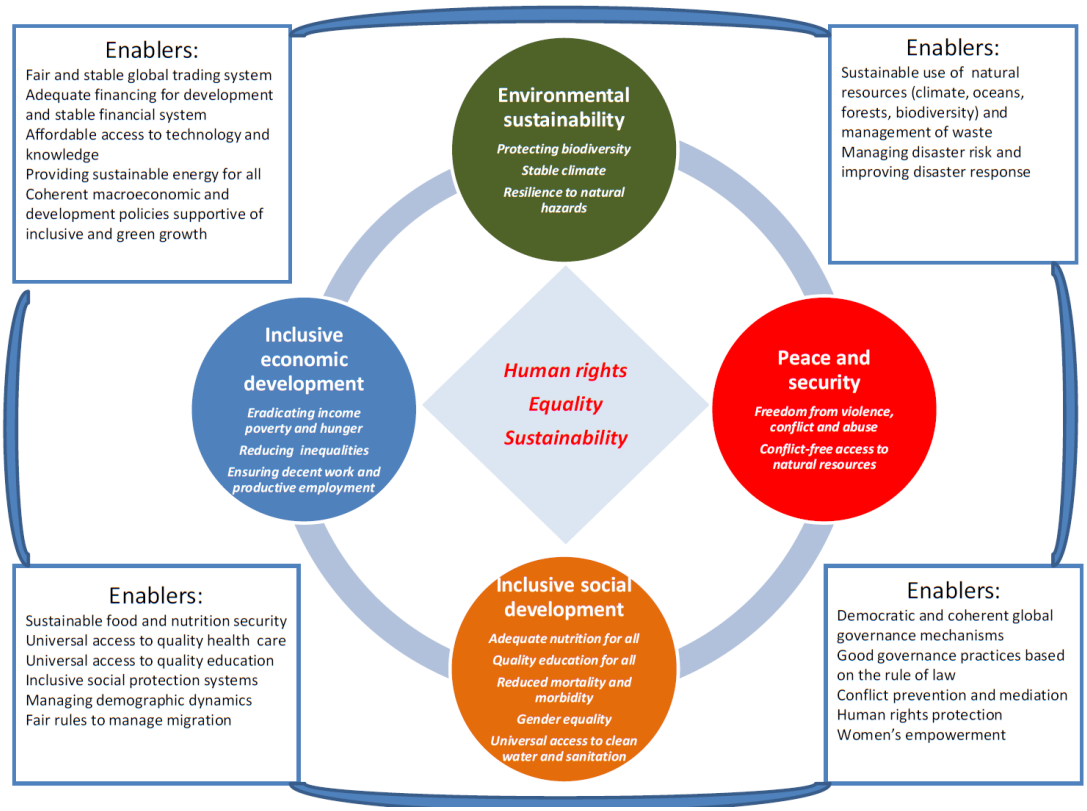
1.4.2 Millennium Development Goals

The United Nations Millennium Development Goals (MDG) provide a system for tracking and comparing, across countries, the progress toward achieving important development goals based on a common set of indicators. Ghana has integrated MDGs into its development policy frameworks including the GSGDA I. The 2010 report shows that while Ghana is on track to achieving most of its MDGs at the National level, its performance at the regional level is mixed. For example, poverty reduction (MDG-1) is still a major challenge in the three northern regions. Achieving universal primary education (MDG 2) is lagging behind in Eastern, Greater Accra, Upper East and Volta regions. On MDG 7, the country is falling behind in reversing the loss of environmental resources, reducing the proportion of people without access to improved sanitation, and achieving significant improvement in the lives of people living in slum areas—all of which have spatial implications.

1.4.3 2015 Sustainable Development Goals

In 2012, a United Nations System Task Force submitted a report "Realizing the Future We Want for All" to the UN Secretary General that outlined the proposed direction for a post-2015 UN development agenda. The report recommended four key dimensions for a more holistic development approach: (i) inclusive social development; (ii) inclusive economic development; (iii) environmental sustainability; and (iv) peace and security (Figure 1.2). To the extent possible, NSDF has taken these dimensions into account.

Figure 1.2 Post-2015 UN development agenda



1.4.4 National Urban Policy and Action Plan

The first National Urban Policy (NUP) in Ghana was formulated in 2011 with the goal of promoting "sustainable, spatially integrated and orderly development of urban settlements with adequate housing and services, efficient institutions, sound living and working environment". The document outlines the main sectoral issues, the guiding principles, and twelve objectives and the actions needed to achieve them. The key objectives that relate to NSDF are the following: facilitate balanced redistribution of urban population; promote spatially integrated hierarchy of urban centres; ensure effective planning and management of urban growth and sprawl; improve environmental quality of urban life. The NUP Action Plan, accompanying the main document, defines a few key activities under each policy initiative along with a timetable and implementing entity.

1.4.5 Local Government, Administration and Planning System

The Government's decentralisation policy is embodied in the Local Government Law (1988), the Local Government Act (1993) and the Civil Service Law (1993). These laws established a local government and administration system that devolved central government authority to the District level and created Regional Coordinating Councils (RCC) to play a coordinating and harmonizing role over it.
RCCs are headed by a Regional Minister and comprise two representatives from each District, the Presiding Member and the District Chief Executive, two Traditional Rulers and the Regional Heads of the decentralised Departments.

RCC planning-related functions are to monitor, coordinate and evaluate District Assembly performance and review and coordinate public services throughout the

Region. The role of the (civil service) Offices of the RCC, headed by a Regional coordinating director, is to implement RCC decisions and prepare quarterly reports. District Assemblies are designated as either Metropolitan, Municipal or District Assemblies (MMDA)[1], depending on the size of their population. They are responsible for planning, development, human settlement and environment management, among other areas. They are headed by a District Chief Executive, who is nominated by the President and approved by the Assembly, and a Presiding Member who is elected by two-thirds of the Assembly. Two-thirds of members are popularly elected and one third are appointed by the President in consultation with local chiefs and interest groups.

The planning functions of MMDAs include preparing and submitting development plans through the RCC to NDPC; developing and managing human settlements and the environment; and implementing basic infrastructure and services programmes. The role of the Departments of the Assemblies, headed by the District Coordinating Director, is to implement DA decisions as well as implement development plans, programmes and projects. While DAs have a number of departments, those most relevant to spatial planning include the Physical Planning Department followed by departments that are concerned with the works, natural resources conservation, industry and trade, disaster prevention, agriculture, and social welfare.

1.4.6 Legal and Institutional Framework for Land Use and Spatial Planning

A Land Use and Spatial Planning Bill, (LUSPB), drafted in 2011 under the LAP-I, sets out a new framework for land use and spatial planning, including the formulation of National, Regional and District spatial development frameworks. The Bill is presently under review by the Attorney General's Department.

The main objectives of the LUSPB are: (i) "to harmonize and regulate the laws on land use and planning to provide for sustainable development of land and human settlements through a decentralised planning system, ensure judicious use of land in order to improve quality of life, promote health, safety and *regulate National, Regional, District and local spatial planning*, and generally deal with spatial aspects of socio economic development" and (ii) "to establish a Land Use and Spatial Planning Authority (LUSPA) to implement the provisions of this Act"[8].

Other objectives related to this assignment are: (x) to establish a spatial planning and land use database; (xiii) to ensure the establishment of an inter-sectoral approach to decision-making in spatial planning in tandem with government development objective to attain a coordinated approach to development; and (xi) *to ensure formulation and continued revision of spatial development frameworks* and structure and local plans to guide the development of human settlements in Ghana.
At the National level, LUSPA will take over the functions of the existing TCPD. Its role is to prepare the human settlements component of National Development Policy Frameworks, performing the spatial planning functions of the NDPC, prepare the National Spatial Development Framework, and ensure that Regional and District Spatial Development Frameworks conform to it.

At the Regional level, RCCs will need to establish Regional Planning and Coordinating Units (RPCUs), which in turn will form a Spatial Planning Committee (SPC) to be serviced by the Regional Physical Planning Department. The Regions will be responsible for preparing Regional SDFs that align with the NSDF as well as for monitoring and evaluating District SDFs to ensure that they are harmonised at the Regional level.

[8] Excerpt from the Land Use and Spatial Planning Bill

At the district level, Metropolitan, Municipals and District Assemblies (MMDAs) will be required to establish District Spatial Planning Committees. The committees will oversee their District Physical Planning Departments in preparing District SDFs that align with the Regional SDFs.

1.4.7 National Land Policy and Land Administration Project

The project to formulate the National Spatial Development Framework (NSDF) is one of the activities under the Land Administration Project (LAP-II). LAP started in 2003 with loan support from World Bank through the Ministry of Lands and Natural Resources. Phase-1 ended in June 2011 and phase -2 started in September 2011. The objective of LAP is "to consolidate and strengthen land administration and management systems for efficient and transparent land service delivery".

The four main components of LAP-II are: (i) strengthening the policy, legal and regulatory framework for land administration; (ii) improving business processes for service delivery; (iii) improved maps and spatial data; and (iv) human resource development and project management.

Sub-components of component 3 comprise: (i) developing policies for surveying and mapping and other spatial activities; (ii) preparation of base maps; (iii) establishment of geodetic reference network; (iv) boundary demarcation (v) *improved maps and spatial data for land administration*; (vi) revaluation of properties and (vii) street addressing and property identification.

NSDF is an activity under sub-component 3.5. Other activities comprise the preparation of four regional SDFs, 20 structure plans and local plans for selected districts, cities and towns. All activities under this subcomponent are executed under TCPD and supported by experts.

1.4.8 National Infrastructure Plan

The draft final National Infrastructure Plan (2013) describes Ghana's infrastructure as "inadequate, outmoded or in a serious state of disrepair". Accordingly, the objective of NIP is "to elaborate and concretize infrastructure objectives of the Ghana Shared Growth and Development Agenda (2010-2013) and beyond". NIP provides a vision and recommendations for investment in six infrastructure sectors: energy; transport; information and communications technology; floods, water and waste management; shelter and human settlements; and social infrastructure. NIP recognises the need for national level spatial coordination of its proposals. Details on the NIP are discussed in the *Chapter V* addressing *Infrastructure*.

1.5 Formulation methodology and stakeholder consultations

1.5.1 Formulation process

This section explains how the National Spatial Development Framework was developed and who was involved. The process through which the NSDF has been formulated largely followed a phased process that was described in the New Spatial Planning Guidelines and Manual for the Preparation of Spatial Plans. Four phases were implemented:

Phase-I Project conceptualization and planning: In this phase, the Government of Ghana decided that NSDF formulation would be led by TCPD in consultation with NDPC and supported by the technical assistance of an international consulting firm. The project was tendered and COWIORGUT Joint Venture was engaged and started the assignment in May 2013 and implementation conducted by COWI A/S. A NSDF formulation team comprising the staff of the consulting firm and ten staff of TCPD was formed.

Phase-II Project management and progress reporting: This phase focused on the fielding of the technical assistance (TA) team, preparing suitable office accommodation, procuring vehicles and equipment, establishing internet connections, and meeting the key institutional stakeholders. The TA comprised four international experts and five Ghanaian experts. The international experts comprised a project manager, planner-economist, planner-infrastructure, GIS expert supported by a senior land governance advisor. The Ghanaian experts comprised an assistant project manager, economist, agriculture specialist, spatial planner and social development specialist. A kick-off workshop was held for the whole team to present an overview of project and to agree on initial issues to be addressed, stakeholders to meet, a timetable for the work, and the composition of working groups.

Phase-III Assessment of the current situation and framework conditions: In this phase the Project Team collected data and reports pertaining to the existing situation and trends at the national, regional, district and urban settlement levels. Documents include policies, programmes and projects. A National Technical Committee and Regional Oversight Committees were formed.
Inception Report Workshop was held with key stakeholders to clarify all aspects of the assignment and the expectations of the Client. The workshop focused on objectives and scope, approach and methodology, expected outputs, and allocation of resources.

Project Inception workshops involving all the key stakeholders were held in 4 zones to be as close to the Regional Coordinating Councils and their respective District Assemblies and Communities as possible. Comments and feedback from the client and key stakeholders were collated and the resulted documented in a report.
Two levels of over-sight committees were established: a National Technical Committee (NTC) for overall policy orientation and ten Regional Oversight Committees (ROCs) to provide operational oversight and technical direction to project implementation.

In order to collect data from most agencies, a formal, written request was prepared and sent respectively to each relevant officer.
Data collection efforts targeted the acquisition of timely, up-to-date and geo-referenced digital data. Where data was collected in non-digital formats, such as hard copy, it was converted into a digital format, including GIS shape files.
All data collected was subjected to a process of data cleaning and an assessment of completeness, consistency and correctness. In cases where data was found to be

imperfect for any reason, efforts were made to obtain a correct data set or the TA team undertook the data cleansing.

Phase-IV focused on the analysis of data and preparation of development options: After ensuring the quality and consistency of the data-sets, these were analysed using various software packages including LUPMIS/MapMaker, SPSS, ArcGIS, and Excel and other Mapping and GIS tools. Spatial analysis was down at all relevant spatial levels, which included national, sub-national, regional, district, and urban settlement.

In general, the analysis attempted to answer the following questions: What is the present status and trend of the phenomena at the various spatial levels? Why is it happening? What matters most? What can be done about it using spatial tools or other instruments?

The period for determining trends was largely restricted to the census periods, and primarily to the most recent 2000-2010 periods owing to problems of data availability for other periods.

Analysis covered numerous themes including demography and urbanisation; land cover types comprising forests, crops, grassland, wetlands and built-up or settlement cover; natural resources including minerals; cultural heritage resources including tourism sites; connective infrastructure and services including roads, railways, marine and lake transport and air transport; basic services including electricity, water supply, sanitation, solid and liquid waste management; education at all levels in terms of level-achieved, facility locations, quality of facilities; health; food production including food crops, cash crops, animal husbandry and fisheries. A times series analysis of land cover was conducted at national level for 1990, 2000 and 2010 at national level in a 5 km grid to identify the land cover change trends.
Key network infrastructure elements were buffered to understand the population distribution within various distances of the different types of roads.

Formulation of National Spatial Development Framework and appropriate strategies and programmes of action
Phase IV focused on discussing and finalising development options, strategies, programmes and projects. Numerous options were prepared and discussed in a series of national and regional workshops.

1.5.2 Stakeholders

Stakeholders in the NSDF include individuals and organizations that are leading and participating in its formulation as well as those that will use and benefit from its provisions. Participation in the planning process is necessary in the New Spatial Planning Process.

The key stakeholders of the NSDF are the two agencies that have played major roles in its formulation: the Town and Country Planning Department (TCPD) and the National Development Planning Commission (NDPC). NDPC, the designated approving authority for the NSDF, recognises the importance of spatial planning; the structure of the national long-term development strategy (NLTDS), now under preparation, has a separate chapter for spatial development and all sectoral chapters will be illustrated with maps that highlight the sector's issues and priorities. NDPC will integrate NSDF's findings and recommendations into the NLTDS.
TCPD is expected to be upgraded into the Land Use and Spatial Planning Authority (LUSPA) after the bill is enacted into law. Accordingly, it has (or will have) the mandate for monitoring implementation of the NSDF, preparing regular updates, and supporting

regional and district authorities to prepare SDFs in accordance with its provisions. In addition, TCPD is the custodian of the Land Use Planning and Management Information System (LUPMIS), which hosts the geospatial data used to prepare the NSDF.

The LUSPA Board are also important stakeholders. The Board is comprised of representatives of the following entities: National Development Planning Commission, Ministry responsible for Roads and Highways, the LUSPA, Environmental Protection Agency, Lands Commission, Stool Lands authority, Ministry for Water Resources, Works and Housing, the private sector, and the traditional authority nominated by the National House of Chiefs.

MDAs, MMDAs and zonal authorities (e.g. SADA) that are responsible for forward planning, development and financial allocations as well as local agencies responsible for development control and land administration will also find the NSDF useful. All agencies are encouraged to study and communicate the implications of the NSDF on their particular sectors and geographic areas to TCPD.

Private sector firms and developers may also find the projections of population distribution as well as the maps of future national infrastructure useful guidance for making informed investments. This may help avoid speculative development in the private sector and future mismatch between property development and demand. The public will also have access to the NSDF once it is published and made available on line on the Town and Country Planning website.

1.5.3 Consultation Process

A central feature of the process of preparing any plan, including an NSDF, is to encourage and enhance multi-sectoral participatory plan-making. National spatial planning is a complex undertaking as it involves a wide-range of cross-sectoral policies relating to many diverse participants and stakeholders, both horizontally and vertically, such as the national, regional and district governments and agencies, traditional rulers, utility service providers and private sector, amongst other.

The NSDF formulation team undertook extensive formal and informal consultations with stakeholders. First, a National Technical Committee (NTC) was organized in October 2013. The NTC members comprised of the Chair, Honourable Minister of MESTI, and representatives from Town and Country Planning Department; Ministry of Local Government and Rural Development; Ministry of Lands and Natural Resources; Ministry of Roads and Highways; Environmental Protection Agency; Lands Commission; Ministry of Water Resources, Works and Housing; National Development Planning Commission; National House of Chiefs; Ministry of Transport; Ministry of Energy; Ministry of Finance and Economic Planning; Ministry of Food and Agriculture, The Civil Aviation Authority and the Ghana Institute of Planners, to name the key ones.

Then ten Regional Oversight Committees (ROC) were organised, they comprised of key officials from the region including the Honourable Regional Minister and representatives from the Regional House of Chiefs, Economic Planning, Town and Country Planning, Lands Commission, Environmental Protection Agency, Department of Feeder Roads, Roads and Highways, Food and Agriculture, Office of the Administration of Stool Lands, National Disaster Management Organisation, National Council on Women and Development, Ghana Statistical Service, Forestry Commission and NDPC.

In October 2013, NSDF formulation team organised four, multi-day consultations in Accra, Kumasi, Takoradi and Tamale where the team shared initial findings with all ten

ROCs and solicited comments and suggestions and verified data. All of these consultations were attended and supported by key TCPD officials, National Director, Deputy Director and Counterpart Team Leader, and at least three TCPD Officers as well as seven advisors from the Technical Assistance team. The proceedings were recorded in separate reports.

On 6-7 February 2014, NSDF held stakeholder consultations with the NSDF Regional Oversight Committee representatives in Accra to discuss the analysis for the development of spatial development options and to fill in the gaps in the data. Between 22 June and 31 July 2014, NSDF formulation team made fact-finding visits to all ten regions and held workshops to review its final findings and draft recommendations.

Stakeholder Consultations on the Spatial Development Options were held on a region by region basis. Each region was visited to both get a visual impression of the natural environment of each region and ensure the highest number of participants. On averages, there were over 50 participants in each workshop. Following the consultations at regional level, the Project Team documented the key questions and issues raised and the planned response from the NSDF team.
A consultation workshop was held at NDPC in December 2014. Consultation and approval workshops were held in January 2015 with all regions on a zonal basis in Greater Accra, with the four coastal regions; Northern Region, with the three northern regions; and Ashanti, with the three mid-belt regions as well as the Ministry of Food and Agriculture, the Civil Aviation Authority and the Ghana Airport Company Ltd in February 2014.

Volume I

Chapter 2

Population

2 Population, urbanization and human settlements

2.1 Historical population growth

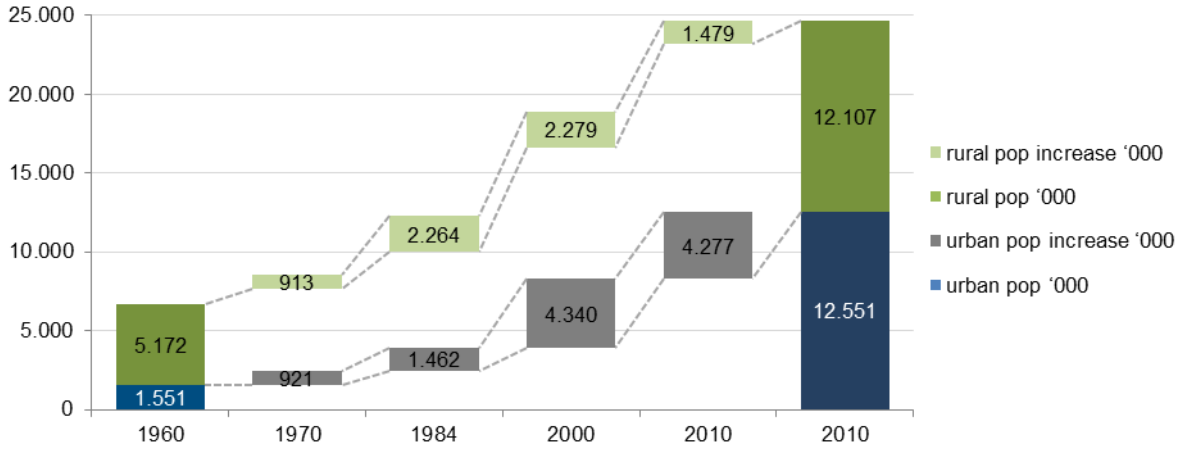
2.1.1 Population growth globally and in Africa

The world's population almost tripled from about 2.5 billion to nearly 7 billion inhabitants between 1950 and 2010. In the same period, Africa's population more than quadrupled from 230,000 to over one million—nearly doubling its share of the world´s population from 9 to 15 percent. Similarly, the populations of Sub-Saharan Africa and West Africa grew at comparable rates. In addition to rapid population growth, urbanisation became a major feature of demographic change, the world over, a milestone was reached in 2007 with 50 percent of the world's population living in urban areas.

2.1.2 Population growth in Ghana

Ghana's population followed a similar trend to that in West Africa. Its population quadrupled from around 6 million to over 24 million between 1960 and 2010 (figure 2.1 and table 2.1). The population growth rate increased from 1960 and reached a peak of 2.73 percent per year between 1984 and 2000. The rate declined slightly to 2.69 percent between 2000 and 2010. Nevertheless, despite this decline, the annual increase in population was higher between 2000 and 2010 than between 1984 and 2000 (575,000 compared to 414,000).

Figure 2.1 National urban and rural population increases, 1960-2010



Source: NSDF 2013 based on GSS population census

The increase in population growth rates between 1960 and 2010 was due to the sharp decline in total fertility rate (from 6.50 to 3.28 births per woman) and an increase in life expectancy (from 43 to 64 years for females; from 38 to 60 years for males) during the same period. The decline in fertility and increase in life expectancy are attributed to economic and social development, particularly improved education, health care and nutrition (GSS Population and Housing Census 2010).

International immigration between 2000 and 2010 had a small role in population growth. Out-migrants from Ghana to other countries numbered only about 250,000 people; immigrants numbered just under 400,000, for a net gain of only 150,000 people.

Table 2.1 National population growth summary, 1960-2010

	year	1960	1970	1984	2000	2010
	# years in period		10	14	16	10
total	population '000	6,726	8,559	12,296	18,912	24,658
total	population increase '000		1,833	3,737	6,616	5,746
total	average annual pop increase '000		183	267	414	575
total	population growth rate		2.44	2.62	2.73	2.69
urban	urban population '000	1,551	2,472	3,934	8,274	12,551
urban	urban population increase '000		921	1,462	4,340	4,277
urban	average annual urban pop increase		92	104	271	428
urban	urban population growth rate		4.76	3.39	4.74	4.24
urban	urban share (urbanization level)	23	29	32	44	51
urban	urbanization rate		2.35	0.71	2.01	1.49
rural	rural population '000	5,172	6,085	8,349	10,628	12,107
rural	rural population increase '000		913	2,264	2,279	1,479
rural	average annual rural pop increase		91	162	142	148
rural	rural population growth rate		1.64	2.28	1.52	1.31
rural	rural share	77	71	68	56	49

Source: NSDF Study 2013 based on GSS population census

2.1.3 Urban population growth in Ghana

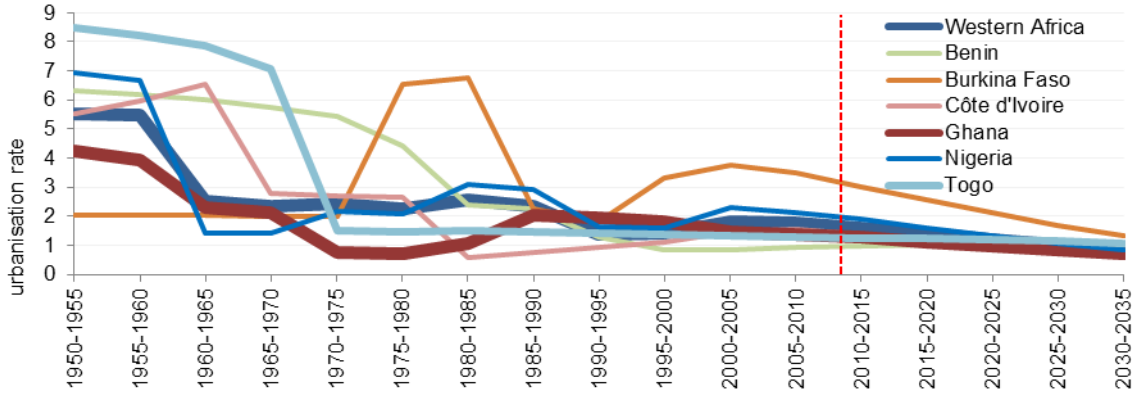
Between 1960 and 2010, the urban population[9] grew much faster than the population as a whole—from 1.5 million to over 12 million, which was 1.5 and 3.3 times the urban populations of 2000 and 1984, respectively. Annual urban growth rates reached their peak of 4.76 percent between 1960 and 1970, fell between 1970 and 1984, recovered between 1984 and 2000, and declined slightly to 4.24 percent in the last decade between 2000 and 2010.

Urbanisation level or the percentage of population in urban areas compared to the national population increased from about 23 percent in 1960 to over 51 percent in 2010, exceeding the rural population for the first time in history.

Urbanisation rates measured as the average annual rate of change of the urbanisation level fell from 2.35 percent between 1960 and 1970 to 0.71 percent between 1970 and 1984, increased to 2.01 percent between 1984 and 2000, and dropped again to only 1.50 percent between 2000 and 2010 (Table 2.1). Ghana's urbanisation rate is declining in line with the global trend, as population becomes more urbanized (Figure 2.2).

[9] Urban growth is a combination of four components: (i) natural growth of the population in urban areas, (ii) in-migration from rural areas and internationally, (iii) extension of existing urban area boundaries, and (iv) the re-classification of settlements when they exceed the 5,000' population threshold. Some authors combine the third and fourth component.

Figure 2.2 Urbanisation rate in West Africa and Ghana, 1950-2035



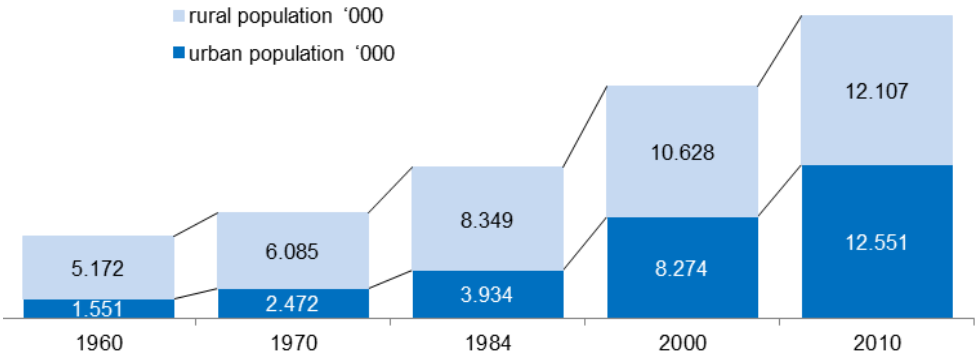
Source: NSDF Study 2013 based on World Urbanisation Prospects, 2012 Revision

In the last two intercensal periods (1984-2000 and 2000-2010), absolute increases in urban population declined slightly from 4.43 to 4.27 million, but the annual increase in urban population rose from about 270,000 to 424,000 people per year.
Between 2000 and 2010, the ratio of the annual growth rates of urban and rural populations also increased, with the urban population growing over three times faster than the rural population.

2.1.4 Rural population growth in Ghana

The rural population more than doubled between 1960 and 2010 from over 5 to over 12 million. Nevertheless, rural population growth rates and absolute annual increases reached their peaks between 1970 and1984 and then declined. Taking into account the different duration of the intercensal periods, annual rural population increases declined from about 162,000, to 142,000 and 148,000 in the last three intercensal periods.

Figure 2.3 Urban and Rural Population, 1960-2010



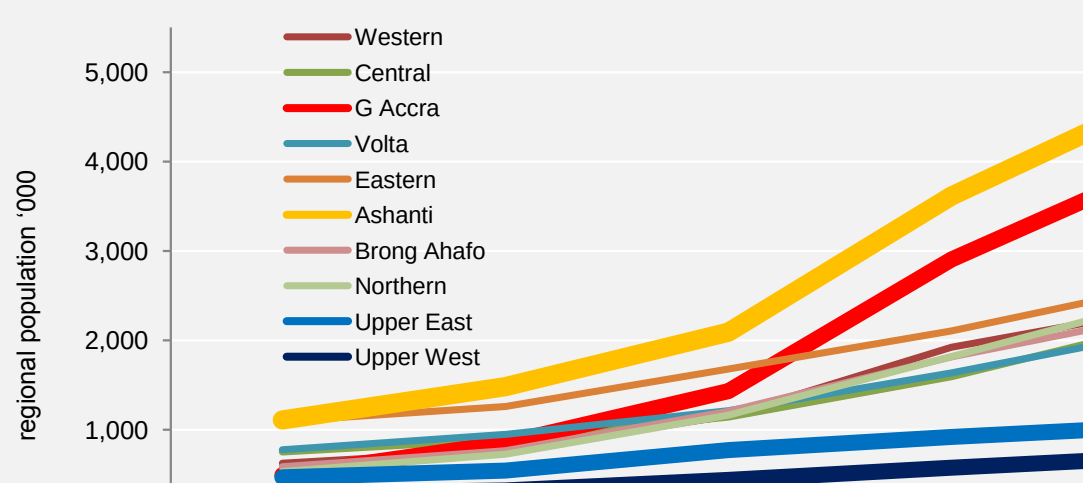
Source: NSDF 2013 based on GSS Population and Housing Census in various years

2.2 Population growth - the regional perspective

Regional population growth patterns between 1960 and 2010 appear to fall into three distinct groups, which may be termed 'strong', 'moderate' and 'weak', as shown in Figure 2.4. The strong growth regions, Greater Accra and Ashanti, have increased eightfold and fourfold, respectively, since 1960. The moderate growth regions—Northern, Western, Brong Ahafo, Central and Volta—have increased by between 2.7

and 4.5 times. The weak regions, Upper East, Upper West and Eastern—have increased by only 2.4 times.

Figure 2.4 Population growth by region, 1960-2010



Source: GSS Population and Housing Census in various years

While this pattern of growth at first appears to be engrained, table 2.2 reveals that regional population growth rates and population shares have fluctuated over this period. More indicative of possible future regional growth are the growth rates that were realised in the last census period (2000-2010). For example, Accra historically the growth rate leader was overtaken in the latest census period by the Central region, although its growth in the eastern part may be attributed to the spatial expansion of the Accra city-region.

Five regions with various growth spurts over the last decade include Northern (2.8 to 3.1%), Eastern (1.4 to 2.3%), Volta (1.9 to 2.6%), Upper West (1.7 to 2.0%) and Upper East (1.1 to 1.3%). Again, the growth of southern parts of Eastern and Volta regions may be related to the influence of the nearby Accra city-region.
The remaining four regions—Greater Accra, Ashanti, Western and Brong Ahafo, all saw their growth rates decline between these periods. This change meant that, between 2000 and 2010, the three fastest-growing regions were Central (up from 6th position), Greater Accra, and Northern. Nevertheless, the traditionally low-growth regions remained Upper East and Upper West.

It has been suggested that the high growth rates in Greater Accra and Ashanti regions are due to high net in-migration pursuing actual and perceived economic opportunities. The higher growth rates in Central region may be explained by both a high natural increase, especially in the coastal districts, as well as rural-rural migration in the northern half, pursuing opportunities in production of cash crops such as cocoa, oil palm and citrus as well as gold mining. (World Bank Ghana Urbanisation Review, 2013).

Table 2.2 Regional population growth summary, 1960-2010

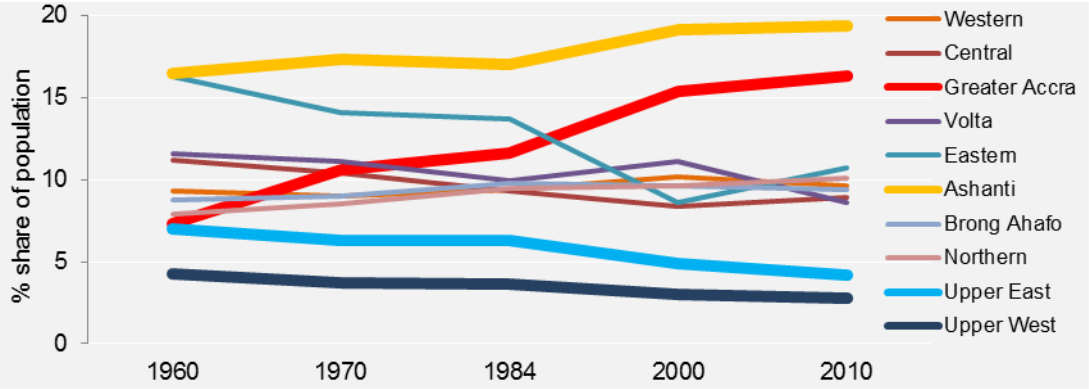
	population (m)					annual growth rate				% share of total population				
	1960	1970	1984	2000	2010	1960-1970	1970-1984	1984-2000	2000-2010	1960	1970	1984	2000	2010
Ashanti	1.1	1.5	2.1	3.6	4.8	2.9	2.5	3.5	2.8	16.2	17.4	17.1	19.1	19.5
G. Accra	0.5	0.9	1.4	2.9	4	5.6	3.8	4.5	3.3	7.4	10.5	11.4	15.4	16.3
Eastern	1.1	1.3	1.7	2.1	2.6	1.4	2.1	1.4	2.3	16.2	15.1	13.8	11.2	10.6
Northern	0.5	0.7	1.2	1.8	2.5	3.2	3.4	2.8	3.1	7.4	8.1	9.8	9.6	10.2
Western	0.6	0.8	1.2	1.9	2.4	2.1	3	3.2	2.1	8.8	9.3	9.8	10.1	9.8
Brong Ahafo	0.6	0.8	1.2	1.8	2.3	2.7	3.3	2.6	2.4	8.8	9.3	9.8	9.6	9.3
Central	0.8	0.9	1.1	1.6	2.2	1.7	1.8	2.1	3.3	11.8	10.5	8.9	8.5	8.9
Volta	0.8	0.9	1.2	1.6	2.1	2	1.8	1.9	2.6	11.8	10.5	9.8	8.5	8.5
Upper East	0.5	0.5	0.8	0.9	1	1.5	2.6	1.1	1.3	7.4	5.8	6.5	4.8	4.1
Upper West	0.3	0.3	0.4	0.6	0.7	1	2.3	1.7	2	4.4	3.5	3.3	3.2	2.8
Total	6.8	8.6	12.3	18.8	24.6	2.4	2.6	2.7	2.7	100	100	100	100	100

Source: NSDF Study 2013 based on GSS population census

Regions also fall into three district groups according to recent trends in their share of the total population (Table 2.2 and Figure 2.5). Over time, Ashanti and Greater Accra regions have increased their share of the population, Upper East and Upper West have lost share, and the shares of other regions have not changed appreciably. Population share has increased most sharply and continuously in Greater Accra followed by Ashanti. Shares have increased slightly in Northern and Brong Ahafo, fluctuated but remained largely static in Western Region, and declined in the other regions (Central, Volta, Eastern, Upper East and Upper West).

As of 2010, the four most populous regions; Ashanti, Greater Accra, Eastern and Northern, accounted for 46 percent of the national population and Ashanti (19%) and Greater Accra (16%) together account for over a third. The three Northern regions together held only 17 percent of the population. One challenge for spatial development is to meet the needs of the large and growing share of people in the most populous regions while pursuing strategies to stagnate and manage the declining share of the least populous.

Figure 2.5 Trend in region share of population, 1960-2010



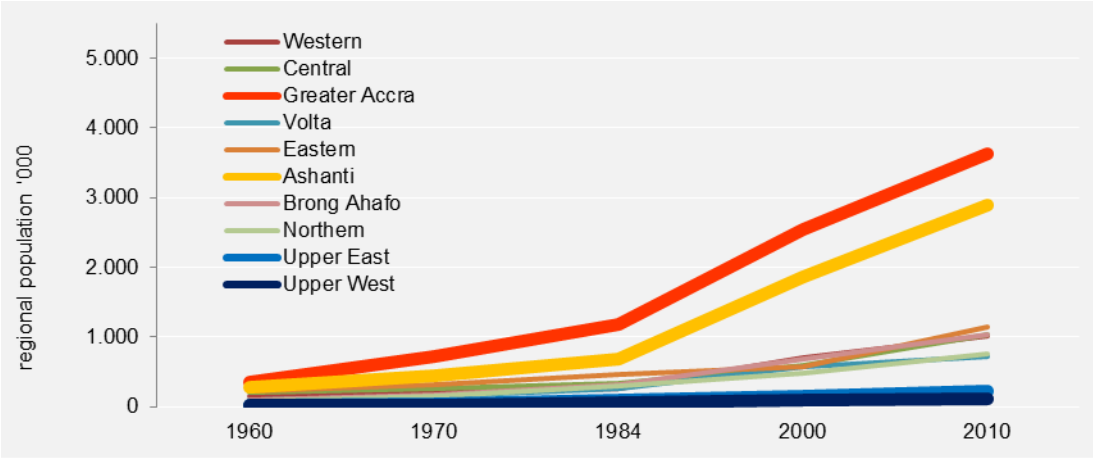
Source: NSDF Study 2013 based on GSS population census in various years

2.2.1 Urban population growth

Regional urban populations grew at a faster rate than, but followed a similar pattern to, total population (Figure 2.6 and Table 2.3). In the four intercensal periods 1960-1970, 1970-1984, 1984-2000, and 2000-2010, urban populations grew annually at 4.7, 3.7, 4.6, and 4.2 percent, respectively. However, regional urban growth rates varied widely over time. Between 1984 and 2000, four regions had urban growth rates that exceeded the national average urban growth rate, from highest to lowest: Ashanti, Western and Volta regions followed by Greater Accra.

Most recently, between 2000 and 2010, Eastern and Central became the urban growth rate leaders, followed by Ashanti and Northern regions. Lagging regions remained Upper West (1.3%) and Volta (2.35%). While it is not evident at the regional level, there is evidence at the district level that urban growth in Eastern and Central regions is occurring close to their border with Greater Accra and can be interpreted as if being part of this region's urban dynamism.

Figure 2.6 Urban population growth by region, 1960-2010



Source: NSDF 2013 based on GSS population census in identified years

While regional urban population growth rates varied significantly between 1960 and 2010, the overall trend was one of increasing shares in Greater Accra and Ashanti (Table 1.3). Nevertheless, between the last two census periods, 1984-2000 and 2000-2010, Eastern region went from being the slowest (1.3%) to the fastest growing (7.2%) region in 40 years. Central region's growth rate jumped from 3.8 to 5.7 percent, being the second highest. It is likely that the growth in these two regions is related to their proximity to Greater Accra, which saw a decline in its own urban growth rate from 4.9 to 3.6 percent and a slight decline in urban share from 30.8 to 28.9 percent, the first ever. Other regions with increasing urban growth rates were Northern and Upper East.

Urban growth rates fell sharply in Upper West (4.8 to 1.3%), Western (6.3 to 3.7%) and Volta (5.2 to 2.4%) regions and less so in Brong Ahafo (4.8 to 4.2%). Ashanti also saw its urban growth rate decline although, unlike that in other declining regions, it remained above the national 4.2 percent urban growth rate.

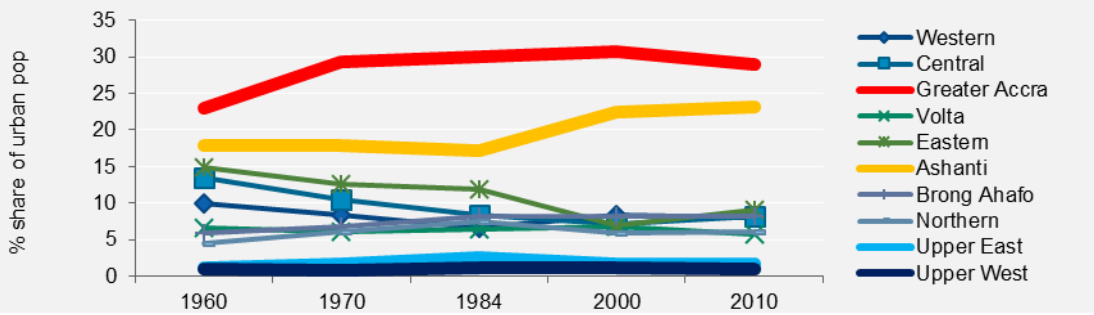
Table 2.3 Regional urban population summary 1960-2010

	urban population (m)					urban population annual growth rate				% share of urban population				
	1960	1970	1984	2000	2010	1960-1970	1970-1984	1984-2000	2000-2010	1960	1970	1984	2000	2010
G Accra	0.40	0.70	1.20	2.50	3.60	7.4	3.6	4.9	3.6	23.0	29.4	30.1	30.8	28.9
Ashanti	0.30	0.40	0.70	1.90	2.90	4.7	3.1	6.5	4.6	17.8	17.8	17.2	22.4	23.1
Eastern	0.20	0.30	0.50	0.60	1.10	3	2.9	1.3	7.2	14.9	12.5	11.8	6.9	9.1
Central	0.20	0.30	0.30	0.60	1.00	2.1	1.7	3.8	5.7	13.5	10.5	8.3	7.2	8.3
B Ahafo	0.10	0.20	0.30	0.70	1.00	6.3	4.7	4.8	4.2	5.9	6.8	8.1	8.2	8.2
Western	0.20	0.20	0.30	0.70	1.00	3	1.7	6.3	3.7	10.0	8.4	6.6	8.4	8.0
Northern	0.10	0.10	0.30	0.50	0.80	7.9	5	3.2	4.5	4.4	6.0	7.4	5.8	6.0
Volta	0.10	0.20	0.30	0.60	0.70	4.1	3.7	5.2	2.4	6.6	6.1	6.4	6.8	5.7
U East	0.00	0.00	0.10	0.10	0.20	8	6.8	2.3	4.3	1.2	1.6	2.5	1.7	1.8
U West	0.00	0.00	0.00	0.10	0.10	4	5.9	4.8	1.3	0.9	0.9	1.2	1.2	0.9
Total	1.6	2.5	3.9	8.3	12.6	4.8	3.4	4.7	4.2	100	100	100	100	100

Source: NSDF Study 2013 based on GSS

Regional shares of the national urban population have started to change between 2000 and 2010 (Figure 2.7) in important ways. Most importantly, Greater Accra's share fell for the first time from about 31 to 29 percent while Ashanti's continued to grow. Other regions with declining urban shares were Volta, Western and Upper West, the latter's share falling below one percent. Meanwhile, two regions saw their share increase appreciably—Eastern and Central—although again this urban population was likely part of the expansion of the Accra city-region.

Figure 2.7 Trend in region share of all urban population, 1960-2010



Source: NSDF Study 2013 based on GSS population census in identified years

2.2.2 Rural population growth

The rural population is determined largely by the natural growth of the rural population and the rate that the rural population is urbanising at, through factors such as rural-urban migration, reclassification of villages into urban settlements upon exceeding the population threshold, and absorption of rural areas into expanded urban boundaries. While rural growth through urban-to-rural migration is also possible, there is no evidence that this is occurring at a significant level.

Rural population growth, growth rates and share of the national population are summarised in Table 2.4 and are shown in Figures 2.8 through 2.9.

Table 2.4 Rural population summary, 1960-2010

	rural population (m)					annual growth rate				% share of rural population				
	1960	1970	1984	2000	2010	1960-1970	1970-1984	1984-2000	2000-2010	1960	1970	1984	2000	2010
Ashanti	0.8	1.0	1.4	1.8	1.9	2.3	2.2	1.4	0.7	16.	17.	16.	16.	15.
Northern	0.5	0.6	0.9	1.3	1.7	2.3	3.0	2.7	2.6	8.9	9.5	10.	12.	14.
Eastern	0.9	1.0	1.2	1.5	1.5	1.0	1.8	1.5	-0.3	16.	15.	14.	14.	12.
Western	0.5	0.6	0.9	1.2	1.4	1.8	3.4	2.0	1.1	9.1	9.3	10.	11.	11.
Volta	0.7	0.8	1.0	1.1	1.4	1.7	1.3	0.7	2.8	13.	13.	11.	10.	11.
B Ahafo	0.5	0.6	0.9	1.1	1.3	1.9	2.9	1.6	1.2	9.6	9.8	10.	10.	10.
Central	0.5	0.6	0.8	1.0	1.2	1.6	1.8	1.3	1.6	10.	10.	9.7	9.4	9.6
U East	0.5	0.5	0.7	0.8	0.8	1.1	2.1	0.9	0.6	8.7	8.3	8.1	7.3	6.8
U West	0.3	0.3	0.4	0.5	0.6	0.8	1.9	1.2	2.1	5.3	4.9	4.7	4.5	4.9
G Accra	0.1	0.1	0.2	0.4	0.4	-0.7	4.9	2.4	0.6	2.6	2.1	2.9	3.4	3.1
Total	5.2	6.1	8.3	10.6	12.1	1.6	2.3	1.52	1.31	100	100	100	100	100

Source: NSDF Study 2013 based on GSS population census in identified years

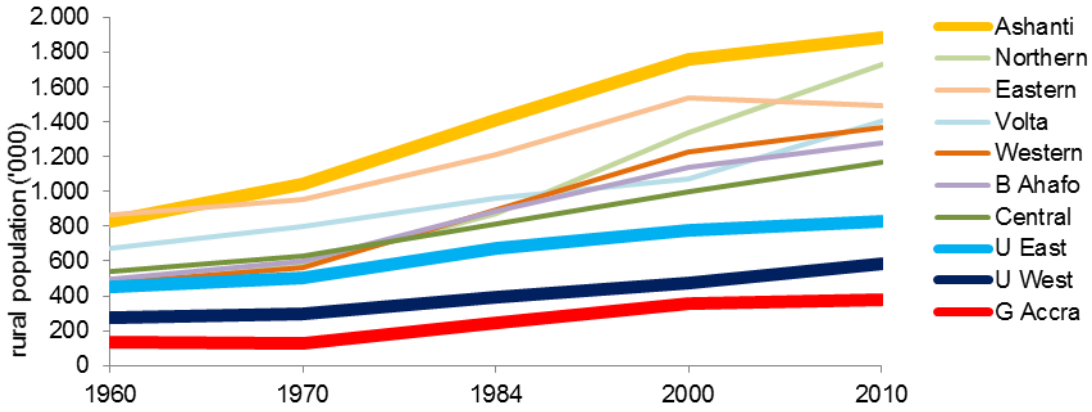
In general, rural population growth rates declined between 1970 and 2010, but fluctuated greatly by region, between 2.8 and - 0.3 percent. A comparison of growth rates in the last two census period reveals increases in only three regions; Volta (0.7 to 2.8%), Upper West (1.2 to 2.1%) and Central (1.3 to 1.6%). All other regions recorded growth rate declines, with the largest decline in Greater Accra (2.4 to 0.6%), followed by Western (2 to 1.1%), Brong Ahafo (1.6 to 1.2%), Ashanti (1.2 to 0.7%), and Upper East (0.9 to 0.6%).

Between 2000 and 2010, Volta, Northern and Upper West saw the highest rural population growth rates. Rates were also above average in Central Region. Rates fell below the national rural average in Brong Ahafo (1.22%), Western (1.11%), Ashanti (0.68%) and Greater Accra (0.64%).

An important milestone, perhaps, is the absolute shrinkage of Eastern region's rural population in the last census period, the first instance of such a decline in Ghana since Greater Accra in the 1960s. This, coupled with the region's high urban growth rate, is evidence that rural population loss, either from migration, urban expansion, or reclassification, is fuelling urban population growth.

Nationally, the rural population remains more distributed than the urban population. At more than 15 percent, Ashanti has the largest share of the total national rural population, followed closely by Northern Region (14%). Regions with low rural shares include Greater Accra (3%), Upper West (5%) and Upper East (7%).

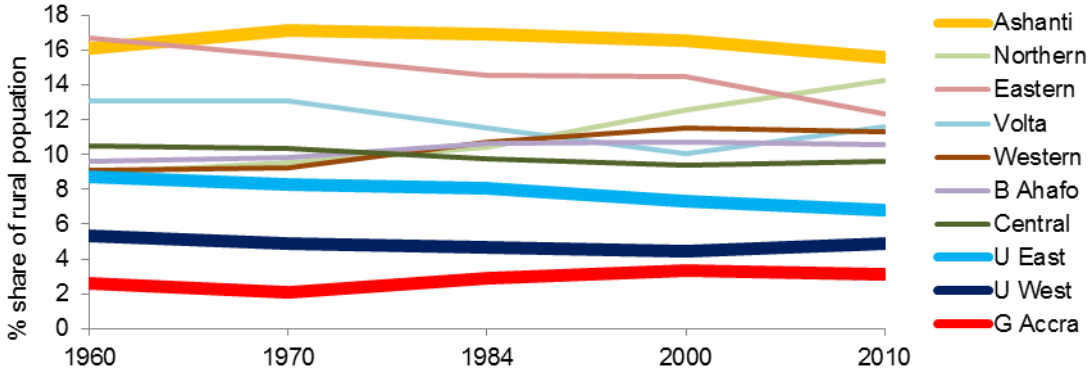
Figure 2.8 Rural population growth by region, 1960-2010



Source: NSDF Study 2013 based on GSS population census

Regional shares of the national rural population have not changed much over the years. Ashanti's share has declined but remains the largest (15.6%), followed by the shares of Northern (14.3%) and Eastern (12.3%) regions. The Northern Region's share has been increasing since the 1970s. In contrast, Greater Accra's share is only 3.1 percent. Depending on the physical and economic context, a large rural population in a region, particularly one that has an attractive urban centre, is likely to be a source of future rural-to-urban migration. All other things being equal, rural populations are more likely to migrate to nearby urban centres than to one that is more distant.

Figure 2.9 Region share of rural population 1960-2010



Source: NSDF Study 2013 based on GSS population census

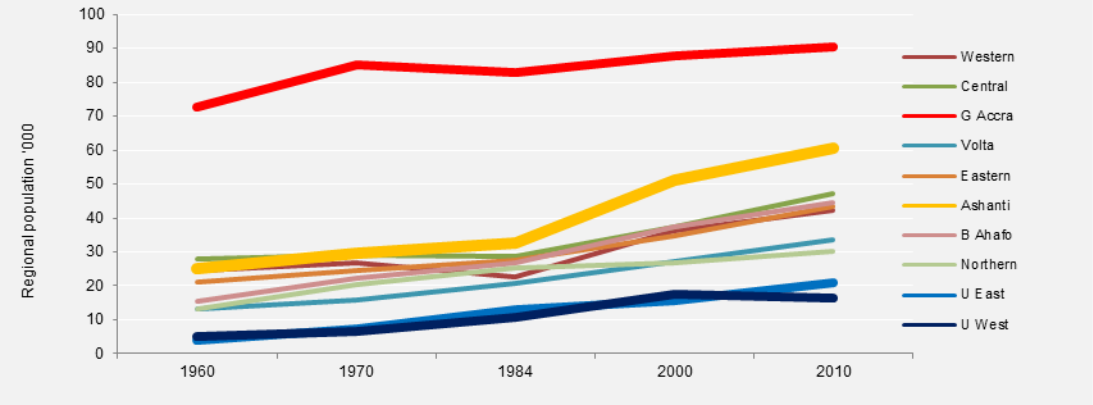
2.2.3 Regional urbanisation levels

Urbanisation level may be defined as the share of a geographical area's population living in urban areas. Overall, Ghana's urbanisation level has increased from about 23 percent in 1960 to over 50 percent in 2010. The term "urbanisation" or "urbanising" refers to the increase in urbanisation levels over time.

While all regions are urbanising, the rate of change varies significantly. Greater Accra and Ashanti have urbanised faster than the others and have higher-than-average urbanisation levels, 90 and 60 percent respectively, in 2010 (figure 2.10). Four regions have reached levels of between 42 and 47 percent (Western, Eastern, Brong Ahafo and Central), while three regions have low levels of between 16 and 30 percent (Upper West, Upper East, and Northern). Interestingly, Upper West region recorded a decline

in urbanisation level between 2000 and 2010 because of the large increase in its rural population compared to urban population.

Figure 2.10 Urbanisation levels by region 1960-2010

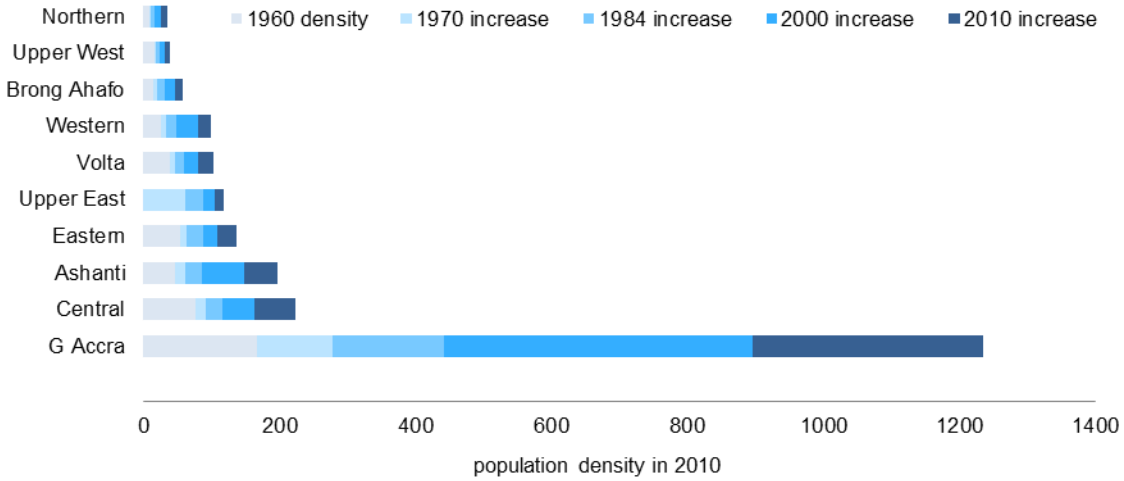


Source: NSDF Study 2013 based on GSS population census in identified years

2.2.4 Regional population density

Population growth between 1960 and 2010 has led to increased population density[10] in all regions (figure 2.11). However, the differences between regions are dramatic. For example; the density of Greater Accra in 2010 was five times that of the Central Region and 35 times that of the Northern Region. The long-term flow of migrants to the area with the highest density suggests that high density is associated with the pull factors that attract migrants to the region. Some of the differences between regions is due to their size. For example; Northern region, with about a third of Ghana's land area, is about 21 times the size of Greater Accra, which occupies only 1.4 percent of the national territory.

Figure 2.11 Change in population density 1960-2010 by region



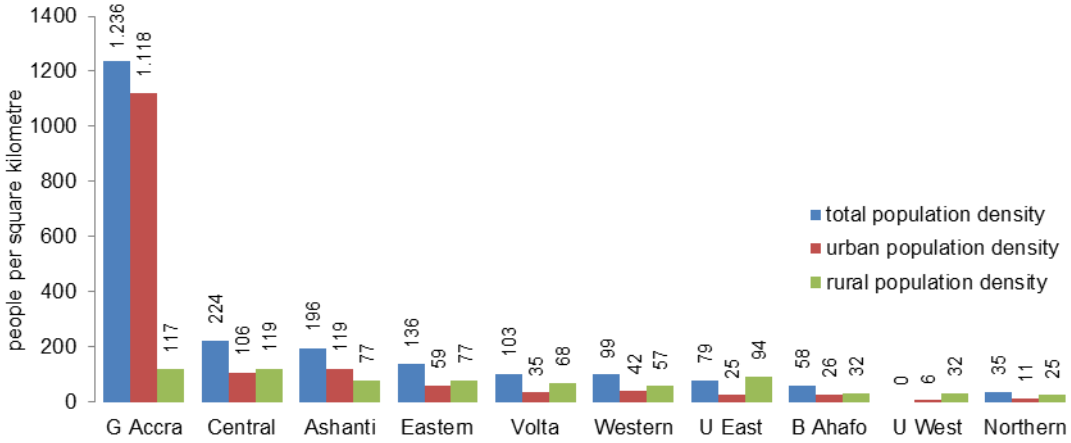
Source: NSDF Study 2013 based on GSS population census in identified years

Greater Accra's total and urban population densities in 2010 were significantly higher than those of the other regions (Figure 2.11), respectively 12 and 21 times the national average. Interestingly, the rural population densities of Central and Greater Accra regions are higher than the total population densities of Volta, Western, Upper East,

[10] The population density referred to here is the crude density assuming equal distribution within the region.

Brong Ahafo, Upper West, and Northern regions. Given this, it is more likely that their rural populations will become urbanised, either through migration to existing urban areas or re-classification of villages into urban centres.

Figure 2.12 Population densities by region, 2010 (persons per km^2)



Source: NSDF Study 2013 based of GSS population census

2.2.5 Regional migration

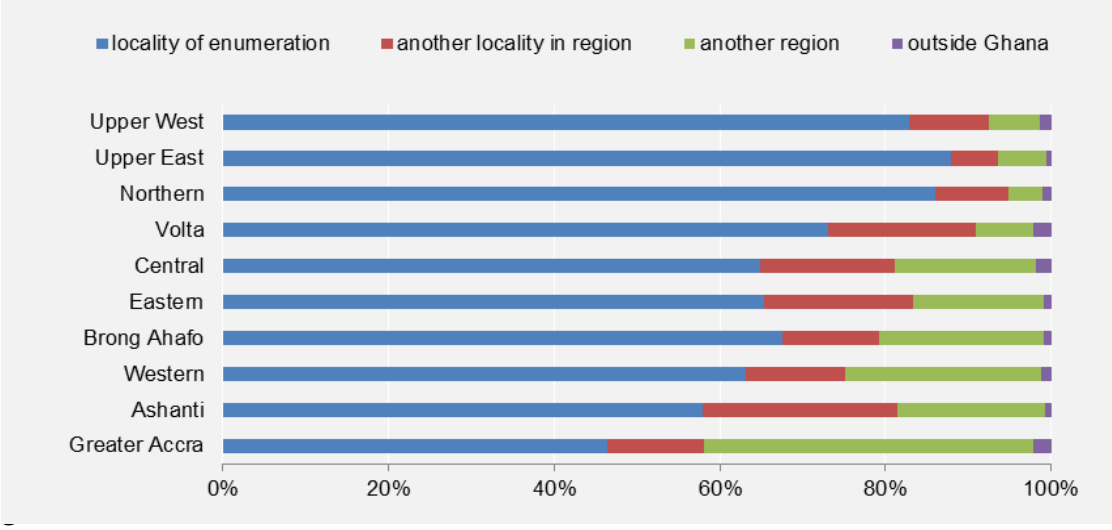
Apart from natural population growth, migration between regions and within regions accounts for the present size of the population in regions and districts and will also contribute to the future size of these populations.

The 2010 Census Analytical Report acknowledges that "census data on migration do not provide enough and adequate information on patterns and differentials of migration in a country". Nevertheless, while the population census does not directly record data on regional migration, it may be inferred by the census data on the locality-of-origin of enumerated households (Figure 2.13). The GSS census provides *place-of-birth* and *place-of-enumeration* data on migration over the lifetime of household respondents but does not define the time of these movements. In addition, questions pertaining to migration were different in the 2000 and 2010 census.

Locality-of-origin gives an indication of the nature of lifetime migrants (it does not indicate when the migration took place and so the rate of migration cannot be calculated). Households from "another locality in the region" may be considered as *intra-regional migrants* from one district to another. Those from "another region" may be considered as *inter-regional migrants*.

In Ghana as a whole, 65 percent of the population live in the district of their birth while 35 percent have migrated sometime during their lifetime. As a factor in national population redistribution, inter-regional migration is slightly more important than intra-regional migration; some 18 percent of the population migrate between regions while 15 percent migrate within regions. International migration is negligible; only 1.1 and 0.2 percent migrated from an ECOWAS countries and from outside Africa, respectively.

Figure 2.13 Percentage of Regional population by locality of origin, 2010



Source: NSDF Study 2013 based on GSS Population Census 2010

In-migration

Regions with higher percentages of lifetime in-migrants may be said to be relatively more attractive, and have more attractive localities, than regions with lower percentages. These regions, in order of attraction, are Greater Accra (51%), Ashanti (41%) and Western (36%). Less attractive regions are Upper West (16%), Northern (13%) and Upper East (11%).

Comparing intra- and inter-regional migrants gives an indication of the relative attraction of localities within regions. Intra-regional migration may be easier and more likely than inter-regional migration due to the smaller distances between place-of-origin and destination.

Regions with high shares of intra-regional migration are Ashanti (23%), Eastern (18%) and Volta (18%). While there is no data on the specific moves of intra-regional migrants in theory, the same numbers of people could be moving from-and-to all localities, it is likely that one or just a few localities in the region are more attractive than the others. In the case of Ashanti, the most attractive locality is likely to be KMA. In the case of Eastern and Volta, it is likely to be the districts adjacent to Greater Accra. Regions with low shares of intra-regional migrants are Upper East, Northern and Upper West. This may be an indication that there are few localities in these regions to which it is worth migrating.

Regional variations in inter-regional in-migration are wider than in intra-regional migration. In-migration is highest in Greater Accra (40%), Western (23%) and Brong Ahafo (20%) regions and lowest in Upper East, Upper West and Northern regions.

In-migration to regions as a percentage of its population increase was by far the highest in Greater Accra (41%) but also significant in Central Region (27%). Ashanti, Brong Ahafo and Eastern regions all had similar percentage of in migrants (~16%) as did Western, Upper West and Upper East regions (6-10%). In migration was insignificant in the Northern region. The level of in-migration is a strong indicator of a region's attractiveness.

The mix of migrant types varies by region and relates to the relative level of attractiveness or pull-power to migrants from near and far origins. For example; Greater Accra, Western, Central and Brong Ahafo all have more inter- than intra-regional migrants, while the others, particularly Ashanti and Volta, have the reverse pattern.

Out-migration from regions as a percentage of its increased population reached 38 percent in Upper East and ranged between 17 and 26 percent in all other regions except Greater Accra and Ashanti, with 9 and 11 percent out-migrants respectively.

Out-migration

Regions with higher percentages of lifetime out-migrants may be said to have populations that are less content to remain in place than those with lower percentages. The less contented regions are Upper West (37%), Volta (32%), Upper East (31%), Eastern (28%) and Central (28%). The more contented regions are Greater Accra (8%), Western (12%) and Ashanti (13%).

Net-migration

Net-migration is the difference between in-migration and out-migration. Net migration in regions as a percentage of their increased population was positive only in Greater Accra (32%), Western (7%) and Ashanti (6%). This indicates that only these three regions are growing as a result of net in-migration.

Table 2.5 Summary of inter-regional migration, 2010

	total population '000	in-migration '000	out-migration '000	net-migration '000	% in-migration	% out-migration	% net migration	migration effectiveness ratio	% annual of net	net-migration	% net-migration
Western	2,376	562	279	282	24	12	12	34	15	43	1.80
Central	2,202	374	612	-238	17	28	-11	-24	15	-36	-1.64
G. Accra	4,010	1,598	323	1,275	40	8	32	66	15	194	4.83
Volta	2,118	146	682	-536	7	32	-25	-65	15	-81	-3.84
Eastern	2,633	418	750	-332	16	28	-13	-28	15	-50	-1.92
Ashanti	4,780	854	614	240	18	13	5	16	15	36	0.76
Brong Ahafo	2,311	458	340	118	20	15	5	15	15	18	0.77
Northern	2,479	101	433	-333	4	17	-13	-62	15	-51	-2.04
Upper East	1,047	61	329	-268	6	31	-26	-69	15	-41	-3.89
Upper West	692	43	253	-209	6	37	-30	-71	15	-32	-4.60

Source: NSDF Study 2013 based on GSS Population Census 2010

Regional attractiveness to other regions

It is important to understand not just a region's in-, out- and net-migration but also the nature of flows between regions; or the extent to which specific regions are attracting migrants from other specific regions. One method for estimating specific migration flows between regions compares the data from two census periods, 2000 and 2010. The number of inter-regional migrants between each region in 2000 is subtracted from that in 2010 to derive the numbers that have migrated between the two census periods. Figure 2.14 depicts the results of this analysis. The area of the bubbles is proportional to the population size; grey bubbles represent the population in each region that did not migrate while the blue bubbles represent migrants. The x-axis gives

the regional populations at place-of-birth and the y-axis gives populations at place of enumeration.

There are several important findings from this analysis. Greater Accra is the most attractive region to migrants. It is the preferred destination for migrants from its three adjacent regions Eastern, Volta, and Central, and from the Ashanti region. It is also second choice for migrants from the Northern and Brong Ahafo regions.
Ashanti is the next most attractive region. It is the preferred destination for three of the four remaining regions - Northern, Brong Ahafo, and Upper East, and it is the second choice for migrants from Western and central regions.

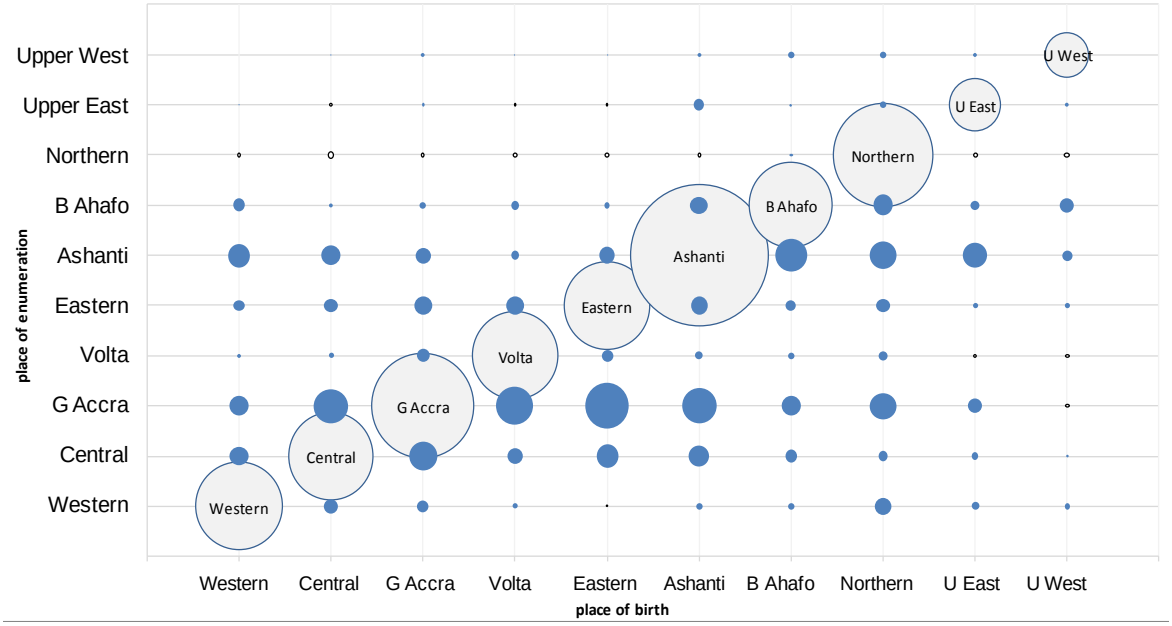
Central region is the third most attractive region. It is the first choice of migrants from Greater Accra, the second choice for migrants from Eastern and Ashanti regions, and the third choice of those from the Western Region, some of whom may be moving to Central Region but working in Western Region.

Brong Ahafo is the preferred destination for migrants from Upper West and the third choice of migrants from Northern and Upper East regions.

In general, the three northern regions are not significant destinations of migrants. North-to-South migration is less common than South-to-South migration, perhaps due to high migration costs and few opportunities for the skill sets of Northern people. Northern migrants to the South are mainly less-skilled, less-educated, willing to take any type of job and unaccustomed to the Southern culture.

Although there are few migrants from Greater Accra, they prefer Central, Eastern, and Ashanti regions. Many of those migrating to Central and Volta regions are probably attracted by new, less expensive, housing developments and commute to jobs in Greater Accra[11].

Figure 2.14 Estimated inter-regional migration, 2000-2010



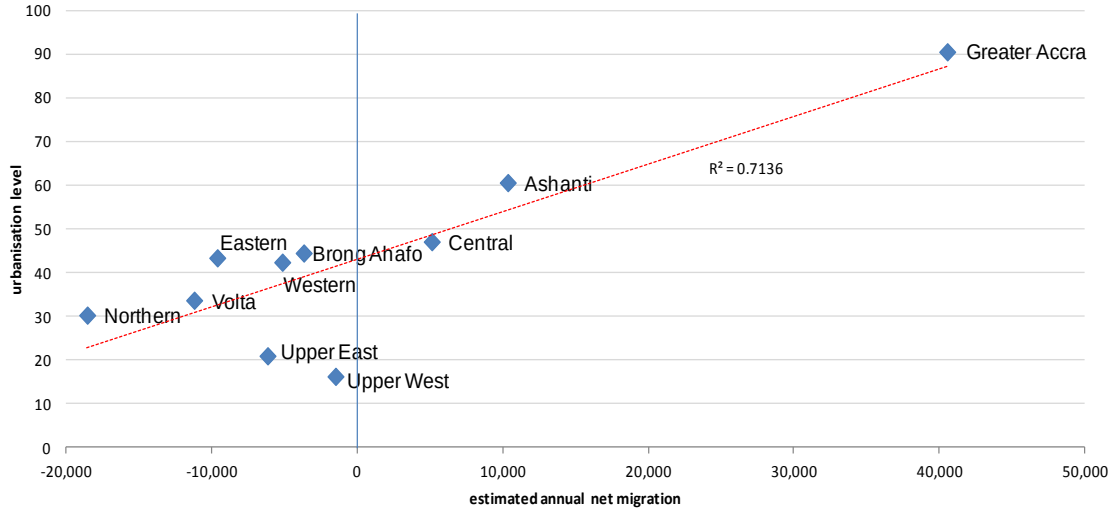
Source: NSDF Study 2013 based on GSS 2010 Population and Housing Census

[11] As suggested by members of the Regional Coordination Committees

Migration and urbanisation

Not surprisingly, inter-regional net-migration appears to be correlated with urbanisation level; the higher the level, the more net-migrants it has (Figure 2.15). This pattern is found in most countries, in general, people migrate to cities, not to rural areas, because of the opportunities that cities provide.

Figure 2.15 Inter-regional net migration by region's urbanisation level



Source: NSDF Study 2013 based on GSS 2010 Population and Housing Census

Migration and age

The likelihood of migrating is related to age. People of working age 15-64 are more likely to migrate inter-regionally than younger and older populations. This is evidenced by the lower proportions of 15-24 year-olds and 25-59 year-olds in the three northern regions than in the rest of the country, and a higher proportion in the south, especially in Greater Accra and Ashanti[12].

2.3 District populations and population growth

It is important to understand the distribution and growth[13] of populations at the district level as well as the regional level. This analysis provides a deeper insight into the spatial dynamics of the country so as to better inform spatial planning.

This section provides a district-level perspective on population growth. It covers district populations in 2010, district population densities, population growth rates, urbanisation levels, rural populations in urbanised districts, the five leading districts as well as the underperforming districts.

2.3.1 District populations in 2010

Overall population, urban population, and to an extent, rural population is more concentrated at the district level than at the regional level (Figure 2.17).

[12] GSS 2010 - Frempong-Ainguah, Badasu & Codjoe, 2010; Kwankye, 2012; Tanle and Awusabo-Asare, 2009

[13] Analysis of district growth rates is complicated by the change in the number of districts and in boundaries between the 2000 census and the census in 2010. Between these periods, the number of districts increased from 110 to 171. While most of the new 2010 districts were created by subdividing the boundaries, a few odd-shaped districts were formed by combining parts of different districts. Thus in order to compare the population in the two census periods, NSDF aggregated the figures from the 2010 census into 2000 district boundaries. In the case of the odd-shaped districts, the project team used the GIS to apportion the urban centre and rural settlements' populations to the appropriate districts.

While the median population of districts is 110,000 people, district populations vary significantly, by a factor of 100, from a high of 2.3 million in Kumasi Metropolitan Area to a low of 25,000 in Awutu Senya in Central Region. As a group, the top four districts – KMA, AMA, STMA and Ga South, account for 20 percent of the population, the same share as the bottom third. The most populous districts are largely or completely urbanised and, arguably, may be more appropriately designated as cities, or parts of cities, rather than as districts. This variance in district populations has implications on spatial governance, planning, and development.

Urban population distribution in districts is even more concentrated than the overall district population. The median district has about 32,000 urban residents while KMA, which is fully urbanised, has 2.3 million. Two districts account for 30 percent of the urban population, the top ten account for over 50 percent, while the bottom ninety account for only ten percent. Eight districts have no urban population at all[14] and may therefore have poor access to urban centre services; these may be candidates for improved links to nearby urban centres.

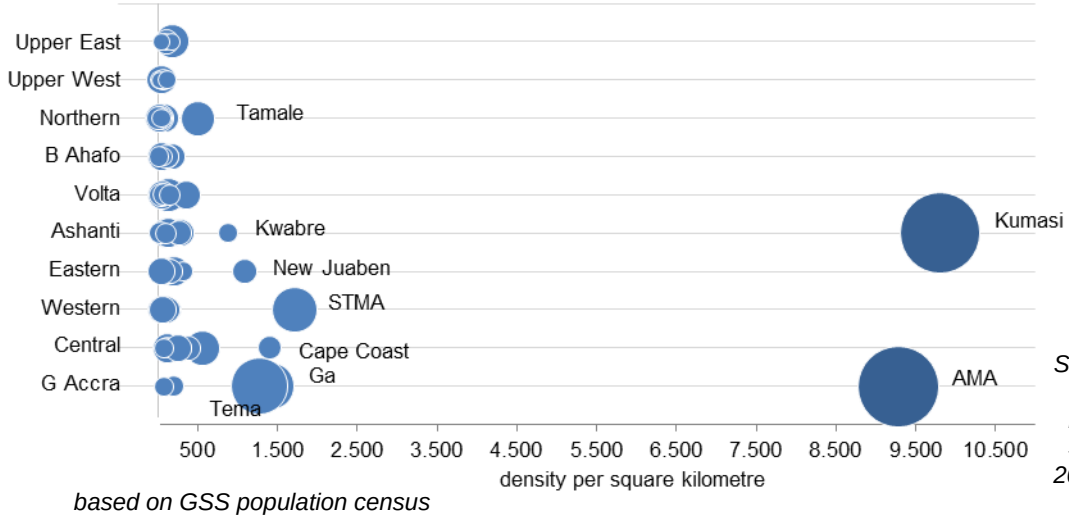
Rural population also varies among districts, but less than total population. The median district has about 72,000 rural inhabitants while Kwahu North contains over 175,000. As a large part of the rural population will become urbanised (through migration, absorption, or reclassification) in the next 20 years, it may be important to target districts with large rural populations and high urbanisation levels for improving urban-rural linkages and to better guide urban and rural growth. Districts with above median rural populations that are more than 50 percent urbanised include Tamale, Ga West, Techiman, Gamoa East and Mfantsiman.

2.3.2 District population density

Between 2000 and 2010, the national population density increased from about 79 to 104 ppkm^2 with density increases in districts changing far more dramatically. Owing to the concentration of population in ten districts with relatively small areas, these have population densities considerably higher than the national average (figure 2.16). For example, Kumasi Metropolitan Assembly and Accra Metropolitan Assembly both reached over 11,000 persons per km^2, Ashaiman's density is 5,500 ppkm^2, Sekondi-Takoradi Metropolitan Assembly's and Ledzokuku Krowor's is about 3,000 ppkm^2, followed by Ga South's at 2,200 ppkm^2. At the low density end are the 33 districts with less than half the national average density.

[14] The eight districts without urban populations are: Assin South, Nadowli, Wa West, Wa East, Bosome Freho, Upper Denkyira West, Sissala West and Awutu Senya.

Figure 2.16 District population density, 2010



Source: NSDF Study 2013

based on GSS population census

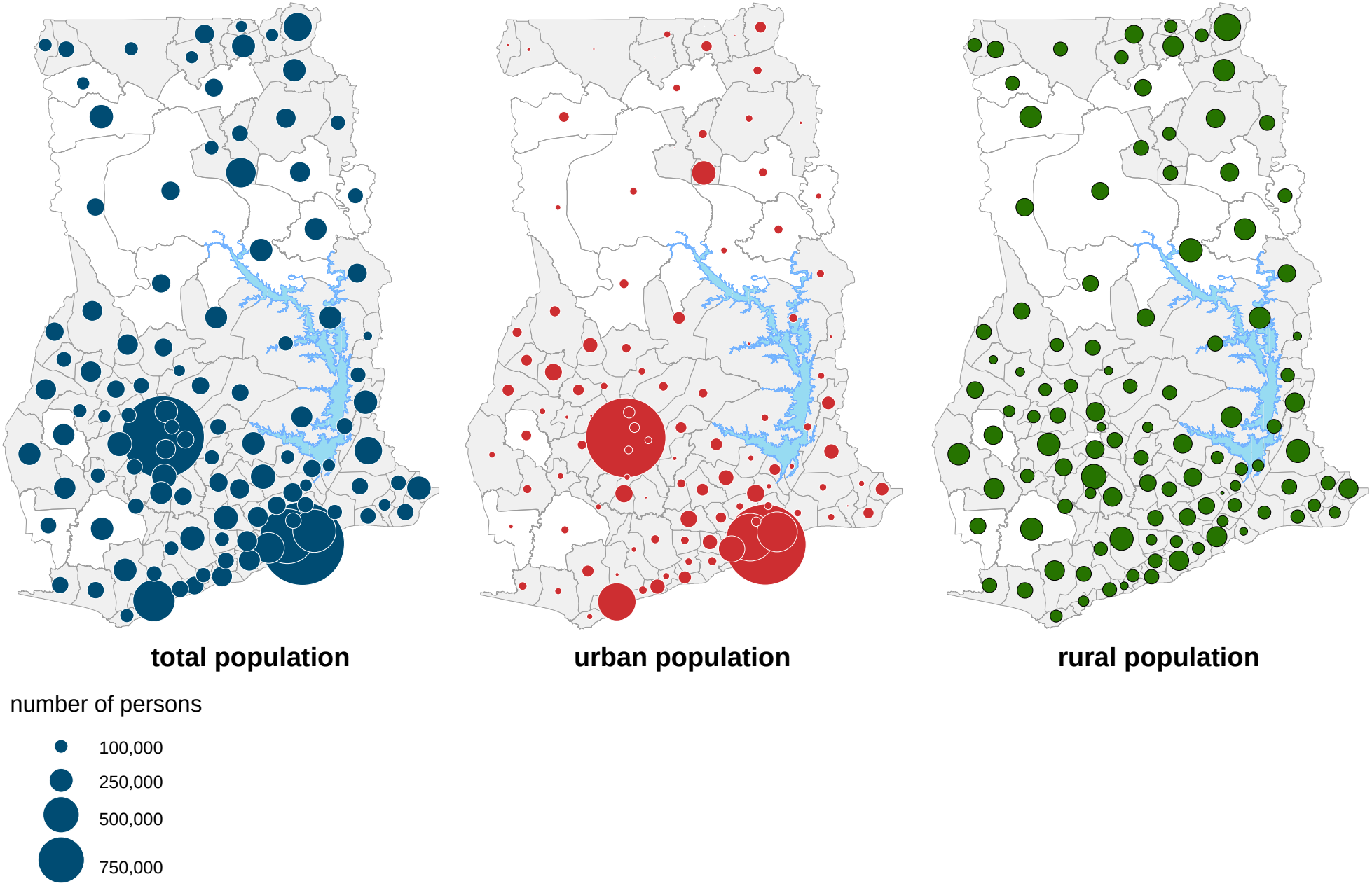


Figure 2.17 Total, urban and rural population in districts, 2010

District urban population density is more concentrated than overall population density. At the top end, the urban population densities are similar to those of total population density because these districts are all or predominantly urban. At the lower end, there are 106 districts with urban population densities of less than 50 ppkm^2 and 38 districts with less than 10 ppkm^2. The median urban population density is 33 ppkm^2.

Rural population density also varies. While the median rural population density is 72 ppkm^2, that of Adentan is almost 400 ppkm^2. The next ten districts[15] have rural population densities of over 200 ppkm^2, which is twice the national population density.

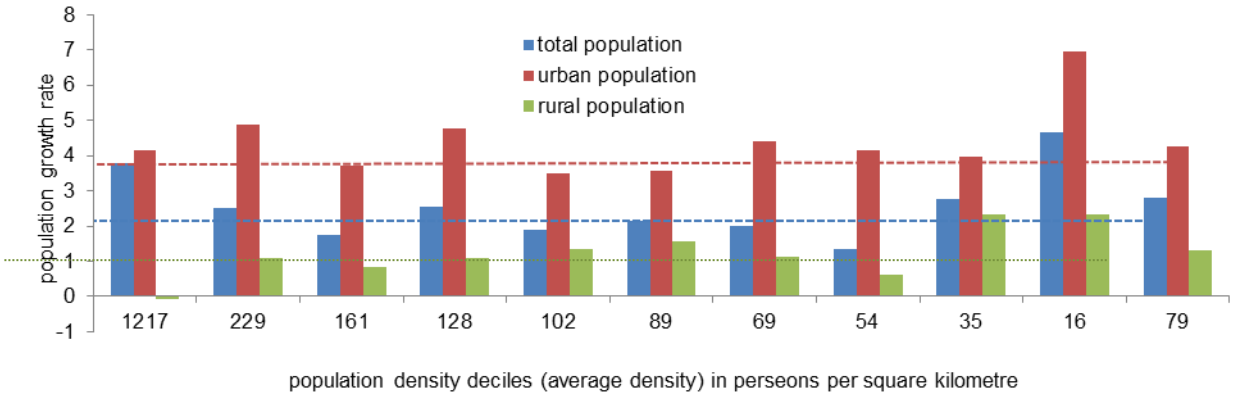
Figure 2.21 provides maps of the total urban and rural population densities by district based on 2010 census population.

While Ghana distinguishes between three types of districts; metropolitan, municipal and districts assemblies, largely based on population size, it may also be useful for planning and development purposes to classify districts into density-types. NSDF proposes the following urban-rural density code classification:

- **rural districts** - are those with population density of less than 195 ppkm^2, 90 percent of the population is in rural areas and/or the district has no urban area with a population of 10,000 or more.
- **urban districts** - are those with a population density of at least 195 ppkm^2, 90 percent of the population lives in urban areas, and the district population in urbanized areas is at least 50,000 or 90 percent of the district population.
- **mixed districts** - meet neither the urban nor the rural district criteria. Mixed rural districts have a population density of less than 123 ppkm^2 and mixed urban districts a population density of at least 123 ppkm^2.

If one applies the criteria of density <195 ppkm^2, urban population < 10,000, and urbanisation level < 10%, then, in addition to the seven districts without any urban population, there are ten more districts that meet the criteria, these are Bongo, Bawku West, Sefwi Akontombra, Garu Tempane, Amansie West, Kintampo South, Saboba, Tolon Kumbungu, Wassa Amenfi East, and Builsa.

Figure 2.18 Population growth rates by district density deciles



Source: NSDF Study 2013 based in GSS population census, 2000 and 2010

[15] These are Awutu Senya 2, Cape Coast, Ga South, Ketu South, Afigya Sekyere, Ga East, Komenda Edina Eguafo, Gomoa East, Atwima Kwamwoma and Abura Asebu Kwaman

2.3.3 District population growth rates (2000-2010)

It is important to understand district population growth trends so as to inform forecasts and plan for future district population[16]. District population growth is analysed overall and in terms of their urban and rural population components.

Between 2000 and 2010, a few districts grew rapidly, most grew moderately, while several lagged and a few even lost population. Grouping districts by region and by growth rates can help to see patterns and help formulate policy, as shown in figure 2.19. The figure shows the regional distribution of districts by their population size – the diameter of the bubble – and growth rates. It divides growth rates into five groups: leading, above-average, below-average, and lagging or declining. Growth rates varied widely from 8.6 to -1.7 percent per year, with ten *"leading"* districts growing even faster than the average national urban growth rate of 4.2 percent. Some 36 "*above-average*" districts grew faster than the average national growth rate of 2.7 percent while 36 "*below-average*" districts grew at a rate below this but above the average rural growth rate of 1.3 percent per year. Some 21 "*lagging*" districts that grew slower than the national rural population and the seven districts that lost population are considered the "*decliners*".

Of the leading districts, four are among those with the largest populations: Kumasi, Ga, Shama Ahanta East and Awutu Efutu Senya. Other large districts, particularly AMA, showed more moderate growth. Interestingly, no region has more than one "*leading"* district except Northern, which has three. And three regions – Upper East, Upper West, and Brong Ahafo have no *leading* districts.

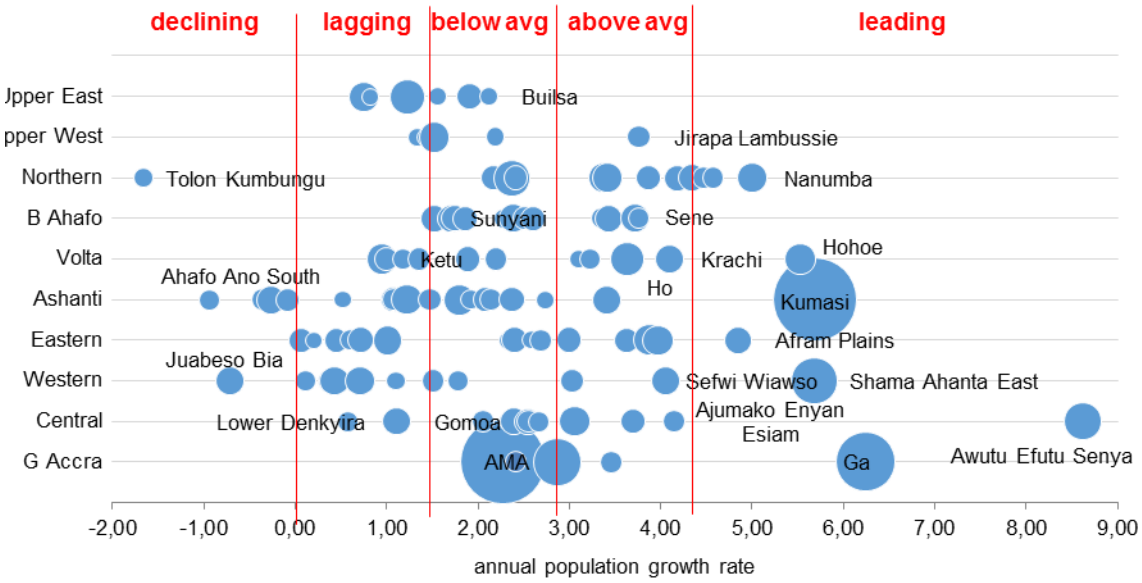
All regions have at least one *above-average* district except Upper East. And all of the other districts in the Upper East and Upper West are below-average or lagging. All regions have *lagging* districts except Northern and Brong Ahafo. Four regions have at least one *declining* district while Ashanti has four.

Figure 2.23 shows the total, urban and rural population growth rates by districts between 2000 and 2010.

There is as yet no government policy that takes into account the population growth rates of districts. Several developed countries have policies that address areas that are stagnating or loosing population.

[16] While it is preferable to consider data from more than two census periods, data on district populations – and urban and rural populations – is available only from the years 2000 and 2010. Population growth is analysed within the 110 district boundaries at the time of the 2000 census by aggregating the 2010 district population into the borders of the 2000 districts

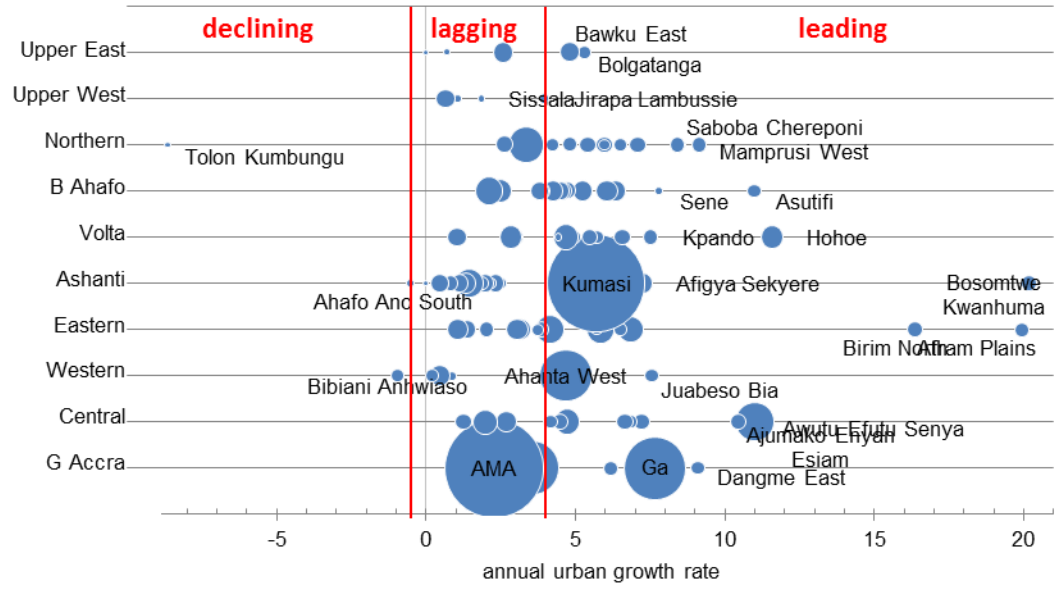
Figure 2.19 District population growth rate by district size and region 2000-10



Source: NSDF Study 2013 based on GSS Population Census 2000 and 2010

Urban population growth rates in districts varied more widely than total population growth rates. The fastest district grew by over 20 percent while the slowest lost population by over 8 percent per year (figure 2.20). District urban growth rates exceeded the national urban growth rate in numerous districts. The fastest seven districts grew at more than 10 percent per year with top two, Bosomtwe Kwanhuma and Afram Plains, growing around 20 percent. Three districts lost urban population, Tolon Kumbungu, Bibiani Anhwiaso and Ahafo Ano South, while another 13 grew at a rate that was lower than that of the national rural population. All regions except Upper West had at least one leading urban growth district except Upper West. The Northern region had eight leading districts.

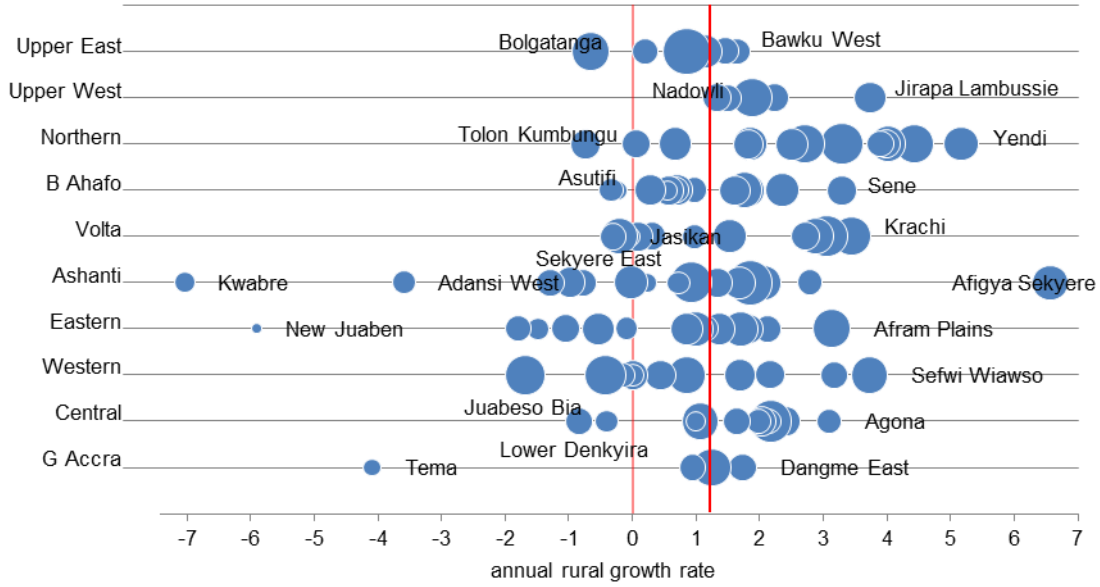
Figure 2.20 District urban population growth rate by district size and region 2000-2010



Source: NSDF Study 2013 based on GSS Population Census 2000 and 2010

Nationally, rural population grew at just over 1.3 percent annually. District rural populations grew within a narrower range than did total populations. The fastest district grew at 6.6 percent while the slowest lost population at the rate of -7 percent per year (Figure 2.21). In three districts, Afigya Sekyere in Ashanti and Yendi and Nanumba in the Northern region, the rural growth rate exceeded the national urban growth rate. In 17 districts, the rural population grew faster than the national population. Significantly, some 25 districts lost rural populations; this occurred in all regions except Upper West. All regions except Upper East and Greater Accra had districts with rural growth rates above the national rate.

Figure 2.21 District rural population growth rate by district size and region 2000-2010



Source: NSDF Study 2013 based on GSS population census

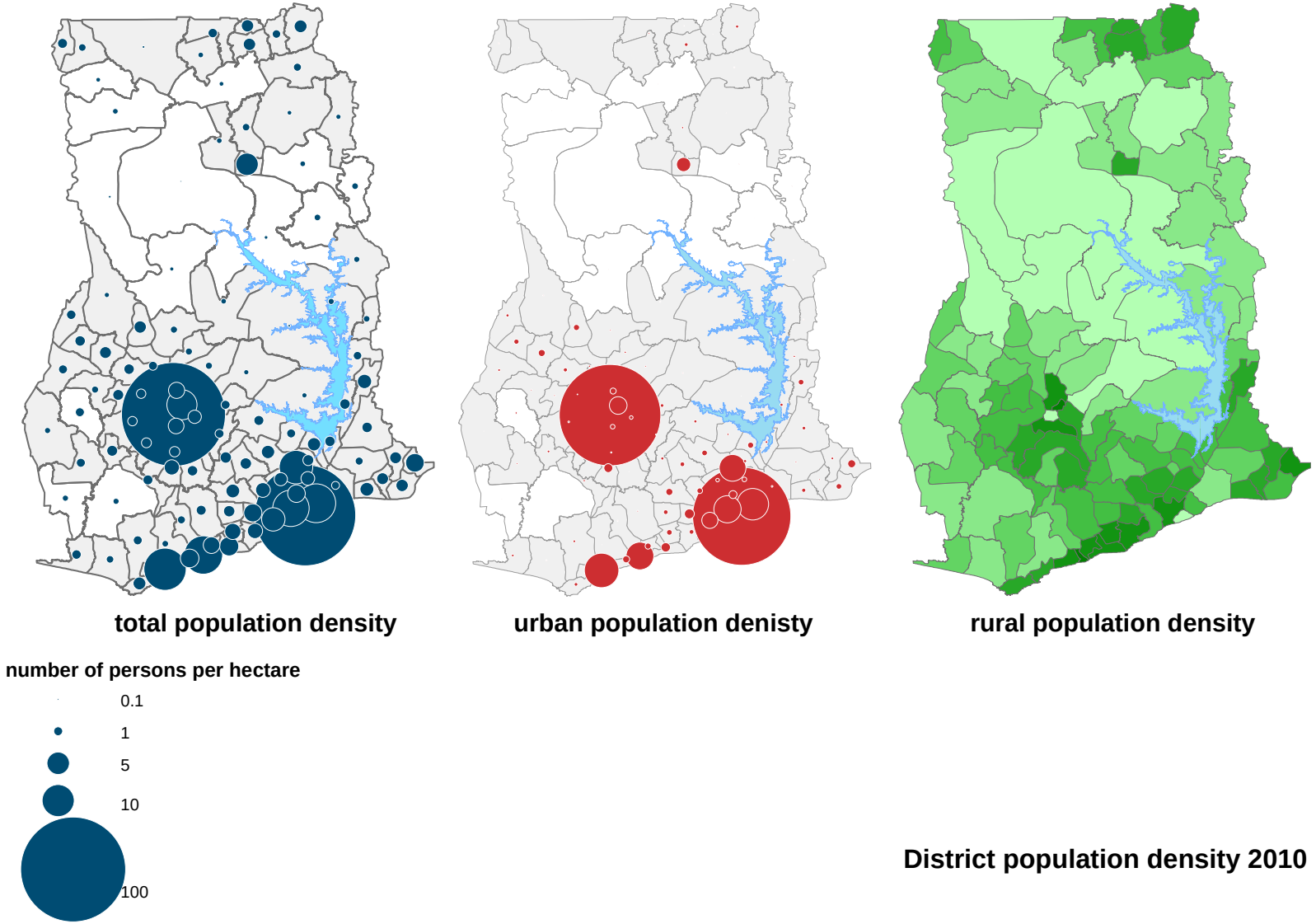


Figure 2.22 Total, urban and rural population density, 2010

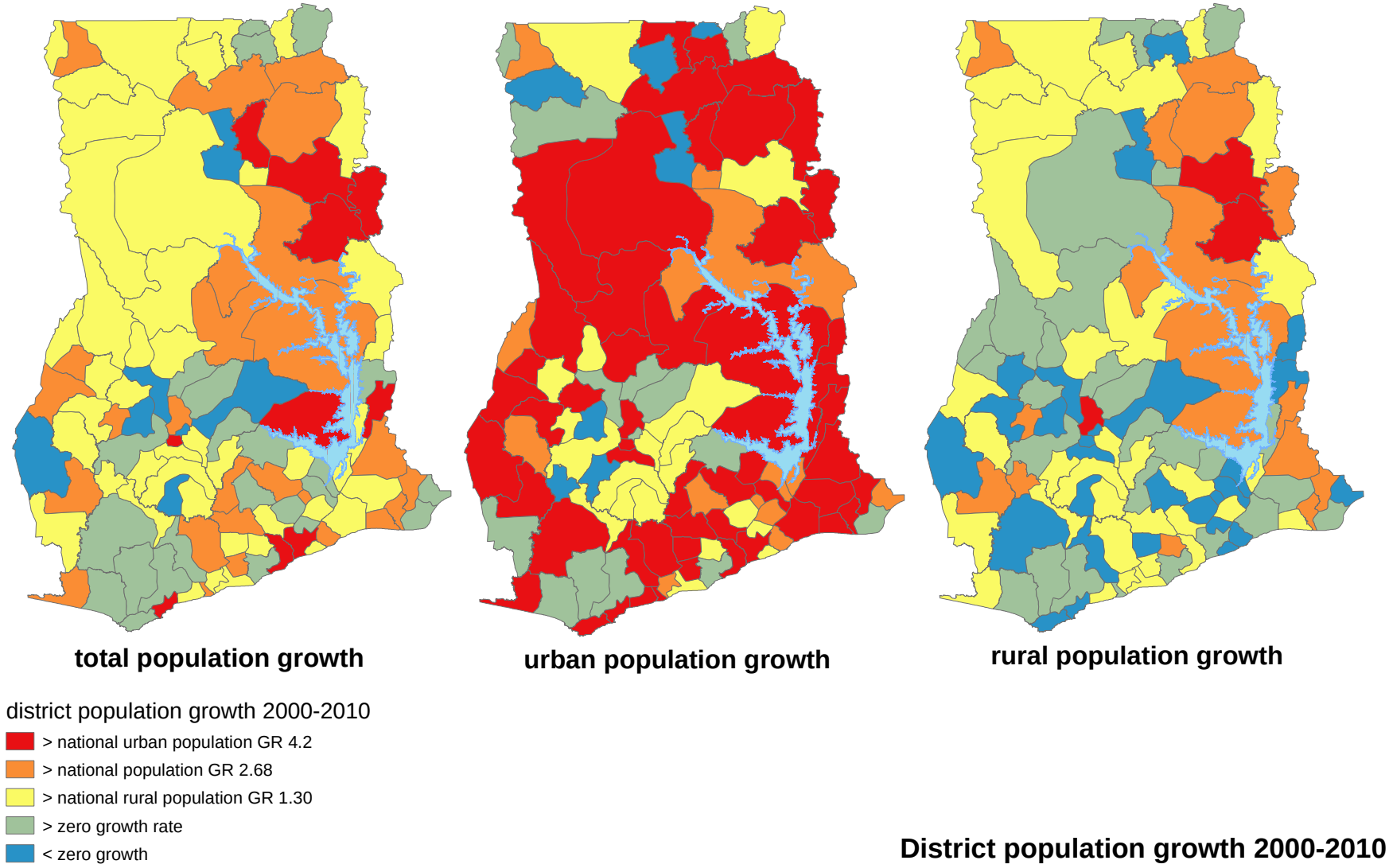


Figure 2.23 **Total, urban and rural population growth rate, 2000 to 2010**

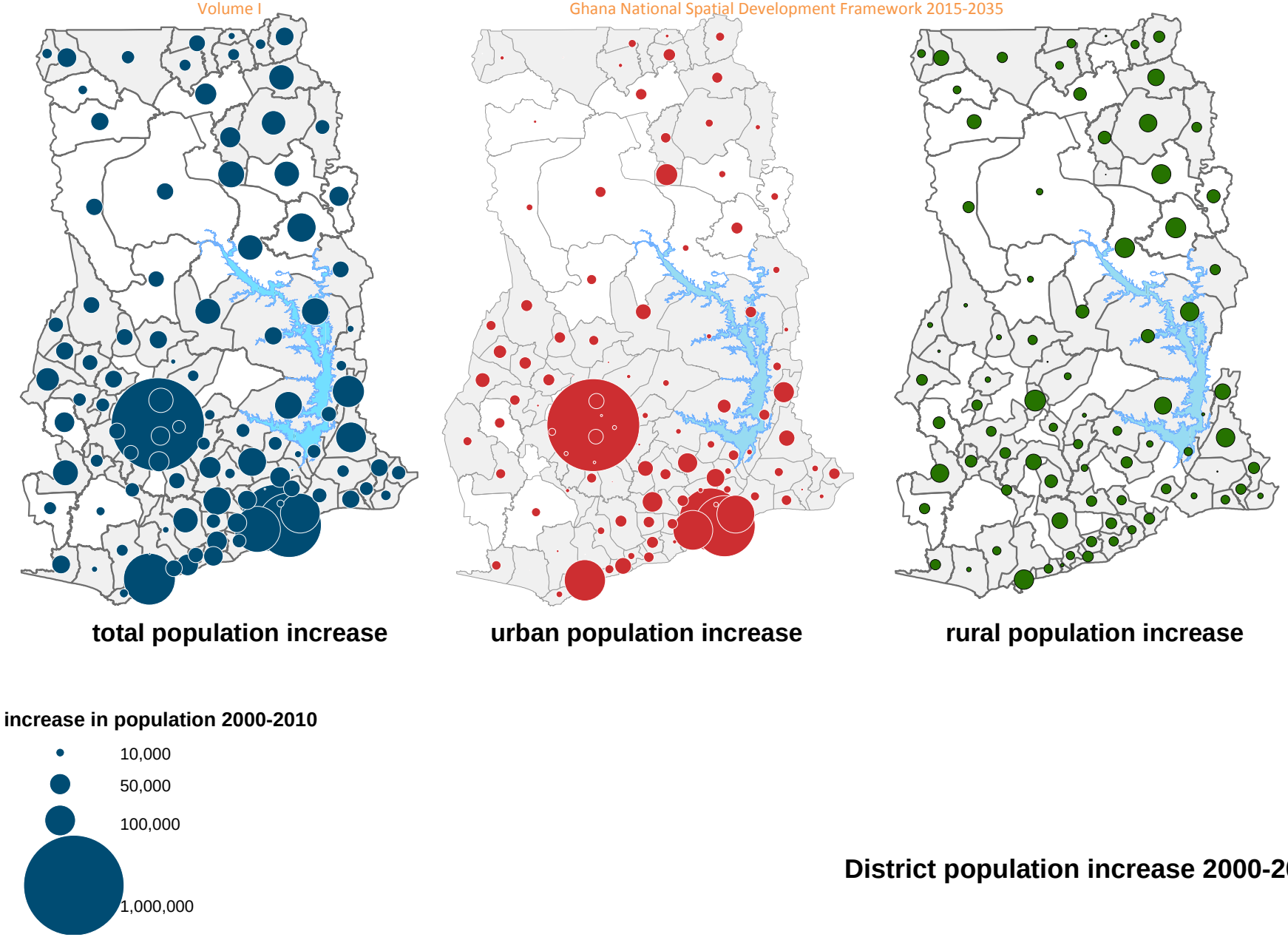


Figure 2.24 **Total, urban and rural population increase, 2000 to 2010**

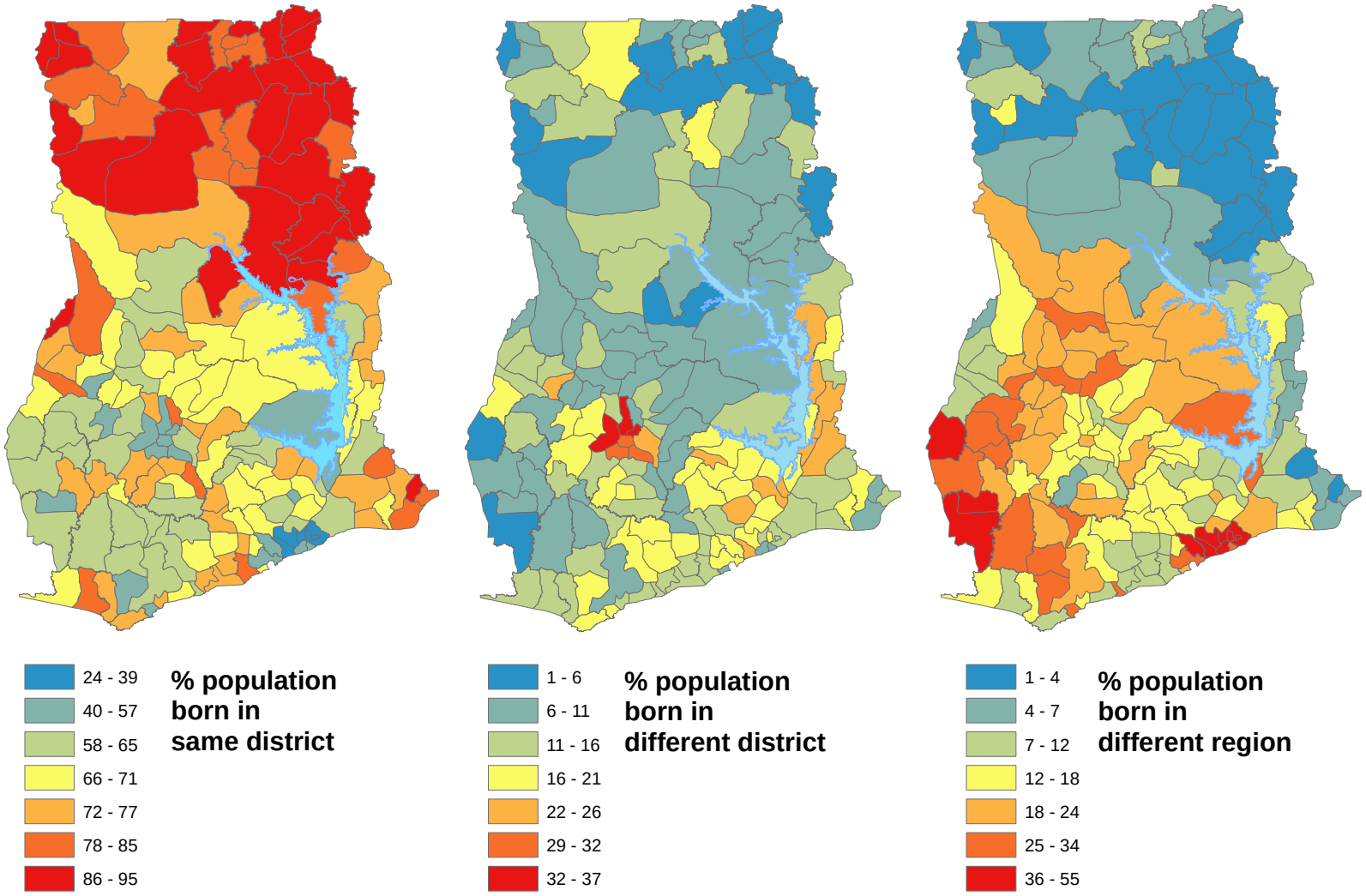


Figure 2.25 **Intra and inter regional migrants**

Table 2.6 shows, by region, the percentage of (year-2000) districts that grew above the regional and national total, urban and rural population growth rates. The analysis shows the extent to which population growth was concentrated in a few districts or dispersed in several. Regions with distributed growth have 50 percent of their districts growing above the regional rate (and 50 percent below). In regions with less than 50 percent, growth is concentrated in a few districts. Thus, Ashanti, followed by Central and Western, with 17, 33 and 36 percent of their districts growing above the regional rate, has the most concentrated growth. In regions with percentages above 50 percent, such as Northern, population decline is concentrated in a few districts. Urban growth was also concentrated in Ashanti Region.

Figure 2.23 compares the total, urban and rural populations of 110 districts in 2000 and 2010[17]. Figures 2.24 and 2.25 rank districts by their growth rates and shares of the national population increase respectively.

Table 2.6 District Growth relative to region and nation

	# districts	% districts growing > region rate			% districts growing > national rate			# of districts loosing population		
		all	urban	rural	all	urban	rural	all	urban	rural
Total	110	42	47	49	35	51	49	9	7	22
Northern	13	62	69	54	62	69	77	1	1	
B. Ahafo	13	46	69	38	31	69	38			6
Volta	12	42	92	100	42	75	50			3
Eastern	15	40	87	100	67	53	60			
G. Accra	5	40	60	60	60	60	20			
U. East	5	40		100	20		100			
Western	11	36	55	45	36	55	45	2	2	3
Central	12	33	42	67	33	58	67			3
Ashanti	18	17	22	50	22	22	33	6	4	7
U. West	6	50	50			33	33			

Source: NSDF Study 2013 based on GSS Population Census 2000 and 2010

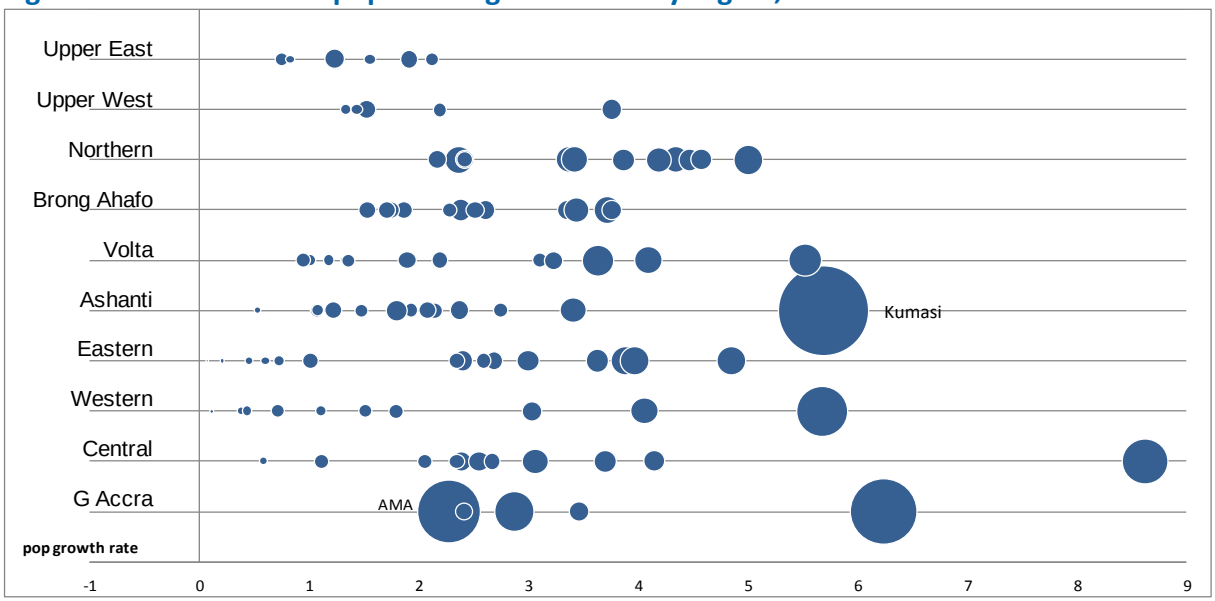
2.3.4 District population absolute increase / Percentage of national growth

National, urban and rural populations increased by about 5.7, 4.2 and 1.4 million people respectively, between 2000 and 2010. This growth was concentrated in a limited number of districts (Figure 2.24 and Figure 2.26). For example, the top twenty percent of districts accounted for 44, 72 and 65 percent of the national total, urban and rural population increases, respectively[18]. KMA's population and urban population increase alone accounted for 15 and 20 percent of the national increase.

[17] Populations for districts in 2010 are aggregated to coincide with the 2000 district boundaries.

[18] This is based on a quartile split of districts by their total, urban and rural populations' increases into quartiles, or five groups of 22 districts each.

Figure 2.26 District population growth rate by region, 2000-2010



Source: NSDF Study 2013 based on GSS population census

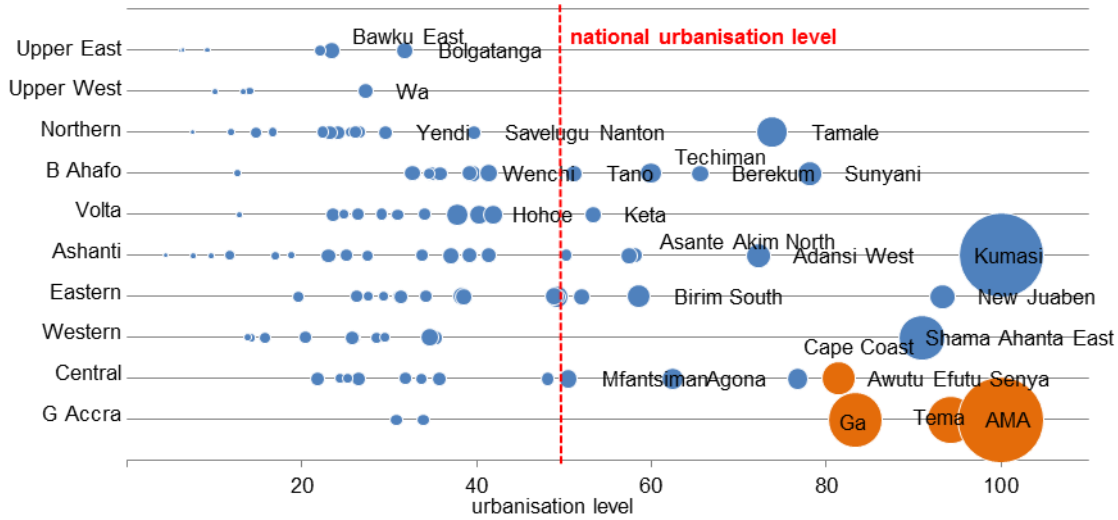
2.3.5 District urbanisation levels

Not only have urban areas grown faster than rural areas but the overall number of persons living in urban areas (urban growth) has increased. This section tries to estimate the extent to which urbanization has occurred through natural growth, migration and reclassification of areas resulting from changes of the boundaries defining urban and rural areas.

District urbanisation levels vary from zero to 100 percent (2.27). Four districts in two regions are 100 percent urban: AMA, Ashaiman and Ledzokuku Krowor in the Greater Accra Region, and Kumasi in Ashanti. Districts that are 100 percent urbanised may be considered as urban centres in their own right or a part of a larger urban entity.

Eleven districts are between 75 and 100 percent urbanised, all of which are in the south, seven along the coast, and two more within 70 km of Accra. Some 25 districts are between 50 and 75 percent urbanised, and all but one (Tamale) are in the south. Seventy-five districts, the largest number, are between 25 and 50 percent urbanised while fifty-six are between zero and 25 percent urbanised. Between 2000 and 2010, the number of districts without any urban population fell from four to one, Nadowli Kaleo in Upper West.

Figure 2.27 District urban population, urbanisation level, by region, 2010



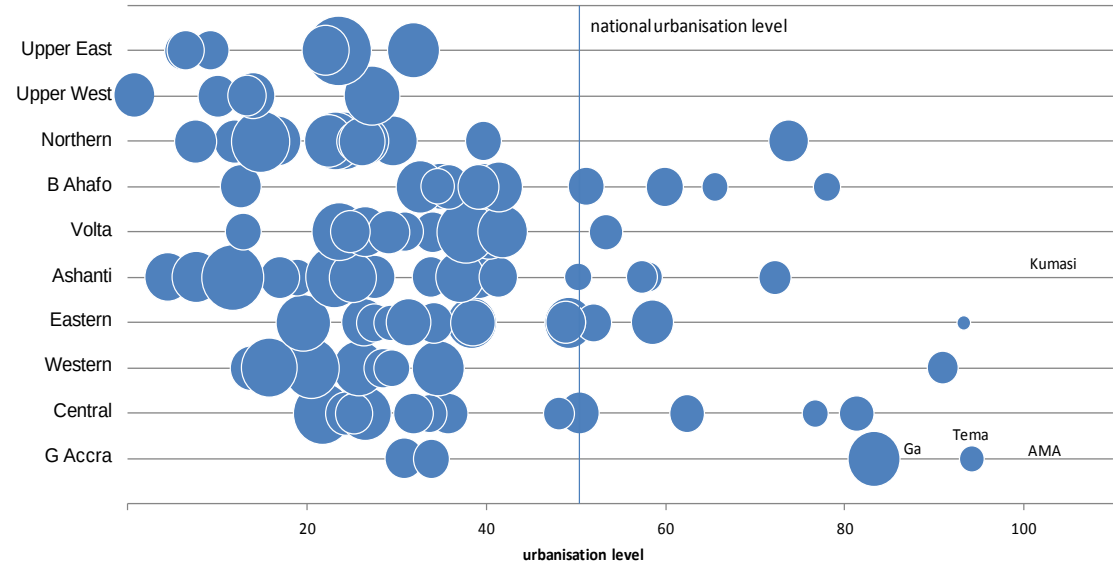
Source: NSDF Study 2013 based on GSS population census

The Figure above shows a link between district urban population size and urbanisation level; districts with larger urban populations have higher levels. Seven districts in Greater Accra, AMA, Tema, Ledzokuku Krokor, Adentan, Ashaiman, Ga South and Ga West, and Awutu Efutu Senya in the Central Region, are more than 64 urbanised and, because they are adjacent, may be taken as one predominantly large urban area.

2.3.6 Rural populations in urbanised districts

Even though a district may be highly urbanised, Figure 2.28, shows that it may have a rural population of substantial size, as seen in Ga, Tamale, STMA and other districts. Rural populations in these urbanised districts are likely to have stronger rural-urban linkages than those in less urbanised districts. In addition, they may also be more likely to become urban themselves either through migration, absorption or reclassification.

Figure 2.28 District rural population, district urbanisation level, by region, 2010



Source: NSDF Study 2013 based on GSS population census

2.3.7 The five leading districts

Population, urban population, and the share of population and urban population growth are concentrated in relatively few districts. The five largest districts in 2010 (and in 2000) were Kumasi Metropolitan Assembly, Secondi-Takoradi Metropolitan Assembly, Ga West, Accra Metropolitan Assembly and Tema Metropolitan Assembly[19] (Table 2.7). These five largest districts contained 26 and 48 percent of the national population and urban population, respectively. The same five accounted for 38 and 47 percent of the increases, respectively, in population and urban population. On average, these top five grew at 4.2 percent and urbanized at the rate of 4 percent. All had population and urban growth rates above the national rates except TMA and AMA. KMA and AMA alone account, respectively, for 16 and 17 percent of the urban population and for 21 and 10 percent of increased urban population between 2000 and 2010. In addition, the top 29 districts had 50 and 70 percent of the population and urban population, respectively.

Table 2.7 Population characteristics of the largest five districts

	population '000	urban population '000	population increase '000	urban population increase '000	population growth rate	urban pop growth rate	% of total pop increase	% of urban increase	% population	% urban pop
Kumasi	2,035	2,035	865	865	5.7	5.7	15	21	8	16
AMA	2,077	2,077	418	418	2.3	2.3	7	10	8	17
Ga West	1,008	653	458	251	6.2	5.0	8	6	4	5
STMA	642	584	272	214	5.7	4.7	5	5	3	5
Tema	672	633	165	186	2.9	3.5	3	5	3	5
Total	6,433	5,981	2,178	1,933	4.2	4.0	38	47	26	48
National	24,659	12,358	5,747	4,084	2.7	4.1	100	100	100	100

Source: NSDF Study 2013 based on GSS Population Census
Note: population and population increase figures in '000

As a result of the different locations and population growth of districts, the range of district populations and urban populations is widening. For instance, AMA, the largest district in 2000, had 32 times the population of the smallest, Kadjebi, increasing to 35 times by 2010. Its urban population was 200 times the smallest.

2.3.8 The underperforming districts

Identifying underperforming districts that are either loosing population or stagnating, or growing at a rate less than the average rural population, can help inform policies and programs to promote regional economic development. The loss of district population may be a new phenomenon in Ghana and is likely to continue, particularly rural population loss. The cause of population decline may vary depending on the district. A comprehensive analysis is beyond the present NSDF given that lack of detailed comparative time series data on household income, educational levels, attainment and levels of unemployment.

Between 2000 and 2010, the following districts lost total, rural and even urban populations:

- Nine districts lost population; these included six in Ashanti Region (Sekyere East, Offinso, Ahafo Ano South, Bosome Freho, Obuasi and Kwabere East), two

[19] The latter three are contiguous within the Greater Accra Region.

in Western (Juabeso, Wassa Amenfi West) and one in the Northern Region (Tolon).

- Seven districts lost urban populations; these comprised four in Ashanti (Ahafo Ano South, Bosome Freho, Obuasi, and Kwabere East), two in Western (Bibiani Anhwiaso, Wassa Amenfi West) and one in the Northern Region (Tolon).
- Twenty-two districts lost rural population, and all regions had districts with declining rural populations except Upper West. Ashanti, with seven, had the most, followed by Brong Ahafo with six, Western, Central, and Volta with three each. Rural population decline may be a result of reclassification from rural to urban settlement status or absolute decline.

There is a need for different policies, strategies and planning approaches for population decline than for population growth. Different strategies may be tailored for districts that are near to or far from suitably-sized urban centres. It may be unlikely that these declining districts regain lost population, but it may be possible to stabilise their populations, employment levels and support smaller populations with a decent standard of living and economic opportunities.

Strategies may include improving physical connections between urban centres and the nearby rural districts, investments in telecoms and internet technology to enable residents to engage in economic activities while remaining in place, and providing place-based economic development incentives so residents who want to remain in these areas are not forced to look elsewhere for economic opportunity.

2.4 Urban settlements system

2.4.1 Introduction

This section examines the status and trends in the urban settlement system in Ghana in the context of global and regional context. An urban settlement system may be defined as the distribution of urban centres by hierarchy including population size and function. The section covers urban primacy, city-regions, metropolitan areas, secondary cities, small cities. It looks at where urban population growth is occurring, and not occurring.

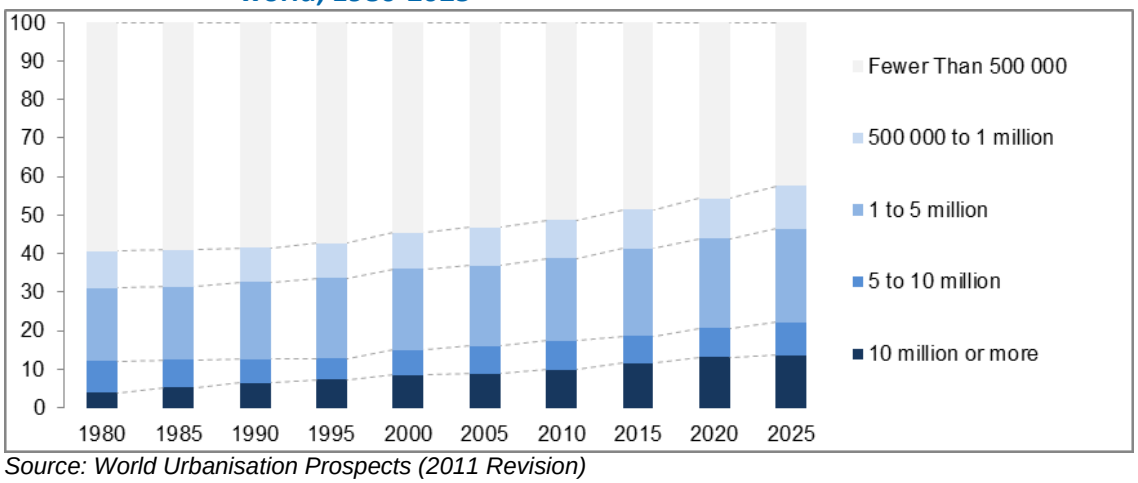
2.4.2 Global urban settlement size-class trends and projection

The United Nations World Urbanisation Prospects (2011) provides a useful perspective on historical and future on urban settlement growth size-class and population (Figure 2.29). It shows that, in general, urban populations have concentrated, and will likely continue to be concentrated, in ever larger urban centres. It points out that, by the year 2000, urban dwellers of the less developed regions were more likely to live in large urban centres than their counterparts in the more developed regions and that this trend is expected to continue.

Africa as a whole is no exception. Between the years 1975 and 2015[20] the share of its urban population living in cities of over 5 million increased from zero to 3.4 percent and the share in cities of 5-10 million increased from 1.5 to 2.3 percent. The share in cities of 1-5 million increased the most, from 3.2 to 12.5 percent, while the share in cities of 500,000-to-1 million increased slightly from 3.3 to 3.5 percent. Nevertheless, the urban population share in cities of fewer than 500,000 inhabitants has decreased from 17 to 14 percent.

[20] This figure is projected by World Urbanization Prospects, WUP.

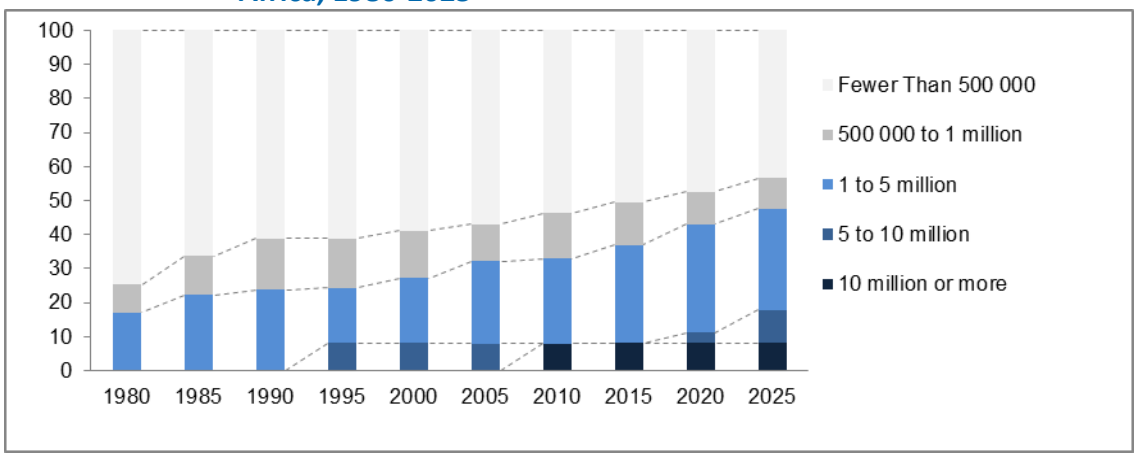
Figure 2.29 Percentage of urban population in cities by size class in the world, 1980-2025



Source: World Urbanisation Prospects (2011 Revision)

West Africa has followed a similar trajectory (Figure 2.30). In 2010, cities of over 10 million inhabitants accounted for 8 percent of the total urban population and are projected to retain this percentage at least to 2025. While before 2010 there were no cities of between 1 and 5 million people, in 2025 these will likely account for 10 percent of the urban population. The population share of cities of 1-5 million will likely grow from 25 to 30 percent between 2010 and 2025. At the same time, smaller cities in two size classes (500,000-to-1 million and fewer-than-500,000) are projected to lose urban share: from 13 to 9 percent and from 54 to 43 percent, respectively, between 2010 and 2025.

Figure 2.30 Percentage of urban population in cities by size class, West Africa, 1980-2025

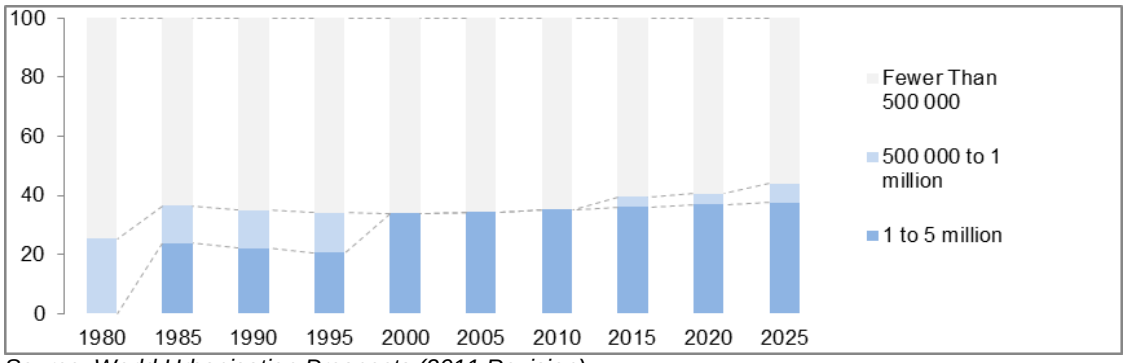


Source: World Urbanisation Prospects (2011 Revision)

Ghana's urban population is also concentrated in larger cities and this concentration is projected to continue. Between 1985 and 2010, about 64 percent of the urban population was in cities of fewer than 500,000. By 2025, while Ghana may not have a city of 5-10 million inhabitants[21], the urban population shares in its largest size classes, 1-5 million and 0.5-to-1 million, are projected to grow respectively from 35 to 38 percent and from zero to 6 percent. At the same time, the share of cities with fewer than 500,000 inhabitants is expected to diminish from 60 to 56 percent.

[21] According to United Nations WUP projections based on the GSS data. NSDF uses a different definition of Accra and has a different projection.

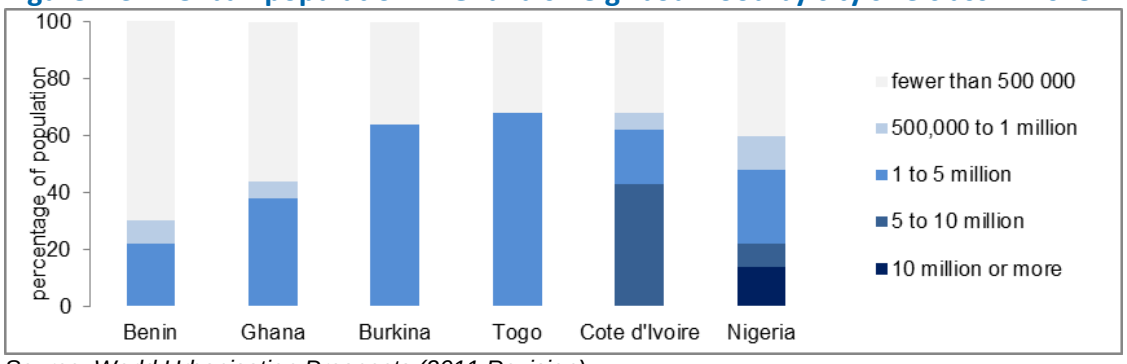
Figure 2.31 Percentage of urban population in cities by size class in Ghana, 1980-2025



Source: World Urbanisation Prospects (2011 Revision)

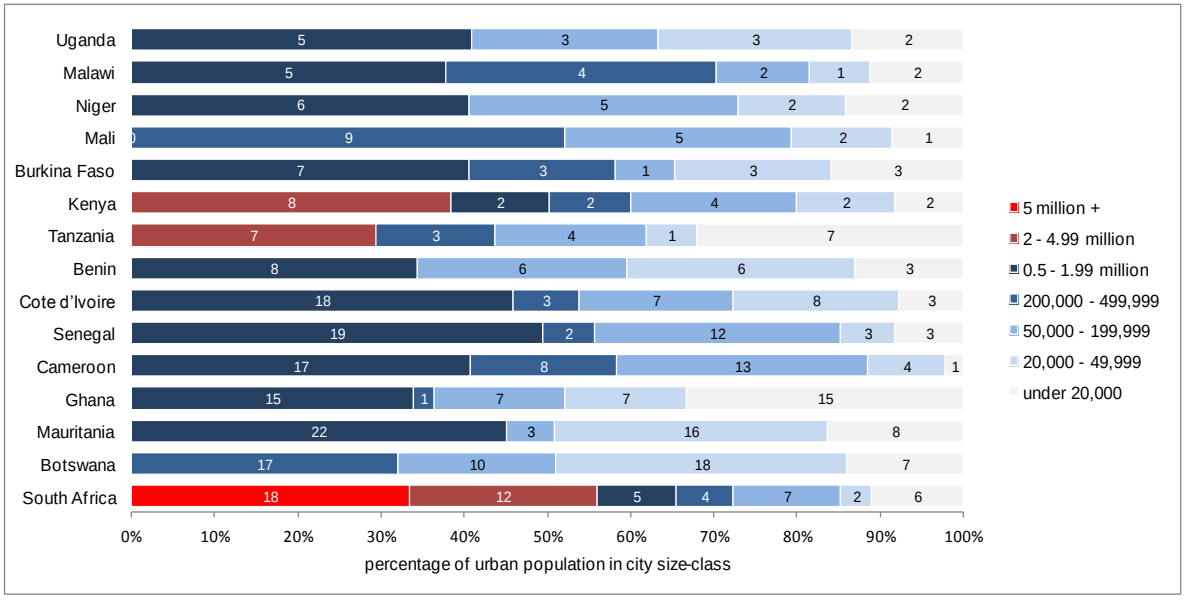
By 2025, compared to its regional neighbours, Ghana is projected to have a higher share of population (56%) in the smallest size-class (<500k) with the exception of Benin, and 38 percent in its largest class behind all but Benin. All other neighbours will have more their urban population in larger cities.

Figure 2.32 Urban population in Ghana's neighbourhood by city size class in 2025



Source: World Urbanisation Prospects (2011 Revision)

Figure 2.33 Population in city size-class of selected countries[22]



Source: Outside the Large Cities: The demographic importance of small urban centres and large villages in Africa, Asia and Latin America; David Satterthwaite; IIED, 2006

2.4.3 Urban settlement policies

Concerns about the urban system in terms of urban-centre sizes and spacing have national and international precedence.

Urban Settlement Policy – historical perspective

Ghana's urban settlement policy has been emerging for over 50 years. Key historical documents that contributed to the development of this policy include the National Physical Development Plan (1963-1970), The National Physical Development Plan (NPDP) along with the Nkrumah-era Seven Year Development Plan of the same period, was the first official document that addressed urban settlement system. It stressed the historical importance of Kumasi and Cape Coast as the main cultural centres. NPDP stressed the economic advantage of population concentration, noting that "services and facilities can be provided to a concentration of people more easily and economically than to people who are scattered throughout rural areas". Thus NPDP proposed a policy of a "planned settlement pattern to distribute economic and social investments" and for the many smaller settlements to become urban" (NPDP, 1965).

Ghana Vision 2020 (The first step: 1996-2000), the first output of the National Development Planning Commission, set forth a 25-year broad-brush plan for transforming Ghana into a middle-income economy. It provided a planning framework to guide ministries and agencies in developing their plans. With five long-term objectives, it recognized the importance of urbanization to national development but encouraged equitable distribution of urban growth between settlements of varying sizes. Specifically, it discouraged growth in the four largest cities and encouraged it in small and medium-sized towns. Encouraging growth of small and medium towns was seen as a way to "relieve the pressures" and address

[22] Caution is advised in interpreting the figures in this table. Different countries have different definitions of urban centres with fewer than 20,000, different ways of defining city boundaries. In addition, the data from countries comes from different years as follows: South Africa (1996),Botswana (2001), Mauritania (2000), Ghana (2000), Cameroon (2001), Senegal (2002), Cote d'Ivoire (1988), Benin (1992), Tanzania (2002), Kenya (1999), Burkina Faso (1996), Mali (1987), Niger (2001), Malawi (1998) and Uganda (2002).

the social, environmental and economic problems of large towns and cities while establishing a "hierarchy of service centres" with links to their rural hinterlands. Public investment in urban centres was restricted to towns of over 20,000 persons.

The National Plan of Action (NPA) on Human Settlements (1995) included three, medium-term policies. These were to: coordinate economic, physical and social aspects of town development; accelerate growth of secondary towns selected to transform the rural sector; and ameliorate adverse economic, social and environmental conditions in key settlements, particularly Accra. It included several spatially-relevant strategies including the following: (i) promote the growth of Kumasi, Sekondi-Takoradi and Tamale; (ii) decongest Accra by promoting regional centres in the Accra-centred region; (iii) promote spatially-equitable population distribution in settlements of varying sizes, particularly small and medium-sized towns; (iv) accelerate growth of selected small and medium-sized settlements to provide infrastructure and services to support the rural sector; and (v) develop the settlement hierarchy by providing services appropriate to the size of the population including the hinterland.

The Growth and Poverty Reduction Strategy GPRS-I, 2002-2005, aimed at generating growth and reducing poverty, targeting the poorest and most vulnerable in society, through improved access to basic social services but contained no spatially-explicit strategies. GPRS-II, 2006-2009, stressed economic growth more than did GPRS I. While it did not explicitly address human settlements policy or spatial policy, it supported decentralization to MMDAs, more efficient and effective service delivery, affordable housing and slum upgrading, improved physical planning, and upgrading of basic services.

Ghana Shared Growth and Development Agenda (GSGDA-I) 2010-2013, included a section on human settlements development with the stated goal of achieving well-planned and spatially-integrated cities, towns and villages. Calling for a hierarchy of human settlements, the GSGDA stressed the role of the largest urban centres as international gateways. Nevertheless, saw as problematic the over concentration of towns in the southern compared the northern, absence of competition to Accra and Kumasi, and lack of intermediate cities between key urban settlements and the rural settlements. Strategies to achieve the spatially-integrated settlement hierarchy were: decongested primary cities and selected fast growing settlements; new growth points to serve as counter-magnets to fast growing cities and regions; and accelerated growth of medium-sized towns to large urban centres.

Ghana Shared Growth and Development Agenda (GSGDA-II) 2014-2017 includes seven key policy objectives under its human settlements theme. Those objectives most spatially-relevant are: spatially-integrated, ordered, hierarchy of human settlements; well-structured and integrated urban development; resilient urban infrastructure and basic services; and an enabling environment to minimize rural-urban migration. Key strategies that relate are: mixed-use development and densification in urban areas; decongested primary cities and selected fast growing settlements with higher productivity; and greening of human settlements.

The National Urban Policy (NUP) prepared by the MLGRD and approved in late 2013, is the most comprehensive expression of the government's urban policy. Among its seven principles, three are spatially explicit: promote urban centres as engines of growth; promote socio-economic development through an integrated settlement system; and facilitate socio-economic development of lagging and rural regions. Among its ten objectives, those that are most spatially-explicit are: balanced re-distribution of urban population; a spatially-integrated hierarchy of

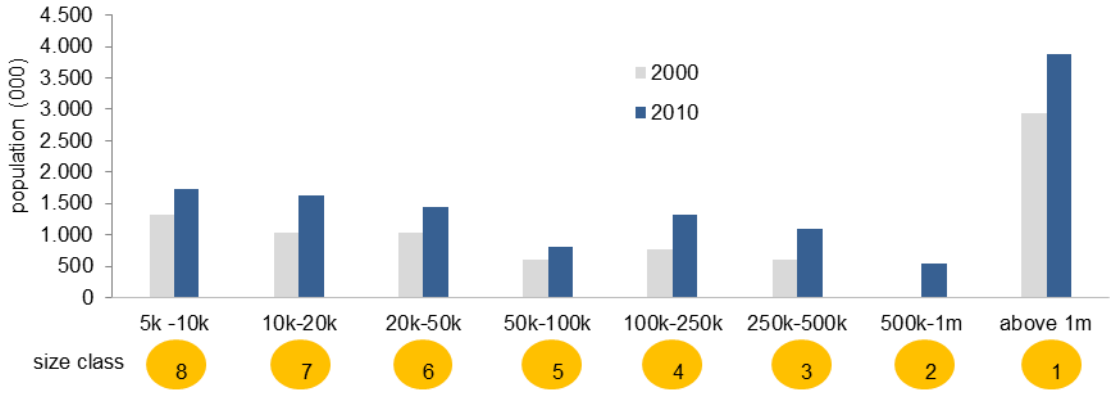
urban centres that enhances rural-urban links; reduced growth and sprawl of primate cities; and climate change adaptation and mitigation mechanisms. NUP settlement hierarchy is described and assessed in NSDF Volume II.

2.4.4 Urbanization and Historical Settlement Growth Dynamics

NSDF analysed the changes in urban population by settlement size-class between 2000 and 2010 (Figure 2.34) and the percentage distribution of this population (Figure 2.35). The analysis is based on standard United Nations settlement size categories, although NSDF added two classes of 100,000-250,000 and 500,000-1 million, to enable improved analysis of the trends and characteristics of urban settlements in Ghana.

Several observations can be made. First, the general urban settlement size distribution remains largely the same in both years. About a third of the urban population lived in the largest cities, size classes 1 and 2. Of the rest, the smaller classes have higher shares than do the larger classes.

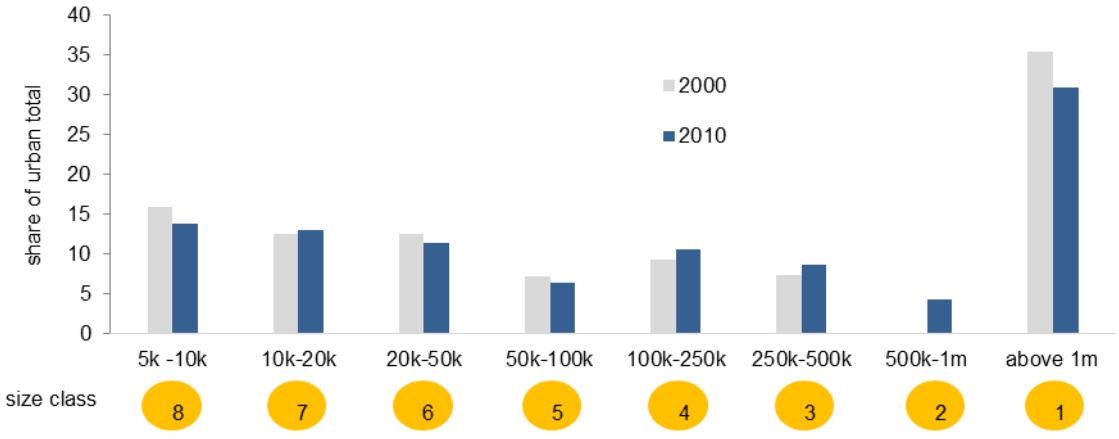
Figure 2.34 Urban population by settlement size-class, 2000 and 2010



Source: NSDF Study 2013 based on 2000 and 2010 Population and Housing Census by GSS

Between 2000 and 2010, the population share in class-1 declined while the shares of the next three size classes, or what may be termed middle-sized cities, increased. Among the remaining classes, population share declined slightly in all except size class-7. This is evidence of the importance of the middle size cities.

Figure 2.35 Percentage of urban population distribution by settlement size-class, 2000 and 2010



Source: NSDF Study 2013, based on 2000 and 2010 Population and Housing Census by GSS

Larger cities have a larger and growing share of the urban population. In 2000, more than half of all urban dwellers lived in cities with more than 100,000 inhabitants (Table 2.8). By 2010 this percentage increased to 55 percent. The number of cities in this group increased from 9 to 14.

Table 2.8 Cumulative percentage of urban distribution by size-class

class	share of urban population		cumulative share		# of urban settlements		cumulative # of settlements	
	2000	2010	2000	2010	2000	2010	2000	2010
>1m	35	31	35	31	2	2	2	2
500k-1m	0	4	35	35	0	1	2	3
250-500k	7	9	42	44	2	3	4	6
100-250k	9	11	51	55	5	8	9	14
50-100k	7	6	59	61	9	13	18	27
20-50k	13	12	71	73	35	49	53	76
10-20k	13	13	84	86	76	123	129	199
5-10k	16	14	100	100	188	257	317	456

Source: NSDF Study 2013 based on 2000 and 2010 Population and Housing Census by GSS

2.4.5 Change in numbers of settlement by size-class

Figure 2.36 shows the change in the number of settlements by size-class between 2000 and 2010, with the number of settlements in 2000 on the “x” axis and the number in 2010 on the “y”. The bubble area is proportional to the number of settlements. The bubble colours indicate change status: grey indicates stayed-in-class; pink means jumped-one-class; red indicates jumped-two-classes, and blue indicates a dropped-one-class.

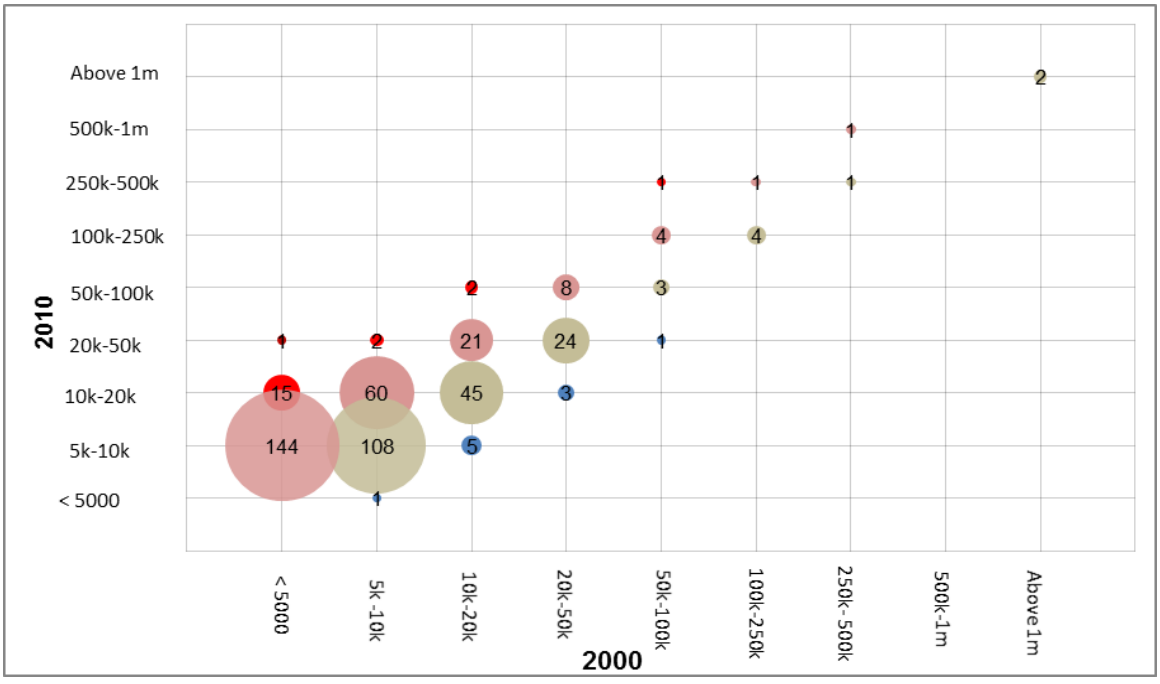
New urban settlements: The number of urban settlements increased by 160, or about 50 percent, to a total of 456 in 2010 after factoring the loss of some settlements during the decade. As expected, most (90%) of new settlements gained urban status at the lowest size-class. These new settlements are distributed among all regions except the Upper East but are concentrated within the "triangle". Because urban settlements are gazetted only during census years, it is not surprising to find new settlements that have larger populations. Thus between 2000 and 2010, 15 previously rural settlements jumped to 10-20k class. These were in Brong Ahafo (4), Eastern (4), Ashanti (3), Central (2) and Volta region (2). Among the newly urbanised settlements, Nyanyano Kakraba vaulted from rural status to the 20-50k class.

Lost settlements: Of the 317 urban settlements in 2000, 20 were not enumerated in the 2010 census, perhaps because they were incorporated into a larger urban area. These settlements are distributed among seven regions: Ashanti (9), Volta (5), Brong Ahafo (2), Northern (2), Western (1) and Central (1).

Change in size class: Of the 297 urban settlements in 2000 that were enumerated as separate localities in 2010, most (62%) stayed in their class while a sizeable percentage (32%) moved up one class. There were a few standouts; 2 percent of settlements jumped up two classes, while 3 percent dropped a class, this requires closer examination. The following describes the change in size class of settlements in 2000:

- Above 1 million: There was no change in the number of urban centres in this class.
- 500,000 - 1 million: A new urban size-class emerged in 2010 as Takoradi shot from more than 330,000 to over 530,000 inhabitants. This impressive growth could hardly be detached from the upsurge of petrochemical industry in the region.
- 250,000 - 500,000: Tema out of the two urban centres in this class increased by 115,560 people but could not move to the next class, contrary to the progression recorded by its counterpart, Takoradi.
- 100,000 - 250,000: Of the five urban centres in this class, only Ga South municipal moved up to the 250-500k class. Again, its growth may be attributed to its 15km proximity to Accra Metropolis. This municipal outran four previously higher settlements during the period. Tamale also grew above 250k but from a previous population range of above 100k and less than 250k.
- 50,000 - 100,000: Four of the nine urban centres graduated to the 100-250k class. Two of these are along the coast, regional capital of Central Region and Ledzokuku, about 12km from Accra. The other two are the regional capitals of Eastern and Volta Regions.
- 20,000 - 50,000: Eight of the 76 class settlements moved up one class, three of which are in the Central Region close to Accra, while the other five are located in Brong Ahafo, Eastern, Volta, Northern and Upper East Regions.
- 10,000 - 20,000: Some 21 settlements – in all regions but Greater Accra, Western and Upper West – moved up one class-size. Two 10-20k settlements; Bujuburam in Central, but only 10 km from Accra, and Techiman in the Brong Ahafo region, jumped to the 50-100k class
- 5,000 - 10,000: Out of 188 settlements in this class, 60 rose to 10-20k and 2 jumped to 10-20k. All regions had at least one of the 60 risers except Upper East. The two jumpers, Nyanyano and Kade, in Central and Eastern Region respectively, outpaced fifty settlements which in 2000 occupied higher size class. The rapid growth of Nyanyano, only 23km from Accra, may be attributed to the Capital's rapid sub-urbanization.

Figure 2.36 Change in settlement size class between 2000 and 2010



Source: NSDF Study, 2014, based on 2000 and 2010 Population and Housing Census by GSS

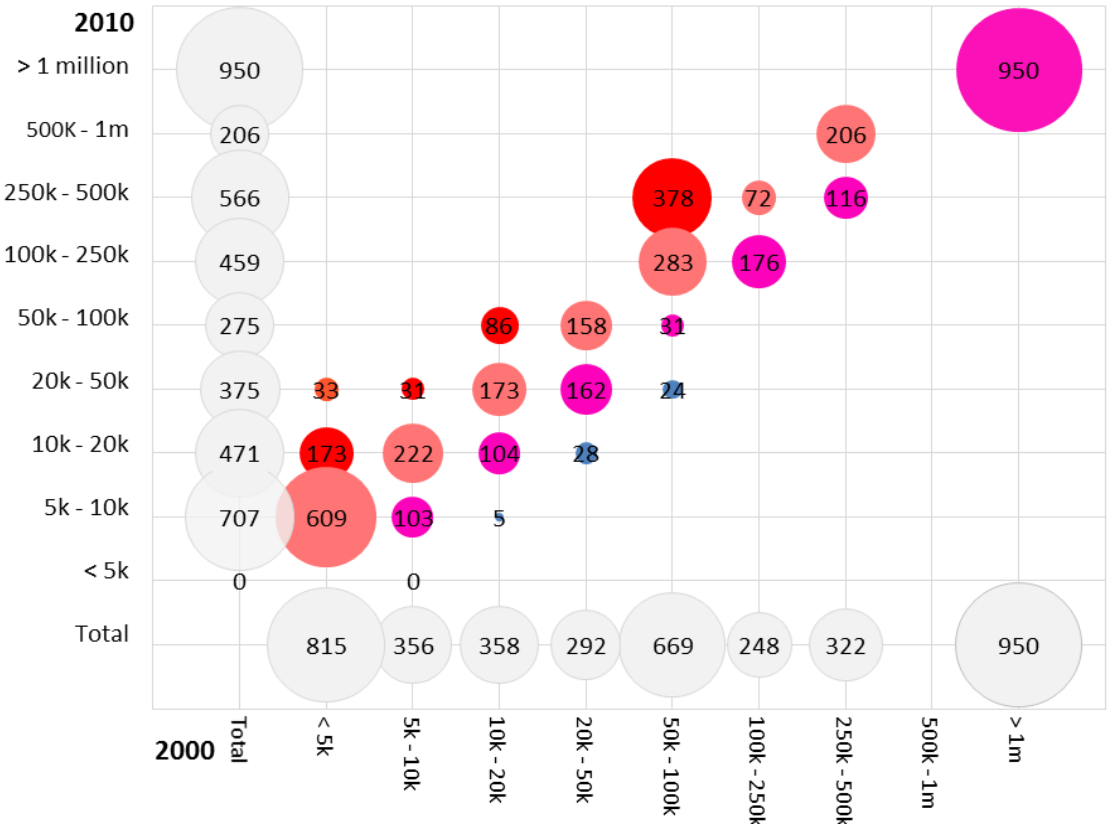
Drop in size class: On the flip side, not all urban settlements have seen healthy, sustainable, population growth. Ten settlements in the four smallest size classes lost significant population over the last census period to have them drop a class. From largest to smallest: Adentan municipal, in the 50-100k class and only 17 km from Accra, lost over 23,000 people and dropped to 20-50k class, albeit by only 5 people. Three 20-50k settlements fell one class-size: Tarkwa, Bibiana and Axim, all in the Western Region. Five 10-20k settlements dropped a class: Prampram, Aburi, and Juaben in Ashanti region, Sekyedumase in Eastern, and Nkenkaasu in Greater Accra. Finally, Foase, in the Ashanti Region, lost its urban status completely.

2.4.6 Urban Population Change by Size Class

Error! Reference source not found. disaggregates the increase in urban population of about four million people by settlement size class in 2000, along the "x" axis, and 2010, along the "y" axis. Again, the area of the bubbles is proportional to population times 1,000. The bubble colours relate to the change status: lavender indicates no change; pink means a jump of one class and red indicates a jump in two classes, blue indicates a drop in class, and grey indicate the total increase in a class.

Of the total urban population increase, only 609K, or about a fifth, stemmed from the reclassification of 160 rural settlements. The remaining 80 percent came from the growth of existing urban settlements (which came from natural increases, migration, and boundary extension, although the share attributed to each is unclear).

Figure 2.37 Urban Population Change by Size-Class



Source: NSDF Study, 2014, based on 2000 and 2010 Population and Housing Census by GSS

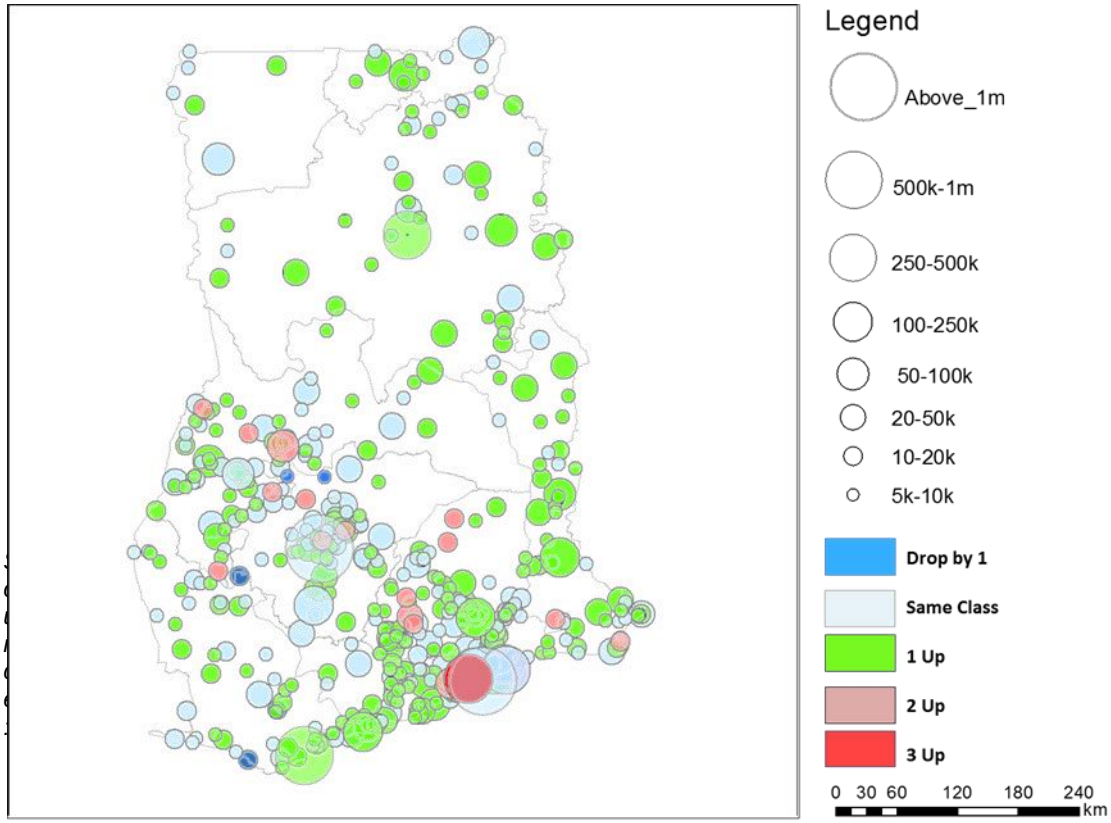
Accra and Kumasi, in addition to staying in class, remained the only settlements in the highest size – class (above 1 million) between the last two censuses. That notwithstanding, the two settlements recorded the highest urban population of about 1 million, representing about a quarter of the total urban growth. Newly urbanizing settlements recorded the next highest urban population increase by absorbing approximately 15 percent of the total urban growth.

2.4.7 Urban Settlement and population change by region

Notwithstanding the massive form of urbanization which has triggered movements between and among classes, it is also noted that some growth were largely restrictive within classes. Out of 187 settlements that stayed within their class-size, about 85 percent grew whilst the remaining 15 percent (twenty nine settlements) declined in population. The latter is found in four regions: Ashanti (14), Western (5), Volta (5), Brong Ahafo (3) and Eastern Region (2). As again captured by figure 3, 108 urban settlements could not expand their population beyond the lowest urban class over the 10 years.

From a national spatial perspective, Accra, Kumasi and Takoradi appear to influence the majority of size-class upward movements. Indeed as depicted by Figure 2.38, the triangular influence of these settlements gravitates most of the mushrooming urban settlements. Of the three, Accra appears to exert the greatest influence as about 30 percent of newly urbanizing settlements are found on the fringes (Eastern and Central Region) of the capital.

Figure 2.38 Settlement Class Changes in Spatial Context



NSDF Study, 2014, based on 2000 and 2010 Population and Housing Census by GSS

Growth dynamics in the three northern regions is characterised by settlements staying in class or moving up by one including Tamale which appears to anchor the

growth of the zone. Contrary to the three northern regions, Brong Ahafo, Ashanti and the northern parts of Eastern and Western regions (in the mid belt) have quite a number of settlements that moved up by two classes. On the other side, Ashanti experienced size - class decline as three settlements dropped in class by one.

Largely, the urban growth along the coastal belt is heavily concentrated between Accra and Takoradi. Owing to its proximity to the capital, central region (specifically on its border with Greater Accra) is characterised by settlements moving up by two classes. Although at a lesser intensity, there has been the proliferation of new urban settlements and upward movement of existing settlements to the east of Accra. Most of the urban settlements in Volta Region moved up by a class. Indeed, an eastern north-south corridor of these settlements appears to emerge.

2.5 Rural settlement patterns and urban-rural linkages

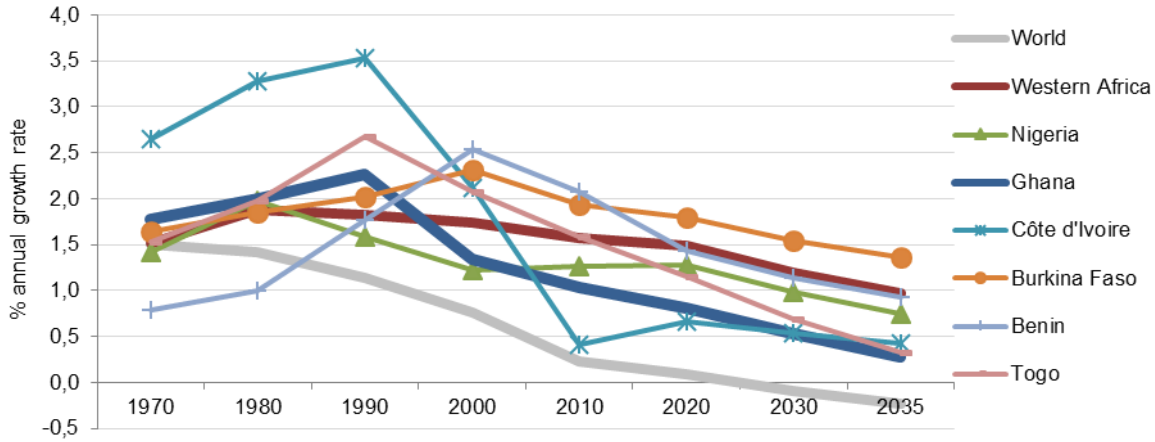
This section examines the rural settlement pattern in Ghana and the nature of urban-rural linkages.

2.5.1 The West African Context

Rural settlements in Ghana must be seen in the context of the settlement patterns in West Africa, particularly in the neighbouring countries (Figure 2.39).

West African population quadrupled since 1950 and urban populations increased by a factor of 20, but rural populations increased only 2.7 times. Rural populations are still growing globally, but the rate of rural growth has declined. Between 1970 and 2010, the World's rural annual growth rate dropped from 1.5 percent to 0.2 percent, and will likely turn negative sometime around 2020. In West Africa, annual rural growth rates reached almost 2 percent in 1980 (with improved health, nutrition and increased life expectancy) but fell to 1.5 percent in 2010 and likely fall to 1.0 percent by 2035. Ghana's rural growth rate in 1990 was higher than the West African average but has fallen more sharply to 1.3 percent in 2010 and will likely fall to 0.3 percent by 2035[23].

Figure 2.39 Rural population growth rate 1970-2035

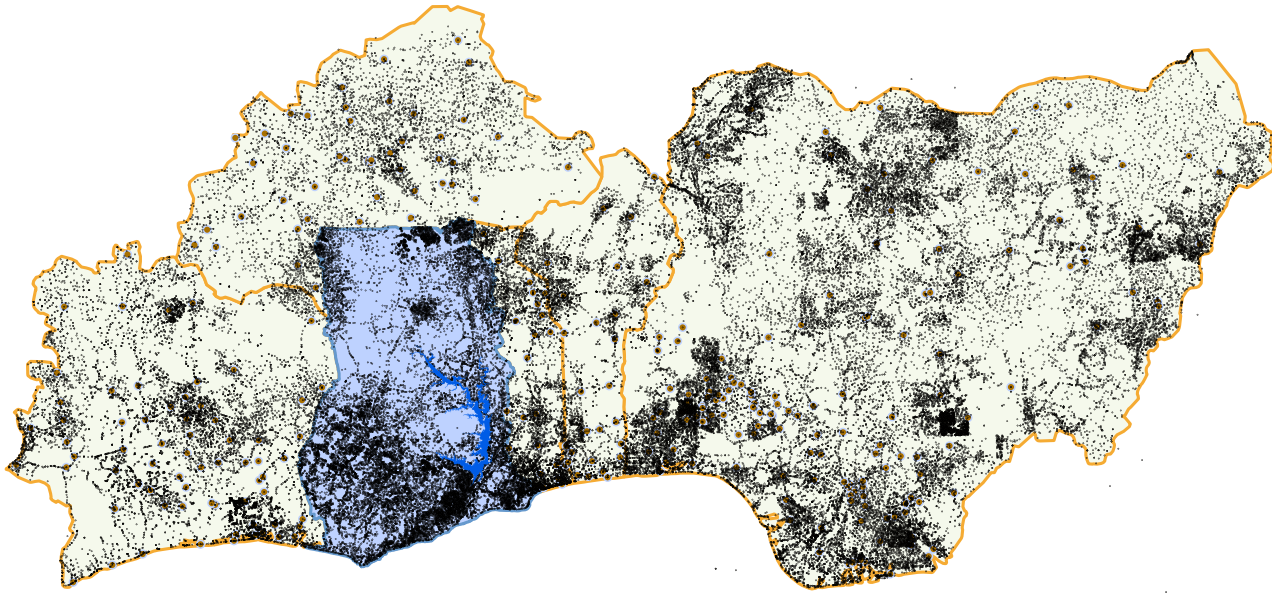


Source: NSDF Study 2013 based on World Urbanization Prospects: The 2011 Revision

[23] World Urbanizations Prospects, 2011 Revision

Figure 2.40 shows the location of rural settlements in Ghana and neighbouring countries. The location of settlements is obtained from GIS shape-files available through the LUPMIS system. Several important observations can be made. First, rural settlements are not uniformly distributed throughout the region but instead form settlement clusters separated by large areas with few – and in places no – settlements. This pattern is in part determined by agro-ecological factors (such as climate, soil characteristics and water availability) in part by proximity to urban markets[24]. Rural populations are migrating towards urban centres and towards the more fertile agricultural land. Rural settlements are becoming denser and are clustering around urban centres and around better infrastructure networks. Across West Africa, about 15 percent of the rural population lives in relatively high-density areas of over 150 inhabitants per km².

Figure 2.40 Rural settlements in West Africa



Second, the settlement clusters are to a large extent blind to national boundaries. For example, settlement clusters in Ghana's Upper West Region extend across the border into Burkina Faso, and those in the Upper East Region as well as the lower part of the Volta Region extend into Togo. It is likely that this reflects common cultural backgrounds and likely economic and social interactions.

2.5.2 Rural settlements in Ghana

The Ghana Statistical Service provides exact coordinates of 24,660 rural settlements as of 2010, but it does not provide data on the population of these settlements. To derive a rough estimate of the average rural settlement population size in each district, NSDF divides the district rural population, as provided in the census, by the number of rural settlements in the district.

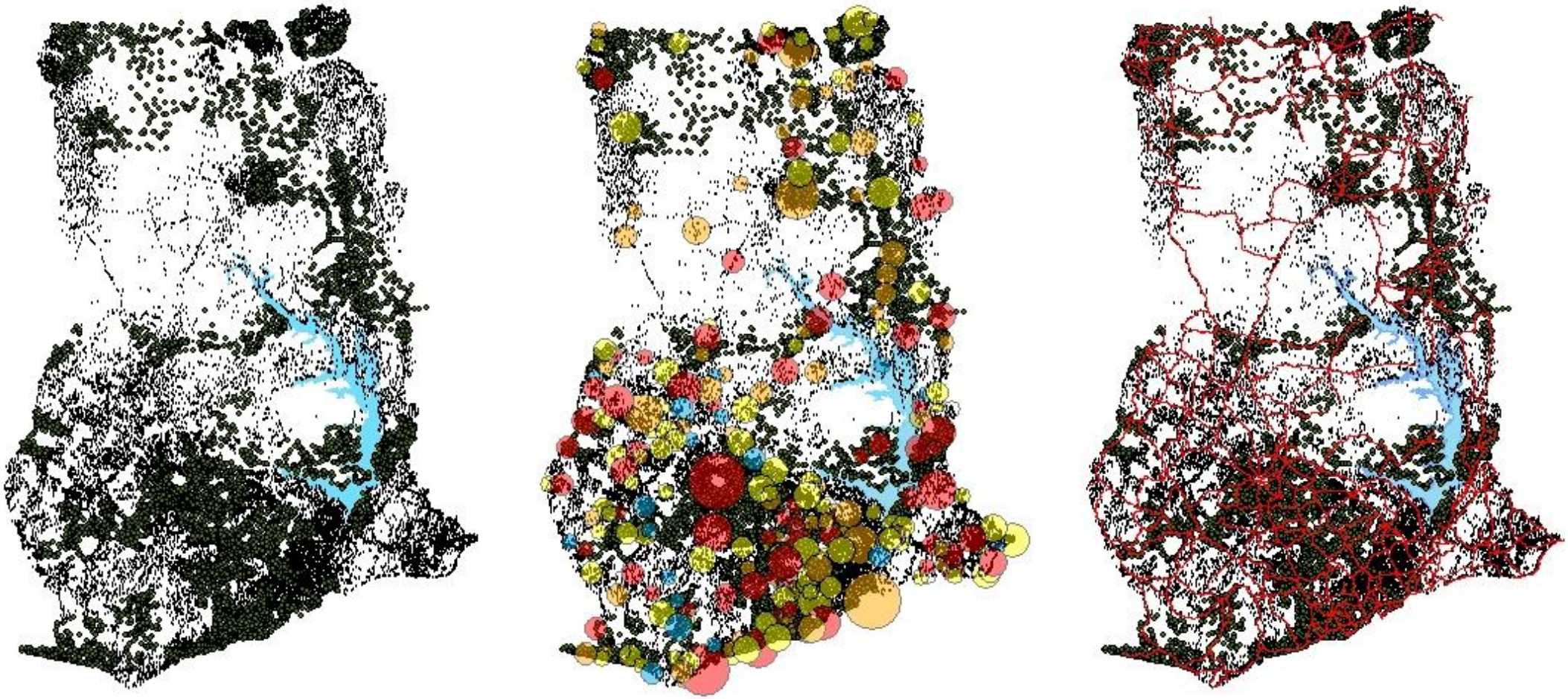
Table 2.9 summaries the rural settlement population and density pattern nationally and by region. Average rural density at the national level is just over 50 rural persons per km², but this varies significantly by region. For example, Greater Accra, Upper East and Central Regions have rural populations that are between three and four times that of Northern, Upper West and Brong Ahafo. While there are 10 rural settlements per km² in Ghana, Greater Accra and Central Regions have about twice

[24] ISTED (1995), "The Dynamics of Urbanization in sub-Saharan Africa", French Ministry of Co-operation, Paris.

as many while Northern and Upper West have about half. Finally, while the average rural settlement population in Ghana is 491 persons, the number reaches 603 in Upper East and only 402 in Brong Ahafo.

Rural settlements are about 50 percent larger than those in Brong Ahafo. All things being equal, the larger the size of a rural settlement, the more diverse may be its economy and higher the likelihood that it will grow to exceed the urban size threshold. In the Central and Greater Accra regions, rural settlement density is twice the national average, while in Northern and Upper West regions, it is about half the national average. The higher the density, the more interaction it may have with surrounding rural and urban settlements, but less agricultural land per settlement.

Figure 2.41 provides three maps depicting the location of rural settlement population clusters, their proximity to urban centres, and their proximity to trunk roads. Map 1 reveals a pattern of several clusters of rural settlement populations, with clusters present in all regions. Map 2 shows that, in general, rural settlement population clusters tend to be close to urban centres, particularly in the 'triangle'. Map 3 shows that, in general, rural settlement population clusters are near to trunk roads.



Map 1 rural settlements

Map 2 urban + rural settlements

Map 3 rural settlements + trunk roads

Figure 2.41 Rural settlements in Ghana

Table 2.9 Rural settlement population and density in regions, 2010

	rural population '000	% rural population	area (km^2)	rural population / km^2	# settlements	average rural settlement population	# settlements / 100 km^2
	a	b	c	d	e	f	g
Central	1,164	53	9,588	121	1,998	583	21
G Accra	379	9	3,735	101	737	514	20
Eastern	1,489	57	18,788	79	3,452	431	18
Upper East	827	79	7,591	109	1,371	603	18
Volta	1,405	66	20,627	68	3,157	445	15
Ashanti	1,883	39	24,419	77	3,298	571	14
Western	1,368	58	24,317	56	2,813	486	12
Brong Ahafo	1,283	55	40,127	32	3,191	402	8
Upper West	587	84	18,855	31	1,085	541	6
Northern	1,729	70	69,945	25	3,558	486	5
Ghana	12,114	49	237,992	51	24,660	491	10

Source: NSDF Study 2013 based on GSS Population and Housing Census 2010

Rural settlements at the coast

Settlements located at the coast are likely to derive a large part of their income from fishery and related activities. Nevertheless, coastal locations will be increasingly vulnerable to flooding and erosion due to predicted sea-level rise as a result of climate change. NSDF has found that the rural settlements within 5 km of the coast line have an estimated total population of 687,000. Some 286,000 people are in settlements less than 1 km from the coast. Local authorities should be encouraged to assess the vulnerability of these settlements and determine required mitigation measures.

Table 2.10 Rural settlement population ('000) within specified distance of coastline

	1 km	2 km	3 km	4 km	5 km
G Accra	106	126	158	202	249
Central	74	93	117	154	191
Western	48	61	67	78	95
Volta	58	79	89	116	152
ALL	286	359	431	550	687

Source: NSDF Study 2013 analysis of Forest Department satellite imagery

2.6 Population projections

Development planners at all level need to anticipate the likely size, composition and geographic distribution of the population for the end of the framework period (2035), if current trends continue forward. Nevertheless, caution must be exercised when using statistical population projections, because that is what they are – recent and current trends projected forward. They show how things may be in the future without interventions that may change trends and without events that cannot be foreseen.

Several organisations have prepared population projections for Ghana. For example, Ghana's National Population Council (NPC), the Ghana Statistical Service, and the consultants of the Greater Kumasi Urban Development Plan (GKUDP) have all prepared different projections at the national and regional levels.

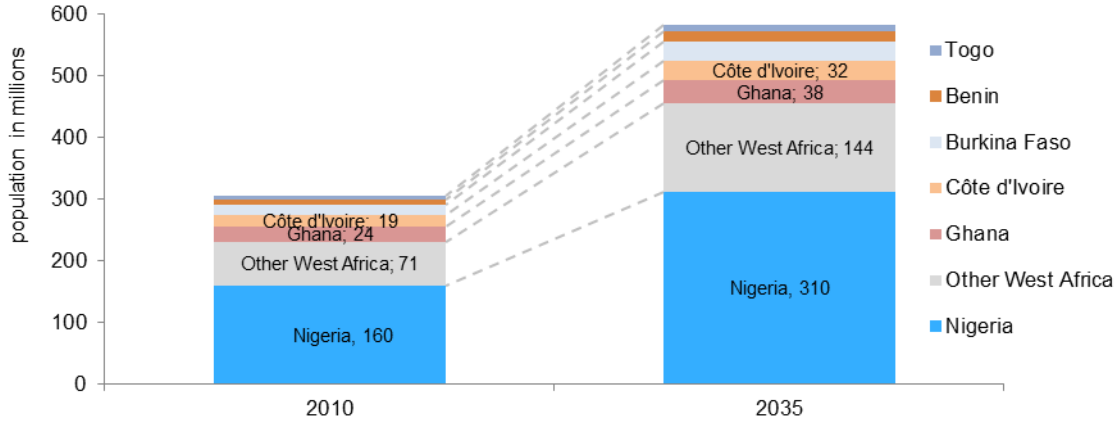
The United Nations Department of Economic and Social Affairs, Population Division, has prepared national population projections for all countries including Ghana. The International Institute for Applied Systems Analysis (IIASA) has also prepared projections for selected countries. These projections were prepared using different methods and based on different assumptions.

Given these existing population projections, it is not necessary that NSDF prepare another. Instead, NSDF derives the likely size and distribution of the population at the end of the planning period in 2035 by reviewing the population projections that have been prepared by others at the national and regional level, selecting the result that is the most reasonable, and then calculating district-level projections based on district trend growth between 2000 and 2010.

2.6.1 West African Population Projection

Ghana's future population and population growth is best understood in the context of that of its immediate neighbours[25] and that of West Africa. The United Nations projects that between today and 2035, the West African population will grow from 305 to 583 million. The population of the six countries in Ghana's neighbourhood will grow from 234 to 439 million, with Nigeria's population of 310 million accounting for 70 percent of the neighbourhood total while Ghana's population at 38 million, the next largest in the group, accounting for only nine percent. The population of Ghana larger neighbours, Côte d'Ivoire and Burkina Faso, will be 32 and 30 million, respectively, while its smaller neighbours, Benin and Togo will be 17 and 11 million, respectively.

Figure 2.42 West African population projection



Source: NSDF Study 2013 based on United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision

2.6.2 National population projections

The different projections for Ghana's population for the year 2035 vary from a high of over 42 million to a low of 35 million, a difference of about 7 million people. The variance can largely be explained by different assumptions regarding fertility rate. For example, NPC has prepared three projection variants – high, medium, and low – with respective populations of 42.6, 39.8, and 37.6 million[26]. GSS projects a population of 41.1 million. GKUDP projects a population of 41.8 million at 2033,

[25] NSDF defines Ghana's neighbours as including the countries with which it has border - Côte d'Ivoire, Burkina Faso, and Togo - as well as Benin and Nigeria.

[26] These projections are based on contraceptive prevalence rates (CPR) of 0.5, 1.0 and 1.5 percentage point per annum for high, medium and low variants respectively.

which can be interpolated to 42.4 million at 2035, which is essentially the same as NPC's high variant. The United Nations[27] projection of 38 million falls between NPC's low and middle variant[28]. Finally, IIASA's projection of about 35 million is even lower than NPC's low variant.

Urban population projections, based on assumptions of urbanisation levels in 2035, range from about 24 to over 29 million, more than double the urban population in 2010. NPC assumes an urbanisation level of 68 percent that, when applied to the natural projection variants, results in a projected urban population range from 25.7 to 29.2 million. The UN assumes an urbanisation level of 65 percent, resulting in an urban population of 24.6 million. IIASA assumes an urbanisation level of 72 percent, which results in an urban population of 26.2 million urban when applied to their population projection.

NSDF takes a conservative approach to population projections. It therefore adopts the high figure of 42 million for the national population at 2035, considering that prior projections of population growth underestimated the population growth[29]. This figure translates into an average annual population growth rate of 2.19 percent over the period 2010 to 2035. The growth rate starts at 2.3 percent in 2010 and falls to 2 percent by 2035.

NSDF also takes a conservative approach to urbanisation level and adopts the IIASA's figure of 72 percent as the anticipated urbanisation level in 2035, which results in an urban population of about 30 million when applied to the high population variant of 42 million.

2.6.3 Regional population projections

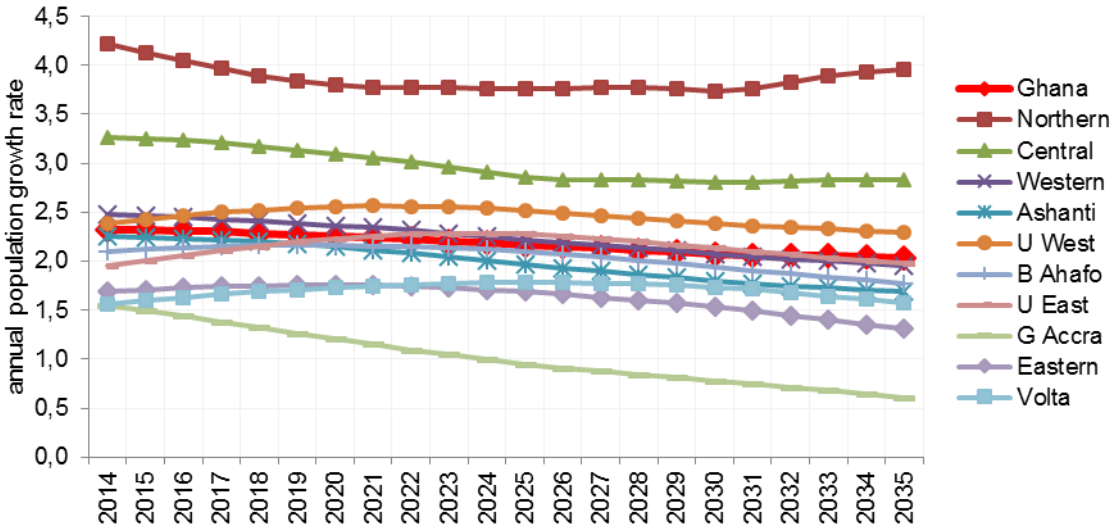
Regional population projections have been prepared by NPC, GSS and GKUDP. NPC's regional projections are based solely on the natural growth rates of regions – based on historical trends in total fertility and contraceptive prevalence rates – and do not take into account intra-regional migration. Nevertheless, these projections help to understand the regional contribution to the total natural population growth. NPC's regional national growth rates vary widely for all variants. Take NPC's high-variant: at one extreme, over the 20-year period, the Northern Region's annual natural growth rate is projected to drop below 4 percent before rising again to 4 percent at the end of the period. At the other extreme, Greater Accra's natural growth is projected to from 1.5 to only 0.6 percent. Other regions with projected, above-average, natural growth rates over the period are Central (3%), Upper West (2.4%) and Western (2.3%).

Over the 20-year period, these differential regional growth rates result in population increases that are far more (or less) than they would have been had their natural growth rates been the same. For example, the natural population increase in Greater Accra, despite having 16 percent of the present estimated 2014 population, will account for only 6 percent of the national population increase. In contrast, the natural increase in the Northern Region, with about 11 percent of the present population, will account for over 23 percent of the national population increase. This suggests that family planning policies and policies to encourage people to remain in their region-of-birth should target regions with high natural population growth rates.

[27] United Nations World Urbanization Prospects, 2014 Revision

[29] For example, the actual population in 2010 was about 5 percent higher than GSS's high-variant projection made in 2000.

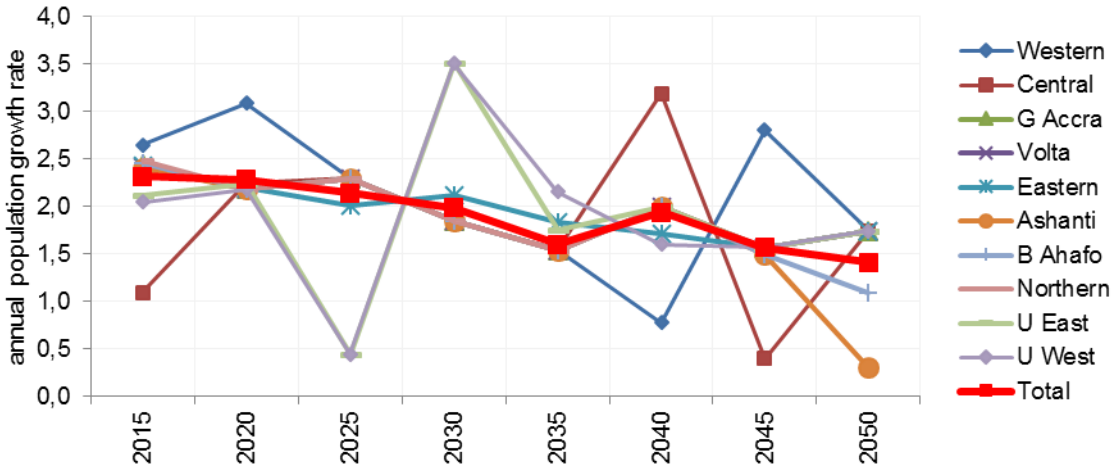
Figure 2.43 NPC projected annual natural growth rates by region



Source: NSDF Study 2013 analysis of NPC population projection growth rates

According to GSS, their regional population projections take into account natural growth and migration, but the specific parameters on which the projections are based are not clear. NSDF review of the annual regional growth rates used in the projection found them to vary widely between five year periods without any clear pattern.

Figure 2.44 GSS Projected annual growth rates by region



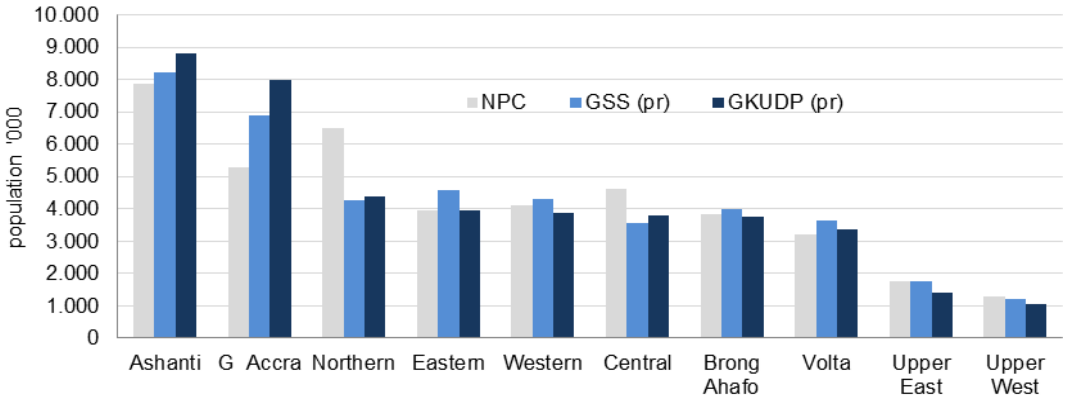
Source: NSDF Study 2013 analysis of NPC population projection growth rates

GKUDP regional projections do not explicitly consider natural growth but are based on the regional population growth trends between 2000 and 2010, modified in accordance with the observation that regions with large cities and urban areas have historically attracted more migration, but with at a slowing rate from 2000 to 2010.

Comparing the three sets of projections (Figure 2.42) reveals the extent to which migration plays a role. NPC provides the no-migration case, GSS appears to have moderate migration assumptions, and GKUDP considers trend migration. GSS and GKUDP projections are closer to each other than to NPC's; both show high

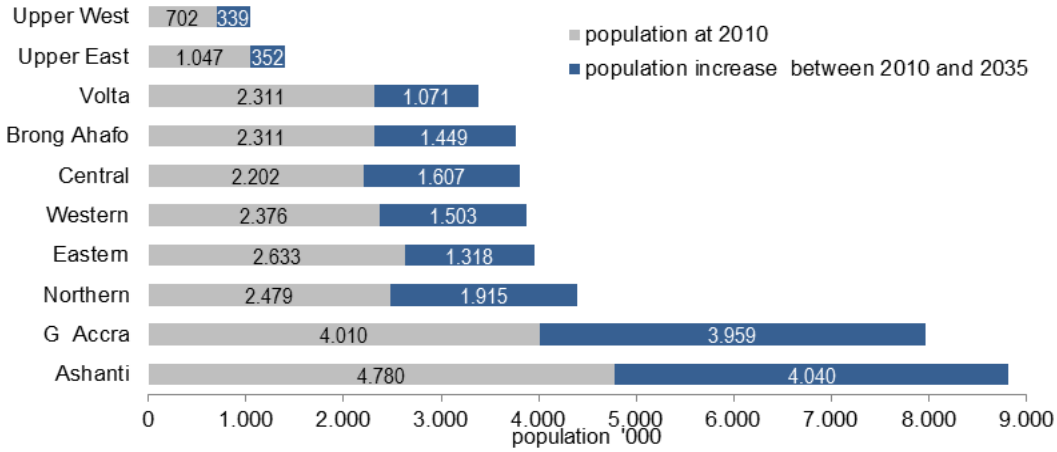
populations in Greater Accra and Ashanti and lower ones in Northern Region, primarily, and Central Region. The major difference between the GSS and GKUDP projections is that the latter projects higher growth in Greater Accra and Ashanti and to a lesser extent in the Central and Northern regions at the expense of the remaining regions.

Figure 2.45 Comparisons of regional population projections to the year 2035



Source: NSDF Study 2013 based on NPC 2014, GSS 2014 and GKUDP 2013

Figure 2.46 Projected population and population increase 2010-2035



Source: NSDF Study 2013 based on GKUDP 2013

2.6.4 District population projections

A complete set of population projections for all of Ghana's districts has never been prepared. Some assemblies have prepared population projections as part of their medium term planning process, but these are isolated cases. GKUDP prepared population projections for the seven districts that fall within the Greater Kumai sub-regional study area, but the methodology and assumptions used for these projections is not described in the documentation.

NSDF has therefore prepared a district population projections based on population growth rate between the years 2000 and 2010 in accordance with the US Census Bureau's methodology[30]. The results of the projection can be described in terms of

[30] First, district population data for the 170 districts in 2010 were aggregated into the 110 district boundaries in 2010 and the annual population growth rates calculated. The US Census Bureau's sub-national population toolkit was used to project the 2035 district populations based on these growth rates, but adjusted to ensure that

total population in 2035, absolute population increase, annual growth rates, and population density.

District populations in 2035 are projected to vary more than 100-fold from 43,000 to almost 5.5 million, resulting in increasing spatial concentration of population. The most populous district will be Kumasi Metropolitan with 5.49 million inhabitants, or 13 percent of the national population. AMA and its seven neighbours in the Greater Accra region will have almost 7.5 million people, or 18 percent of the population. Adding the population of the four districts within commute distance in the Central Region, namely, Awutu Senya, Gomoa East, Efutu and Awutu Senya 2, would raise the total to around 9 million, or about 22 percent of the total. Therefore, together, Kumasi and Accra area districts would have about 14.5 million and account for 35 percent of the national population. STMA with 1.5 million will be the only other district with over 1 million, but five other districts will have over 500,000, these are Hohoe, Awutu Senya, Kwahu North, Ho and Tamale.

Projected absolute district population increases (and declines) are determined by the population growth rates (or decline rates) and the starting population in 2010. Map 2 in Figure 2.47 shows the highest population increases will be in KMA, AMA and the districts around it, and STMA. KMA stands out with a projected increase of almost 3.45 million, accounting for 20 percent of the national increase. However, the combined projected increase of 3.67 million in the city-region of AMA and its seven neighbouring districts (Tema, Ga West, Ga East, Ledzokuku Krowor, Adentan, Ashaiman, and Ga South) is even greater, and accounts for 22 percent of the projected increase. STMA is another district with a high projected increase of almost 1 million.

There are 32 districts that are projected to lose a total of 540,000 people, with individual losses from the top ten ranging from about 20,000 to 60,000. These districts are Offinso, Gomoa West, Kwabre East, Lower Denkyira, Adansi North, Juabeso, Suhum Kraboa Coaltar, Bia, Ahafo Ano South, and Tolon Kumbungu.

Projected annual growth rates of districts vary over a wide range, from a gain of over 5 to a loss of nearly 3 percent per year (map 2 in Figure 2.44). The top ten fastest growing districts, the rates of which range from 5.6 to 4 percent, are Efutu, Awutu Senya. Awutu Senya 2, Ga West, Ga East, Ga South, Hohoe, STMA, Shama, and Kumasi. All of these districts have high urbanisation levels. Thirty-two districts are projected to have negative growth rates. The ten districts with the most rapid declines are: Tolon Kumbungu, Ahafo Ano South, Bia, Juabeso, Adansi North, Lower Denkyira, Offinso, Offinso North, Kwabre East and Suhum Kraboa Coaltar. All of these areas have low urbanisation levels.

District share of 2035 population will also vary widely. Only 14 districts will have over one percent share. The bottom 50 districts will account for less than 10 percent of the population. Districts with negative growth rates will account for less than 7 percent of the population. The smallest districts, with less than 50,000 inhabitants, will be Offinso, Nzema East, Tolon Kumbungu, Afigya Kwabre, and Offinso North.

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the sum of the district populations equalled the projected populations of their regions, and that the sum of the projected population of the regions equals the projected population of the nation.

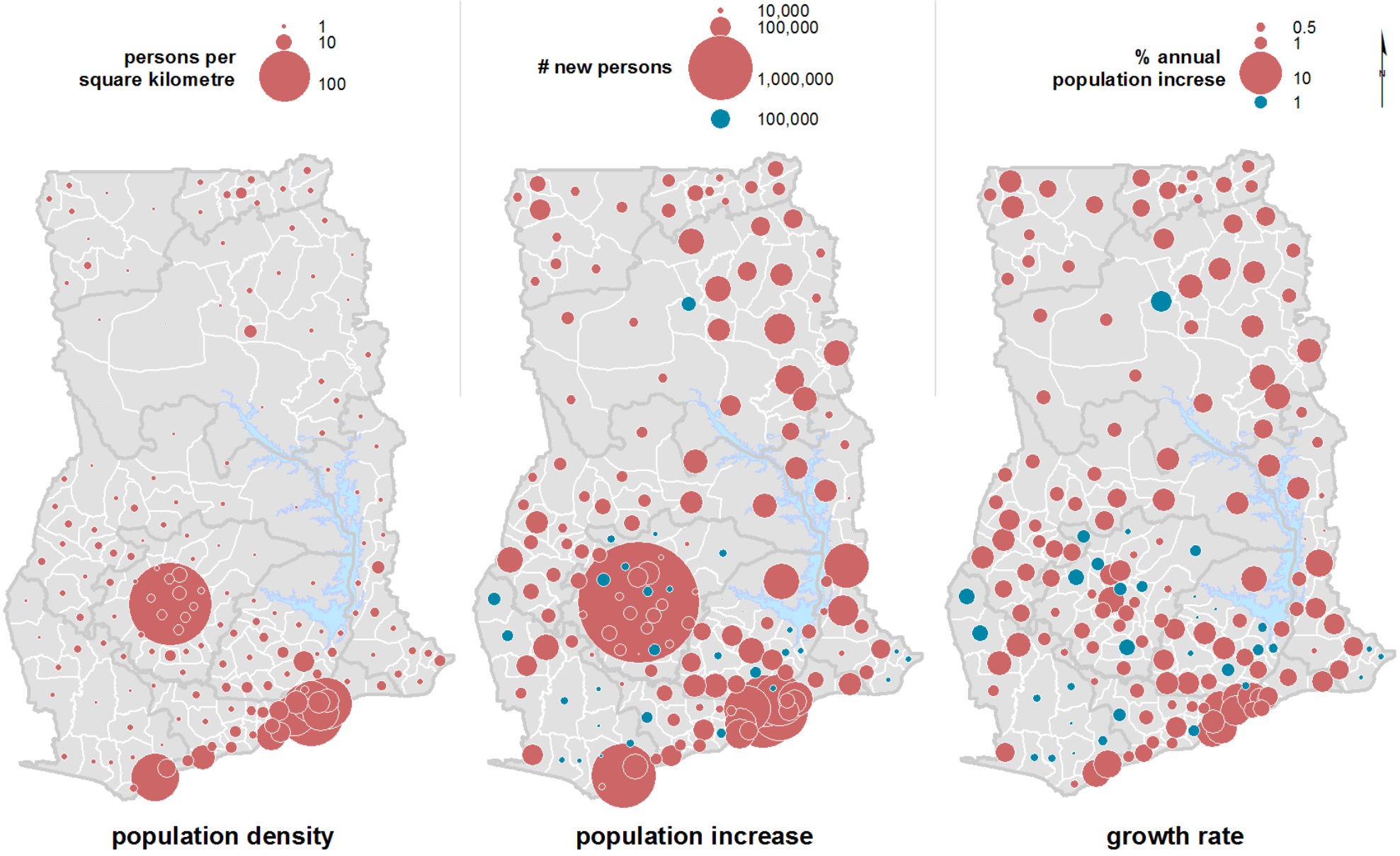


Figure 2.47 District population projection - population density, absolute increase and annual growth rate

2.7 Recommendations to address current and future challenges and opportunities

This section summarises the major issues and challenges related to population and urbanisation facing Ghana now and within the 20 year framework period. Issues that are discussed include: rapid natural population growth; rapid urbanisation; the relative priorities of urban and rural populations; concentration of population growth in districts and settlements; districts and settlements with declining populations; districts without urban populations.

Data availability, accuracy, consistency and format: Evidence-based planning and decision making requires accurate, consistent, and up-to-date data. Districts and settlement names, which are often misspelled, need to be linked to a uniform set of location codes. District boundaries need to be clarified and set, and data pertaining to district boundaries of various periods need to be translated into the district boundaries of all periods. Census enumeration boundaries should coincide with the built-up areas of settlements and with their administrative boundaries. One agency should be the repository of data produced by all agencies and made responsible for ensuring data compatibility and consistency.

How to address Ghana's rapid population growth: Ghana's population is projected to increase by 17 million to about 42 million people by 2035, owing to high fertility rates and declining mortality rates. This figure does not include possible increased migration from other countries seeking relatively better opportunities for employment and education or fleeing the projected climate-change impacts in the countries to the north. Limiting population will require continued reduction of fertility rates. Interventions to achieve this include upscaling existing family planning programmes, improved education especially for girls, and local economic development, particularly in the regions with the highest fertility rates: northern, central and Upper West, and facilitating the process of urbanisation.

How to address varying growth of regions (and districts): Regions are projected to grow at widely varying rates, in part due to natural growth (see above), but also because of interregional migration. The two most populous regions (Greater Accra and Ashanti) are projected to double while the two smallest (Upper West and Upper East) are expected to grow by less than 50 percent. Policies to retain population in regions with net out-migration may include strengthening the economies, infrastructure and basic services in these areas.

Prioritize urban or rural populations: Urbanization trends in Ghana highlight the growing share of urban areas and thus the need for particular attention under the NSDF. Urban areas presently account for over half of the population and are projected to at least double by 2035. While nationally rural populations will continue to grow, some 32 districts will start to see rural population declines. A policy shift may be needed to address the growing share of the urban population while managing the decline in rural population.

Create new or grow existing urban settlements: Policies are needed to address the three components of urban growth; reclassification of rural into urban settlements as they exceed the population threshold, expansion of urban settlement boundaries to accommodate growth of adjacent areas, and natural and migratory growth of existing settlements. For example, should new urban settlement formation be encouraged or discouraged? Should existing urban areas grow denser or should they expand horizontally? It is likely that completely new cities are not required nor

desirable. Unless, perhaps, they are within the footprint of and can be integrated with a city-region, growth of villages above the 5,000 threshold may be discouraged.

Favour existing or future district and urban populations? Spatial policies at all levels will need to decide on the extent that public resources are allocated to meeting the needs of existing populations, including addressing infrastructure and service gaps, or accommodating and providing services for anticipated future population. Policies that address both types of populations may be more economical and politically acceptable. Nevertheless, in order to ensure that existing infrastructure, services and housing are not overloaded more than they presently are, as well as to efficiently cater for the future needs of the highest number of people, policy priorities for public support would favour districts and urban centres with the highest projected population increase and population growth rates.

Box 2 - Should urban areas be constrained from growing larger - the international perspective

There is international consensus among urbanists that urban concentration and city size is that concentrated urbanisation and larger cities have economic, social and environmental advantages over more but smaller cities, for example:

Economic advantages: Larger cities are generally more productive than smaller cities and towns because of economies of scale and agglomeration. Larger cities concentrate, accelerate, and diversify social and economic activity. They attract more highly-motivated and capable people who produce more inventions and create more opportunities for further economic growth. In turn, they attract more domestic and foreign direct investment as a result of increased labour productivity, reduced risk, more learning and innovation opportunities and more financing options. They forge far stronger links to the global economy. Moreover, larger cities generate a higher surplus that could be used to cover the budgetary gaps in providing social services to other areas and help them become more competitive and prosperous (Governing and Financing Cities in the Developing World, by Roy W. Bahl and Johannes F. Linn, 2014). Richard Florida found a correlation between skills and city size in USA cities. Smaller cities have more physical skills, larger cities have more social and analytical skills, with social intelligence particularly abundant in the largest cities. Larger cities not only attract more educated and innovative people, but more with the critical social skills needed to turn new ideas into successful enterprises and industries (“The Social Advantage of Large Cities”, Richard Florida, 2010, the Atlantic, http://www.theatlantic.com/business/archive/2010/11/the-social-advantage-of-large-cities/66980/).

Environmental advantages: Larger cities are “greener”, largely due to their higher densities and more compact form. Higher density development justifies greater investment in and use of quality public transport options, as well as walking, and cycling, which consumes far less space and is more energy-efficient than private vehicles. While some people will drive, it will be over shorter average distances. In larger cities, more people work and live in smaller offices and dwellings, but buildings are bigger and better-built, making them easier to cool and maintain. Denser development means less human encroachment on natural habitats and less loss of arable land. Larger cities have better pollution control through higher public demand, and higher capital-to-area resources. ("To Get America Growing Again, It's Time to Unleash Our Cities: A Guest Post by Ed Glaeser"; by Steven J, Dubner, Freakonomics.com; 14 Feb 2011).

Social and equity advantages: Larger cities can provide social services and physical infrastructure more economically owing to higher densities and shorter distances, which partly accounts for the relatively high proportion of the urban population access to services. Larger cities; with more diverse mix of people, skills specialization and variety of jobs, foster a better human resource fit between worker and workplace. Opportunities for learning and advancement are higher owing to more tertiary institutions and more people with advanced skills and experience, including expatriate talent that prefers living and working in larger cities. Cities offer more opportunities and resources for community building and social change. Large cities that are connected to their hinterlands pull up rural and lagging areas through higher demand for rural products and increased options for rural nonfarm diversification.

Functional urban areas and built-up urban areas are imperfectly understood

First, the administrative names of many urban areas do not reflect the actual built-up urban population areas on the ground. For example, the contiguous built-up area around Accra is included as part of several metropolitan and municipal districts. Census enumeration area boundaries, in which the population of urban areas are identified, in many cases do not coincide with the urban built-up areas. Second, the information on commuting distance, which defines the functional area of an urban centre, is not available.

Are there desired sizes of urban areas and should policies try to attain/limit these sizes? For example, to what extent should public resources support the growth of the largest city-regions like Kumasi and Accra, medium sized cities, or smaller towns.

How to improve urban-rural linkages

Rural areas need a policy response separate from but integrated with urban policy response. The diversity whether rural areas may require different policy responses. Rural populations vary by: urbanization level; population density (say, <150 ppkm$^{2)}$; remoteness as measured by distance to an urban centre of, say, more than 50,000 inhabitants; the percentage of population engaged in agriculture; and distance from a trunk road. As an example: rural areas that are closest to urban areas will benefit from improved urban-rural linkages.

How to address negative population growth rates and decline

Several districts and towns have experienced population decline between 2000 and 2010, and even longer. Priority will be to understand the cause of the decline and determine whether it is sensible, in economic and social terms, to stem the decline, and the best measure to address this.

Volume I

Chapter 3

Economy

3 Economic development and the spatial economy

3.4 Introduction

This chapter provides a detailed overview of the spatial economy of Ghana, with a focus on the economic activity that is occurring and on where it takes place. In recent years, the economy of Ghana has been growing rapidly and economic activity has become more varied. There has been a structural shift away from agriculture towards services, as well as a shift in the location of economic activity, from rural to urban areas. This has been accompanied by an urbanising settlement system and society; by 2010, more than half of Ghana's population lived in urban areas.

As the next section explains, Ghana's history has set the pathways along which economic development currently unfolds in territorial terms. Regional disparities which originated in the colonial era persist today, though there are promising signs of spatial diversification as urban-industrial change occurs. This can be seen in the dispersal of manufacturing activities away from Greater Accra. At present, however, the metropolitan areas of Greater Accra, Kumasi and Sekondi-Takoradi are the drivers of economic growth, as the location of the majority of manufacturing and high value services activities. The remaining regional capitals act as secondary cities, serving as administrative and commercial centres for their respective regions. These secondary cities require greater policy attention to enhance their role and improve their capacity to function as growth centres of industrial activity.

The remainder of this chapter is organised as follows: section 3.5 provides a summary of the history of Ghana's spatial economy; section 3.6 outlines the composition of the national economy and macroeconomic trends; section 3.7 explores the impact that recent economic growth has had on human development indicators; section 3.8 provides a comprehensive analysis of the spatial economy and the location of economic activities, including profiles of the economy in each region; and section 3.9 concludes with a discussion of the key spatial economic issues that have been identified in the preceding analysis.

3.5 Economic development and the evolution of the spatial economy

3.5.1 The historical dynamics of the spatial economy

The formation of Ghana's spatial economy can be traced back to the pre-colonial era and the arrival of European traders on the coast. Prior to this, Ghana's economy was oriented towards trade with the regional powers of the then western Sudan. The territories of present day Ghana were drawn into this inter-regional trade network through the activities of Mande and later Hausa middlemen.

Commodities from the forest belt, including gold, slaves, ivory and kola nuts, were traded along routes through the north of present day Ghana onwards to the Sudanic kingdoms and North Africa. As a result, cities and states formed in the north of the country. At this time, trade flowed from south to north; Ghana's northern part was relatively more prosperous and populated than the south.

This pattern began to change in the 16th Century when the first Europeans arrived. It did not take long for the trade routes to the Sudan to be directed south to the European trading posts along the coast. Although the initial trade began in ivory and

gold[31], it was quickly converted into trade for slaves, driven by the demand for cheap labour in the New World colonies. The result was the development of a new spatial economy centred on the European coastal settlements. In the forest belt, the Ashanti Empire controlled the supply of commodities (primarily slaves) from the hinterland, trading these for luxury goods and modern weaponry, while northern Ghana suffered from depopulation and instability as a result of Ashanti raids.

Between 1830 and 1847, the coastal areas of Ghana became a de facto British colony. The abolition and decline in the slave trade marked the transition from illegitimate to legitimate trade, which was characterised by the search for alternative goods. This transition undermined the dominance of the Ashanti, as the areas in the southwest of the country came to be the primary beneficiaries of the trade in palm oil, rubber and cotton. The British Gold Coast colony was officially formed in 1874, followed by the colony of Ashanti in 1901 and the conversion of the Northern Territories into a British Protectorate in 1902. The final British colony that makes up modern Ghana, Trans-Volta Togoland, was added after World War One from the former German colony of the same name.

According to Songsore (2003), Ghana's spatial economy developed into a core-periphery structure in the colonial period[32]. The core consisted of areas in the forest belt that were integrated as capitalist enclaves, producing raw materials for the metropolitan economy of Britain as well as for the coastal port towns that emerged as centres of import-export activity. The periphery consisted of the areas outside these forest belt and coastal port towns, primarily the savannah areas of the north. These areas were viewed not in terms of their agricultural potential but as a labour reserve for the core growth region. Capital investment was concentrated in the core regions, with the periphery left underdeveloped to ensure a steady flow of labour to the core.

The spatial economy of Ghana at that time could also be viewed as part of a larger spatial economy, that of the British Empire. In this view, the metropolitan economy of Britain served as the industrial core, the forest belt provided raw materials for this industry and the periphery provided labour to the forest belt. Integration into this larger system meant that the urban centres of Ghana never developed as industrial centres because of the steady supply of manufactured goods from mainland Britain.

Post-independence, the government of Ghana pursued a strategy of import substitution, aimed to transform the industrial structure and reduce dependence on colonial powers and other foreign economies for goods[33]. This strategy led to the further concentration of capital and development in the existing core regions. The model of import substitution diverted foreign exchange – generated from the export of primary products, especially cocoa – to the industrial cities of Accra, Kumasi and Sekondi-Takoradi, which formed the terminal points of the defining axes of the so-called 'Golden Triangle'.

These three cities monopolised industrial activity and investment, acquiring a metropolitan status in the process. Thus, the spatial economy of Ghana evolved from the simple core-periphery structure of the colonial era to a three-tiered model. In this model the dominant centre consisted of the urban industrial core of the 'Golden Triangle' and the resource-producing regions of the forest belt became the new periphery, providing foreign exchange and labour to the industrial enclave,

[31] Hence the names Ivory Coast and Gold Coast given to two of the European colonies in West Africa

[32] Songsore, J. (2003), "Regional Development in Ghana: The Theory and the Reality"

[33] Ackah, C., Adjasi, C. and Turkson, F. (2014), "Scoping study on the evolution of industry in Ghana"

while the areas outside the forest belt in the old periphery provided labour and food[34].

It could be argued that, by pursuing a policy of import substitution, Ghana simply substituted the external industrial core of the previous colonial system for a new internal industrial enclave that was also disconnected from the rest of the national economy. The input-output table for Ghana in the era showed very little inter-sectoral industrial flows within the national economy[35]. The natural resources of the country were extracted and exported with virtually no value addition, while capital and raw materials for import substitute goods were imported and concentrated in the industrial enclaves.

The industries that developed under import substitution were characterised by a high dependence on imported capital and raw materials, few backward or forward linkages with the rest of the economy and low productivity. About a quarter of manufacturing was undertaken at a net foreign exchange loss[36], meaning that the amount of foreign exchange expended on capital goods and raw materials imports exceeded the amount saved by not importing the final product. This inefficiency could have been justified with sufficient spillovers to act as a catalyst for the rest of the economy, but the lack of linkages prevented this from being the case. Furthermore, the capital intensive nature of these industries meant that they were insignificant employers in a national context; 'large-scale' manufacturing employed less than 2 percent of the total workforce[37].

The result was a worsening balance of payments' situation, rising debt and an almost total collapse of the economy by the 1980s. Industry's contribution to GDP fell from 21 percent in 1975 to 15 percent in 1980 and to a mere 11 percent in 1984[38]. In 1983, with the economy in crisis following a coup d'état in the previous year, and suffering the worst drought in living memory, the government turned to the IMF and the World Bank for assistance.

3.5.2 Structural reforms and the spatial economy

Beginning in 1983, following the economic crises and collapse of the economy in the preceding decades, Ghana began a programme of economic liberalisation and structural adjustment backed by the Bretton Woods Institutions. The Economic Recovery Programme (ERP), instituted in April 1983, was designed to stabilise the economy and consisted of the following policy initiatives: exchange-rate reform; price decontrol; monetary and fiscal policies; export rehabilitation programme; and the initiation of the Public Sector Investment Programme. The second phase began in 1986 with the adoption of the Structural Adjustment Programme (SAP), which was geared towards correcting structural imbalances.

It is a much-debated topic, but with the benefit of hindsight and in a longer-run perspective the Ghanaian economy is now seen to have responded positively to the structural adjustment reforms. Not only did GDP per capita increase considerably, particularly in the years 2005 to 2014 (see Figure 3.2), it also stabilised remarkably. Correspondingly, per capita income rose steadily in real 2005 constant US-dollar terms, from $324 in 1983 to $724 in 2012. Gross capital formation also increased substantially in the post-reforms period, from the lowest point of 3.4 percent of GDP

[34] Songsore, J. (2003), "Regional Development in Ghana: The Theory and the Reality"

[35] ibid

[36] ibid

[37] ibid

[38] World Bank (1985b), "Ghana: Industrial Policy, Performance and Recovery", WB Report 5716-GH

in 1982 to at least 20 percent every year since 1993[39]. While this major increase in capital formation provided support for Ghana's strong economic growth, much of the growth can be attributed to productivity improvements following structural adjustment. This is hardly surprising given the inefficiency of production under the import-substitution strategy.

Although the macro-economic impact of the structural adjustment and economic recovery programmes on overall growth was positive, the sectoral and spatial impacts of growth were uneven. External funding and investment under the ERP was initially targeted at reviving exports and therefore concentrated in the export-oriented sectors of mining, cocoa and timber, all based in the forest belt. To support growth in these sectors, public sector investment in infrastructure was also made in the export-producing regions.

Following the stabilisation of the economy under the ERP, the SAP sought to revive industrial output within the framework of the principal of comparative advantage and the maxim of free trade. In 1995, free trade zones were created near the major industrial cities to attract foreign investment, offering 100 percent exemption from payment of direct and indirect duties and levies on all imports for production and exports and 100 percent exemption from income tax on profits for 10 years.

Currently, four free zones remain in Tema, Sekondi, Shama and the Ashanti Technology Park[40]. Priority sectors identified by the Ghana Free Zones Board are food processing; cotton processing; textile manufacturing; ethnic beauty products; sea food processing; jewellery/handicraft production; light industry/assembling plant; plastic products manufacturing; metal fabrication; ceramic tile manufacturing; floriculture; and information and communication technology[41].

The result of the export-oriented policies pursued under structural adjustment was to concentrate investment in a few sectors in the industrial core, especially within the free trade zones. Between 1994 and 2013, 83 percent of all FDI projects were located in the Greater Accra region, followed by Ashanti Region with 6 percent and Western Region with 4 percent. The three northern regions combined accumulated just 1 percent of total FDI projects in this period[42]. The concentration of economic activity is described further in section 3.8.1.

To some, the economic reforms initiated under structural adjustment appear to have continued, and even reinforced, the pattern of spatial development set in motion in the post-independence era, that of the "core – new periphery – old periphery" model. Songsore (2003) has argued that the burden of structural adjustment has been borne disproportionately by the least developed regions of the North, while it is the more developed regions, sectors and powerful social groups, which are reaping the benefits[43]. The old periphery regions were excluded from the development process, as they had no comparative advantage in natural resources or pre-existing industrial base with which to attract investment. Furthermore, food producers in the north suffered from a shift in the inter-regional terms of trade due to the removal of subsidies and minimum prices for food crops, further entrenching their poverty and subsistence lifestyle.

[39] The State of the Ghanaian Economy 2012

[40] http://www.gfzb.com.gh/exportpercent20processingpercent20zone/ashanti.php

[41] http://www.gfzb.gov.gh/gfzbpercent20enterprises/annual_report.php#

[42] Osiakro Logistics (2013), "Study on hierarchy and functions of urban settlements in supporting growth."

[43] Songsore, J. (2003), "Regional Development in Ghana: The Theory and the Reality"

However, there are important differences between the more recent development of Ghana's economy post-1983 and development in the post-colonial era. Firstly, the degree of industrialisation and structural adjustment, although modest, has been achieved in a competitive environment. The evidence points to a shakeout of relatively inefficient firms in favour of more competitive ones, resulting in a rise in the manufacturing share of exports[44]. This phenomenon bodes well for further *effective* industrialisation. Secondly, Ghana has a potential comparative advantage in the industries that are being promoted. Hence, there is a greater potential for forward and backward linkages with the rest of the economy than in the previous import substitution enclaves. A more integrated economy also provides the opportunity for the industrial core to kick-start growth in the rest of the country, provided that the appropriate policies and strategies are pursued.

3.6 A growing national economy

In recent years, Ghana has been widely regarded as an African success story and was one of the fastest growing economies in the world between 2009 and 2013. The present situation, however, is less positive. A widening current account deficit, weakening currency and rising inflation have led to a slowdown in growth and in 2014 induced the Ghanaian government to seek assistance from the IMF. Revised figures for GDP growth from the IMF indicate that the economy grew by 5.4 percent in 2013[45], less than the official estimate of 7.1 percent[46], and is projected to grow by just 4.8 percent in 2014.

Despite the recent downturn, the medium term prospects for growth remain positive. Providing the current account deficit is adequately addressed, the IMF projects an average growth rate of 6.8 percent between 2015 and 2019[47].

Section 3.6 reviews the recent performance of the Ghanaian economy up to 2013 at the national level before analysing the performance of individual sectors and sub-sectors in order to identify the drivers of growth.

3.6.1 Fourfold Output Increase since 2004

Although growing relatively slowly since the early 1990s, Ghana's economy was stable until 2004 (see Figure 3.1). Between 2004 and 2009, however, the GDP growth rate increased to a rate of above 5 percent, reaching 15 percent in 2011. The economic growth peak that year was due to the start-up of oil production in the last quarter of 2010. Economic performance in 2012 was also good, despite lower cocoa and oil production.

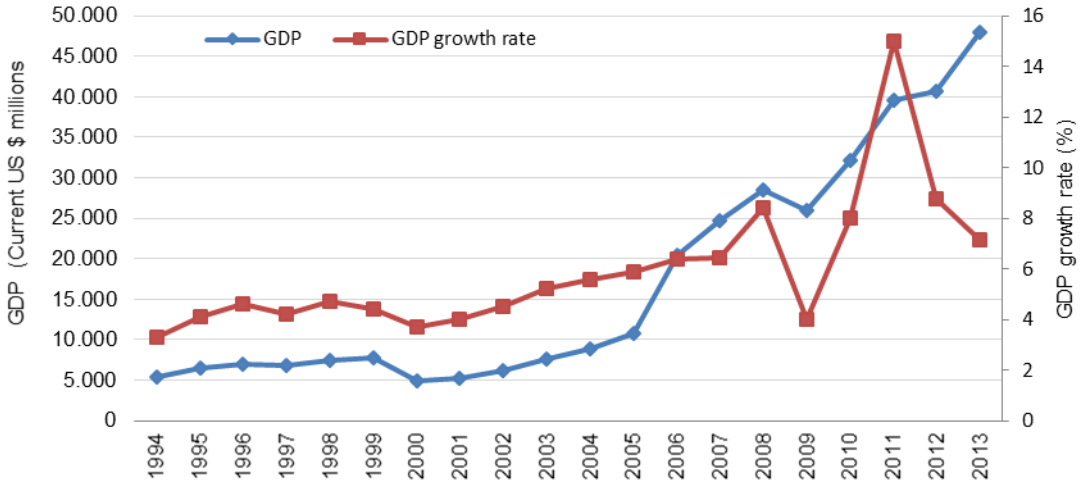
[44] The State of the Ghanaian Economy 2012

[45] IMF (2014) IMF Country Report No. 14/129, available at: http://www.imf.org/external/pubs/ft/scr/2014/cr14129.pdf

[46] Ghana Statistical Service, April 2014

[47] IMF (2014) IMF Country Report No. 14/129, available at: http://www.imf.org/external/pubs/ft/scr/2014/cr14129.pdf

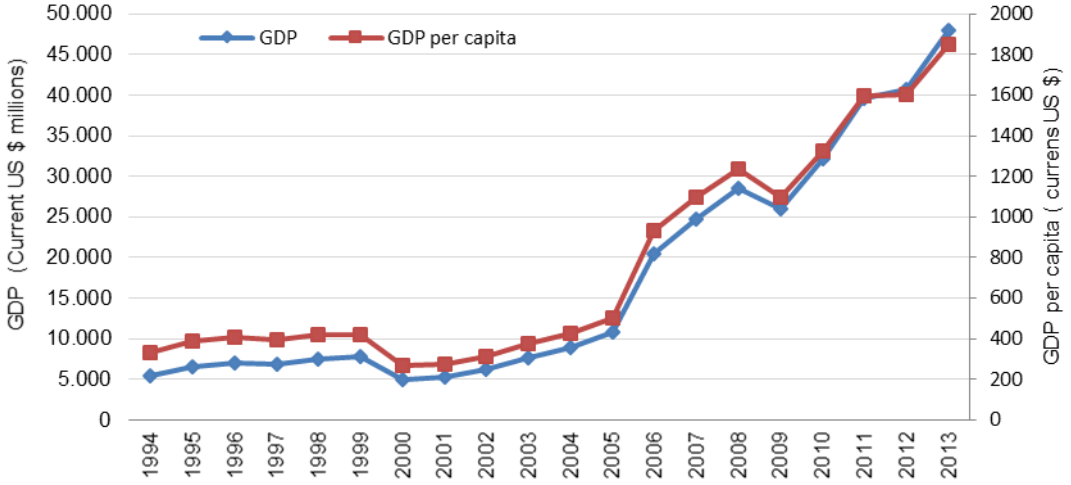
Figure 3.1 GDP and GDP growth, Ghana, 1994-2013



Source: World Bank, World Development Indicators Ghana Country Statistics, Online Database, 2014

GDP per capita has followed a similar trend to GDP. There was little increase in real terms in the decade between 1994 and 2003; since then, GDP per capita increased fourfold, reaching $1,605 in 2012 (see Figure 3.2). Gross National Income (GNI) per capita reached the lower middle income threshold in 2008 and is currently $1,550.

Figure 3.2 GDP and GDP per capita, Ghana, 1994-2013



Source: World Bank, World Development Indicators Ghana Country Statistics, Online Database, 2014

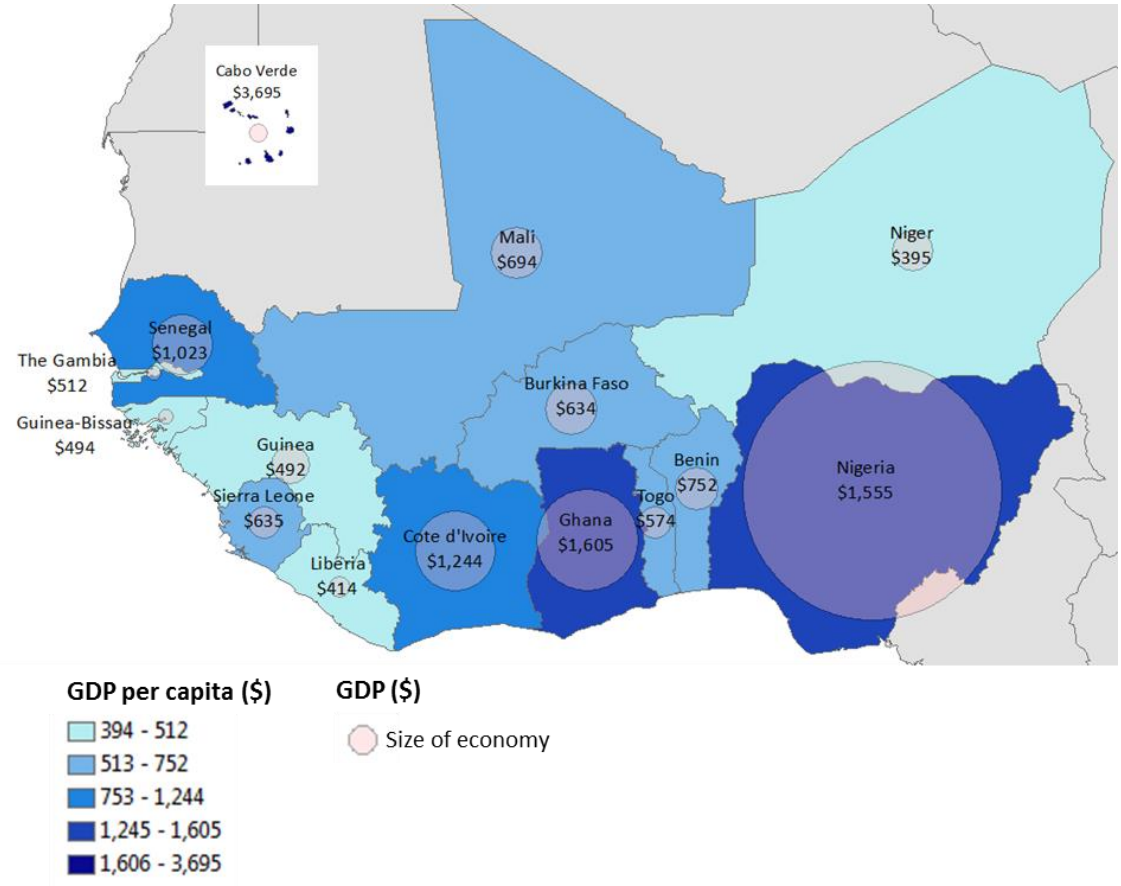
Ghana has the second largest economy in the Economic Community of West African States (ECOWAS) region after Nigeria, contributing 10 percent of the region's total GDP. To the west of the country is Cote d'Ivoire, another lower middle income country and the third largest economy in ECOWAS. Bordering the country to the north and east are the lower income countries of Burkina Faso and Togo. Nigeria, the largest economy in West Africa, lies just 200 km along the coast to the east, but with Togo and Benin in between. Figure 3.3 illustrates the size of each of the ECOWAS economies in terms of GDP, as well as their relative prosperity in terms of GDP per capita.

Ghana's GDP per capita is the second highest in the region, after Cape Verde (see Figure 3.3). Furthermore, the economy is growing faster than any other in ECOWAS; the average annual GDP growth rate for the period 2010-2012 was 10.3 percent – the fourth highest in the world – compared to an ECOWAS average of 5.1 percent.

The overall budget balance for 2012 registered a deficit of 12.1 percent of GDP, higher than the budgeted 4.8 percent and a sharp increase on the 2011 ratio of 4.3 percent of GDP. Ghana has registered an overall budget balance deficit for every year in the period 2001-2012. However, total government revenue as a percentage of GDP has been generally increasing as a percentage of GDP since 2006[48].

Macroeconomic stability continues to be the guiding principle for monetary policy. Ghana recorded a single-digit inflation rate of 9.4 percent in 2012 and, generally, the level of inflation has been decreasing and has been in single digits for the period 2010 to 2012[49]. However, inflation has risen dramatically in 2014 and currently stands at around 15 percent, according to IMF estimates[50]. The exchange rate of the Cedi (GHS) depreciated by 153 percent against the US dollar between the start of 2008 and January 2014, and then by a further 40 percent in the first eight months of 2014.

Figure 3.3 GDP per capita and overall GDP, ECOWAS, 2012



Source: World Bank, World Development Indicators, Online Database, 2014

[48] The State of the Ghanaian Economy 2012

[49] ibid

[50] IMF (2014) IMF Country Report No. 14/129, available at: http://www.imf.org/external/pubs/ft/scr/2014/cr14129.pdf

3.6.2 Foreign Direct Investment and Overseas Development Assistance as catalyst for structural transformation

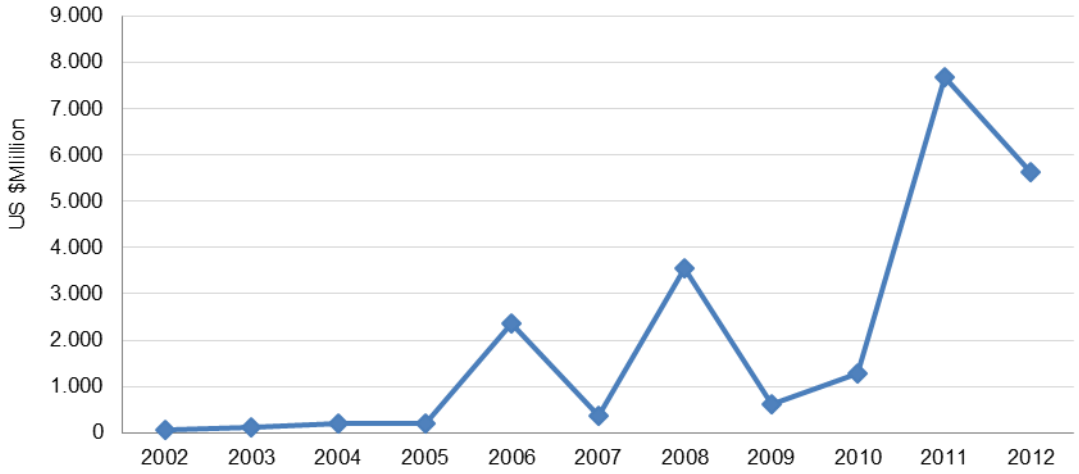
The impacts of globalisation, defined as increasing flows of trade, investment, information and cultural practices, as well as the transnational and transcontinental mobility of capital and labour, have accompanied economic growth in Ghana in the last 15 years.

Integration into the global economy can be assessed by the nature, quantity, and trend of foreign direct investment (FDI) inflows into the country (see Figure 3.4). On the whole, as seen above, FDI inflows have been impressive. This is largely due to Ghana's relative political stability as well as explicit government policies to attract foreign investors. FDI has increased, although not always at a steady rate, from 2000 to the present, reaching a peak in 2011.

Ghana is among the African countries that have received the highest FDI inflows, with a total of over USD 3 billion from 2011 to 2012 (UNCTAD, 2013) [51]. In West Africa, Ghana received higher FDI in relative terms from 2010 onwards. In 2012, Ghana received 22 percent of all FDI inflows into the ECOWAS community, behind Nigeria with 46 percent. The investments originated from both traditional and non-traditional countries, including China, India, Lebanon and Nigeria. The overall good performance indicates a high level of investor confidence in the Ghanaian economy.

Ghana ranks among the top ten recipients of official development assistance (ODA) worldwide, but with the GDP rebased in 2009 and the expected oil inflows, ODA decreased as a percentage of GDP, from 8.8 percent in 2000 to 5.2 percent in 2010, and as a percentage of the national budget, from 44.6 percent in 2010 to 11.4 percent in 2012[52]. In July 2012, the government of Ghana and development partners signed the Government of Ghana/Development Partners Compact 2012–2022 to implement the development agenda and propel the economy to the higher levels of economic growth and sustainable development attained by other middle-income countries[53].

Figure 3.4 Foreign Direct Investment Inflows, Ghana, 2002-2012



Source: NSDF Study based on Ghana Investment Promotion Council Database, 2013

[51] Nigeria, South Africa, Mozambique and Democratic Republic of Congo are the others

[52] Africa Development Bank, Ghana – African Economic Outlook

[53] ibid

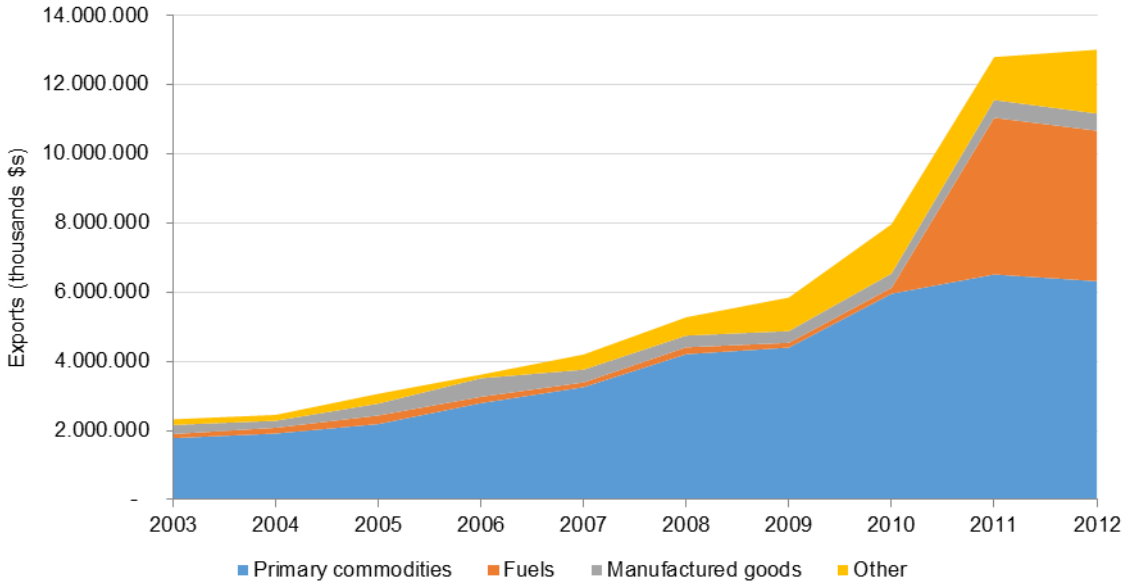
3.6.3 A continuously widening current account deficit

The Trade Intensity Index (exports + imports / GDP) measures Ghana's openness to trade. It has been rising steadily in recent years, implying that Ghana is becoming increasingly open and integrated into the global economy. The Trade Intensity Index was 102 percent in 2012, up from 69.5 percent in 2008. This was above the ECOWAS average of 76 percent and the second highest in West Africa after Liberia.

As 0 shows, exports have increased by almost 460 percent in the last decade. Total exports increased steadily until 2010, before seeing a dramatic increase in 2011, with the start of crude oil production.

Ghana's trade continues to be dominated by primary commodities, primarily gold, cocoa and (since 2011) crude oil. Exports suffered in 2012 from a drop in cocoa production, due to unseasonably cold weather during the harvest season, and from lower than expected oil production[54]. Crude oil is currently the second-largest export earner (20.7 percent) after gold (40.6 percent) with some USD 3 billion in 2012 according to Central Bank, but it has the potential to surpass gold if production from the Jubilee field can be increased to the estimated peak level of 120,000 barrels-per-day (bpd) (owing to technical difficulties, actual production in 2012 ranged from 53,000 to 64,000 bpd)[55]. Exploitation of other fields is also in the pipeline and may steadily increase to double in a 5 to 7 year horizon.

Figure 3.5 Exports by category, Ghana, 2003-2012



Source: UNCTAD, UNCTADSTAT, online database, 2014

In terms of exports, Ghana's most important trading partner is the European Union (EU), which accounted for just under half (47%) of all exports in 2012 (see Figure 3.6 and 3.7). This share had declined from 57 percent in 2003 to a low of 41 percent in 2010 before recovering again in recent years. The total value of this trade has increased almost fivefold in the last decade, from $1.3 billion to a peak of $6.4 billion in 2011.

[54] ibid

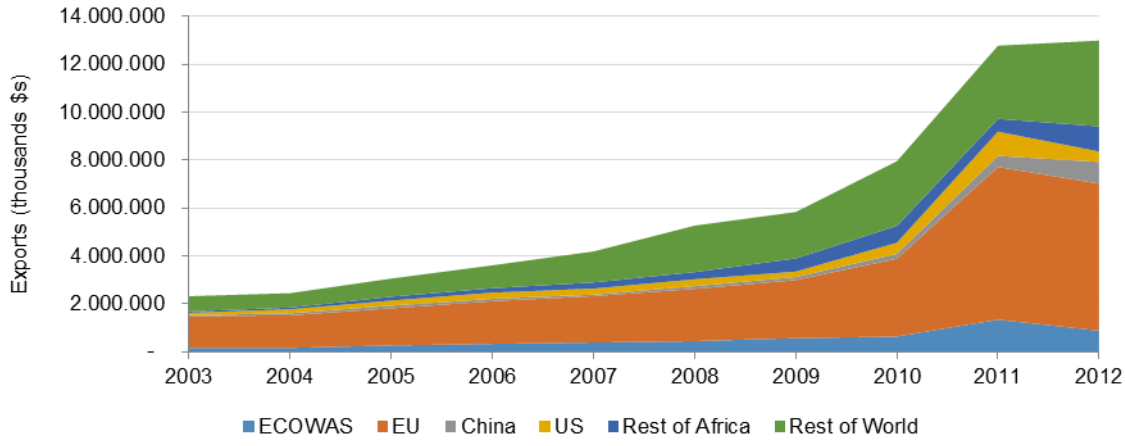
[55] ibid

Ghana had a trade surplus with the EU of $1.6 billion in 2012. Until 2011, exports to the EU consisted almost exclusively of primary commodities. Since then, however, crude oil exports have become increasingly significant, accounting for 53 percent of the $6.1 billion export trade with the EU in 2012.

Another increasingly important trading partner is China. Although small in comparison to the EU, exports to China have increased dramatically since 2003, from just $39 million to $908 million in 2012, and now account for 7 percent of total exports (see Figure 3.6). Moreover, China accounted for almost a quarter (24%) of total imports in 2012, up from 8 percent in 2003 (see Figure 3.7). Imports from China, in 2012, consisted almost exclusively of manufactured goods (94%), while exports consisted of 56 percent crude oil and 43 percent primary commodities. Ghana had a trade deficit with China of $3.4 billion in 2012.

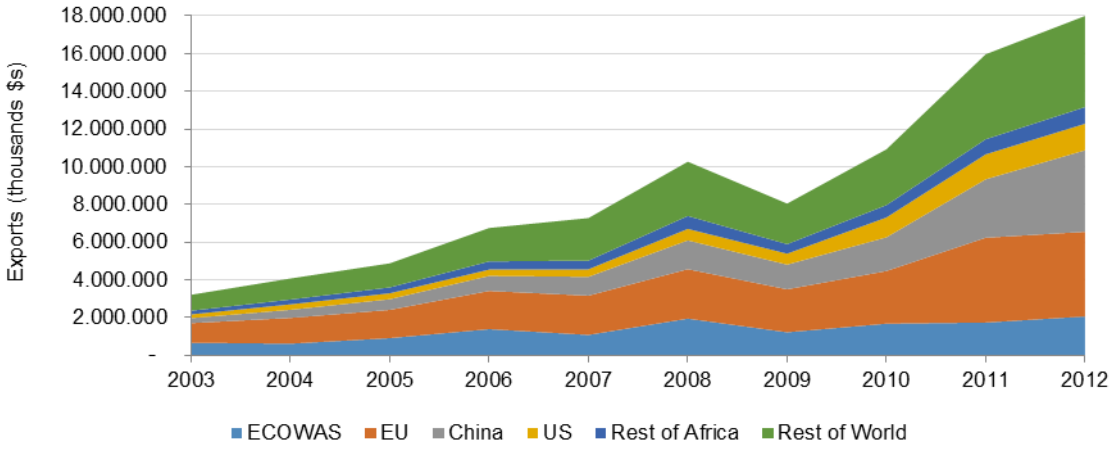
Trade with ECOWAS, as a percentage share of the total, has declined since 2003, although it has increased in total value. Exports to ECOWAS countries were accounted for 7 percent of total exports and were less concentrated in primary commodities and crude oil; 27 percent were manufactured goods, which accounted for 47 percent of all manufacturing exports. Imports were worth $2 billion, of which petroleum products accounted for two-thirds. Ghana had a trade deficit of $1.2 billion with ECOWAS in 2012. Now that Ghana is producing its own crude oil, it should be able to reduce its dependence on petroleum imports from ECOWAS and other partners.

Figure 3.6 Total exports and trading partners of Ghana, 2003-2012



Source: UNCTAD, UNCTADSTAT, online database, 2014

Figure 3.7 Total imports and trading partners of Ghana, 2003-2012

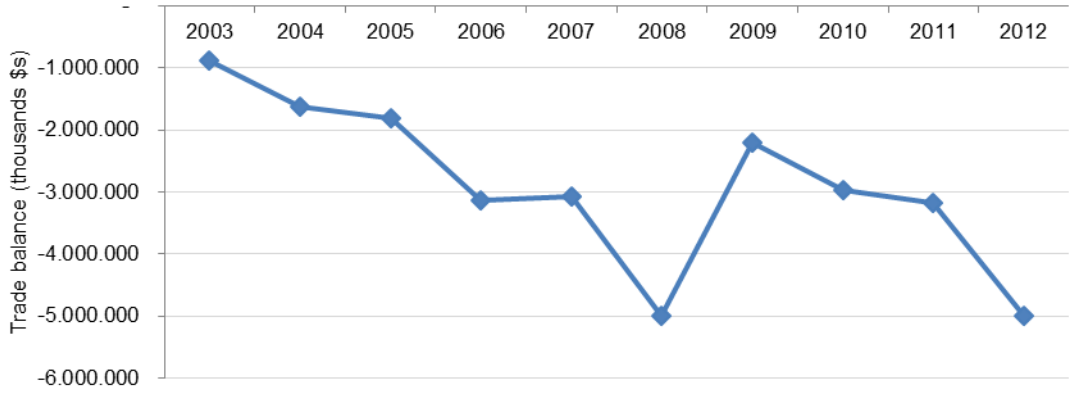


Source: UNCTAD, UNCTADSTAT, online database, 2014

Despite higher receipts from exports of gold, cocoa and crude oil, the current account deficit including official transfers has continued to widen. The deterioration in the current account is attributable to the trade deficit widening to $5 billion in 2012 (see Figure 3.8), the services trade deficit and income outflows (mainly repatriation of profits). The balance of payments came under further pressure towards the end of 2012, mainly on account of lower projected cocoa production, lower oil production and portfolio investment outflows due to election-related fears[56].

The trade deficit increased to 9.7 percent of GDP in 2012 from 8.3 percent in 2011 (see Figure 3.8) and is expected to widen further to 14.4 percent in 2013. This is driven by strong consumption growth, oil imports and rising investment activity, especially in the oil sector[57].

Figure 3.8 Trade balance, Ghana, 2003-2012



Source: UNCTAD, UNCTADSTAT, online database 2014

[56] ibid

[57] ibid

3.6.4 Huge potential for more integration into West African economy

The ECOWAS Treaty of 1975, revised in 1993, established a regional free trade area known as the ECOWAS area via ECOWAS Trade Liberalisation Scheme (ETLS). The terms of the agreement were formalised through various Protocols and Decisions stipulating free movement of persons, goods and vehicles within the 15 ECOWAS Member States. The objective of the ETLS is to establish a customs union among the Member States of the Community over a period of 15 years starting from January 1990, the date that the scheme entered into force. The Union was expected to totally eliminate customs duties and taxes, remove all non-tariff barriers, and establish a common external tariff (CET) [58].

This, however, has not yet been achieved and with the 15 member states often separated by language, currency and culture, the level of implementation of the protocols varies considerably. Ghana itself has failed to successfully implement some of the protocols. This incomplete or inconsistent implementation of the ETLS protocols, especially those pertaining to the free movement of goods, has a host of negative effects within Ghana, including increasing the costs and unpredictability of trade, and discouraging business expansion and investment. Because the ETLS is not being fully implemented throughout the region, private sector firms are paying higher costs on both agricultural and industrial goods and shipments both in and out of Ghana. These costs stifle the integration of regional value chains and generally reduce the competitiveness of West African exports to global markets.

Further integration with ECOWAS would have implications for the spatial economy of Ghana, which would become part of a larger and more integrated West African spatial economy. Greater integration would put cities like Accra in direct competition with other ECOWAS cities, such as Abidjan, Lagos and Freetown for FDI, but would also provide opportunities for Ghana's ports to serve as a gateway to a larger West African market. In general, it is more opportune to do business with neighbouring countries. However, the balance trade within ECOWAS accounts for less than 10 percent of foreign trade.

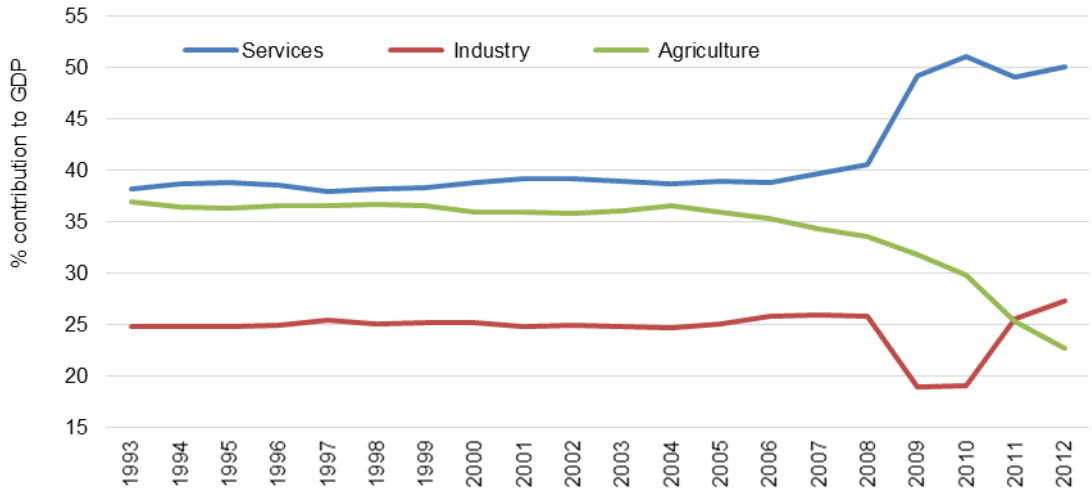
3.6.5 Rapidly diversifying economy

0 3.9 shows the percentage share of the major sectors of the economy from 1993 to 2012. The service sector increased its share, growing from about 38 percent in 1993 to about 50 percent. During the same period, agriculture's relative contribution declined from about 36 percent to 23 percent. The constant decline in agriculture's share occurred despite numerous projects and programmes to enhance productivity and production levels in the sector. As Figure 3.10 shows, the Ghanaian economy is one of the least agricultural in ECOWAS, although agriculture is still an important contributor. The informal sector is also a significant part of the Ghanaian economy. Although official estimates are unavailable, it is estimated to contribute between 20 and 40 percent of total GNP[59].

[58] "ECOWAS market integration: A gap analysis", *West Africa Trade Hub Technical Report No. 33*

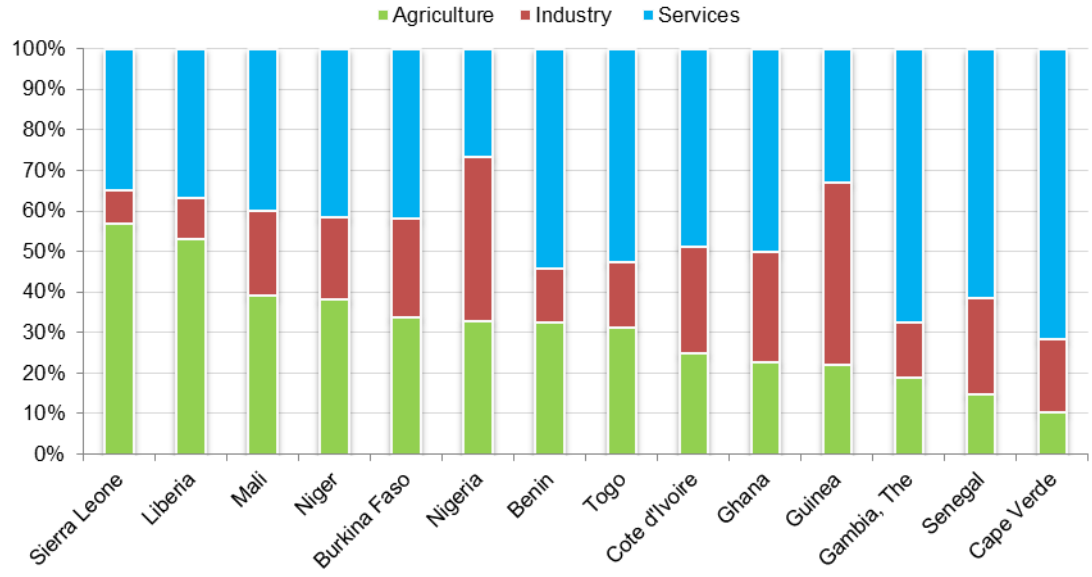
[59] Ghana - Labour Market Profile 2013
http://www.ulandssekretariatet.dk/sites/default/files/uploads/public/PDF/LMP/ghana_2013_final_web.pdf

Figure 3.9 Contribution to GDP by major sectors, Ghana, 1993-2012



Source: World Bank, World Development Indicators Ghana Country Statistics, Online Database, 2014

Figure 3.10 Contribution to GDP by major sectors, ECOWAS, latest year



Source: World Bank, World DataBank, Online Database, 2014

The industrial sector share was relatively stable since 1993, but its relatively lacklustre performance, considering the developmental stage and urbanisation level, is a matter of concern. Manufacturing output contributes just 5.8 percent to total GDP[60].

The downturn in the performance of the industrial sector in 2009 and 2010 saw thereafter a sharp recovery. This may be attributed to the start of crude oil production, which in 2012 contributed about 7 percent of the total GDP. This presents an opportunity for a structural change in the economy through the

[60] Ghana Statistical Service, Gross Domestic Product 2014, available at http://www.statsghana.gov.gh/docfiles/GDP/GDP_2014.pdf

development of a petro-chemical manufacturing base, which is largely absent in Ghana. There is, however, already an influx of industries to support the offshore oil platforms, particularly in the coastal areas of Western Region, putting currently some strain on coastal land resources.

In summary, the Ghanaian economy in 2013 was led by the services sector, which contributes 46 percent to GDP compared to the industrial and agricultural sectors, which contribute 31 percent and 23 percent respectively.

3.6.6 Services sector as the leading driver of growth

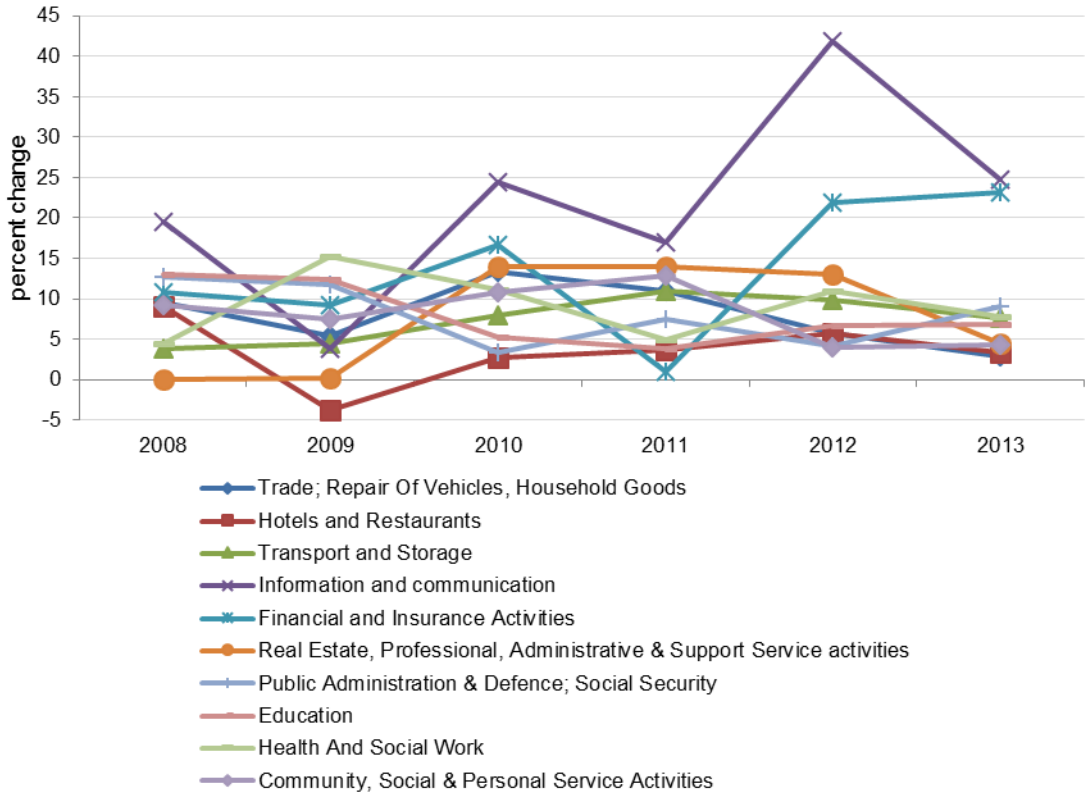
The services sector is the largest contributor to both GDP and employment in Ghana, contributing 49.5 percent of GDP in 2013 and 43.1 percent of employment in 2010. Between 2008 and 2013, the services sector grew at an average of 8.8 percent annually[61]. Growth in the sector is expected to continue, driven by investment in the tourism industry and the increased marketing of Ghana as a global tourist destination. The tourism sector is examined in more detail in Box 2 below. Another area where increased output can be realised is the anticipated expansion of services related to the oil and gas industry, including specialised deep water dedicated oil services terminal.

The largest services sub-sector is *transport and storage* contributing 11.2 percent to total GDP, the third highest of any sub-sector. This sector is followed by '*public administration, defence and social security*' contributing 6.9 percent, and *financial and insurance activities* contributing 6.5 percent. As Figure 3.11 illustrates, the sub-sector with the highest growth rate was information and communication, which grew at an average of 21.9 percent a year during this period. However, this sub-sector contributes only 2.4 percent to total GDP. More promising is the performance of the *financial and insurance activities* sub-sector, which has grown at an average of 13.8 percent and by 23.2 percent in 2013[62].

[61] Ghana Statistical Service, Gross Domestic Product 2014, available at http://www.statsghana.gov.gh/docfiles/GDP/GDP_2014.pdf

[62] ibid

Figure 3.11 Performance in services sub-sectors, 2008-2013



Source: Ghana Statistical Service, National Account Statistic, Gross Domestic Product 2014

Box 2 Tourism

Ghana is one of the top tourist destinations in Africa, receiving the largest number of tourists for cultural purposes. The number of visitors has grown steadily in recent years, from just under 428,000 in 2005 to over 1 million in 2011 – an average growth of 16.7 percent per year. In 2010, the UN World Tourism Organization singled out Ghana as one of four countries who outperformed the global average for the sector.

Receipts have also risen steadily, from about $836 million in 2005 to $2,178 million in 2011 – an average growth of 17.3 percent a year, and the sector now contributes 5.5 percent of total GDP. Furthermore, employment almost doubled in the same period, from 172,800 to 330,500. Tourism is comparatively more labour-intensive than industrial sub-sectors such as mining and quarrying, hence continued expansion of the sub-sector can provide much needed employment opportunities in the country.

Ghana has a great advantage to become a leading African tourist destination because of its unique slave forts and history, cultural diversity, natural environment and political stability. It also has the opportunity to promote sustainable tourism. Areas for consideration include are: cultural tourism (festivals, events, rural tourism); heritage tourism, with focus on the slave routes; recreational tourism (beaches, water sports, golf, etc.); adventure tourism (rainforest eco-tourism, nature reserves and game parks); and events tourism with focus on conferences and meetings.

Ghana is currently served by an increasing number of major airlines including KLM Royal Dutch Airlines, Ethiopian Airlines, Air Namibia, Emirates, Lufthansa, Delta Airlines, Virgin Atlantic, Brussels Air, Turkish Airlines, Royal Air Maroc and British Airways. The main sources of tourists outside Africa are the USA, UK, Germany, Netherlands, and Germany. Nigeria, Cote d'Ivoire, Togo, and South Africa are the major contributors from Africa.

Source: "The State of the Ghanaian Economy in 2012" (2013), ISSER; "Top Guide: Investing in Ghana" (2014) Ghana Investment Promotion Centre (GIPC)

3.6.7 Diminishing share of agriculture in total output

Although the contribution of the agricultural sector to output has declined significantly over the last decade, its importance should not be underestimated. Over 40 percent of the workforce is employed in the sector and it has a vital role to play in achieving Millennium Development Goal (MDG) (1) to halve extreme poverty and eradicate hunger by 2015. Ghana's current agricultural policy is described in box 4 below.

Box 3 Agricultural Policy in Ghana

At present, agriculture outside of the cocoa-producing regions of the southwest is largely subsistence-based and rain-fed, particularly in the north of the country. Given this, the Government has sought to modernise the sector through the Food and Agriculture Sector Development Policy (FASDEP), developed in 2002 to provide a strategic framework for the implementation of clearly defined steps towards the modernisation of the sector, and its successor the FASDEP II[63], which emphasises the sustainable use of all resources and commercialisation of activities in the sector, with market-driven growth in mind.

Current policy interventions made within the agricultural sector of Ghana are based on the Medium Term Agriculture Sector Investment Plan (METASIP). METASIP, which seeks to implement FASDEP, consists of six strategic programmes covering the period 2011-2015:

- Agricultural mechanisation: This initiative aims to increase access to and use of agricultural technology through the establishment of agricultural mechanisation service centres in 62 districts, each equipped with agricultural equipment such as tractors, maize shellers, combine harvesters and water pumps.
- Fertiliser and Seed Subsidy Programme: The programme seeks to promote the use of fertilisers and improved seeds through subsidised distributions. In 2012, 170,000 mt of fertiliser and 20,000 kg of seeds were distributed to 300,000 farmers.
- Irrigation Development: In order to reduce the agricultural sector's reliance on rainfall to irrigate crops, a number of irrigation projects have been initiated. These include work to build and repair dams in the northern regions.
- Livestock production technologies: Initiatives include distribution of subsidised and improved livestock to farmers to enhance productivity, as well as the establishment of livestock demonstration centres.
- Youth in Agriculture Programme (YIAP): This programme seeks to create employment by supporting 80,000 youths with inputs to produce food crops, livestock, aquaculture and agribusiness.
- Extension Services: This initiative seeks to encourage the adoption of technology and best practices among farmers by establishing community demonstration sites and building capacity in farmer based organisations along the agricultural value chain in order to form district networks.

Source: "The State of the Ghanaian Economy in 2012" (2013), ISSER

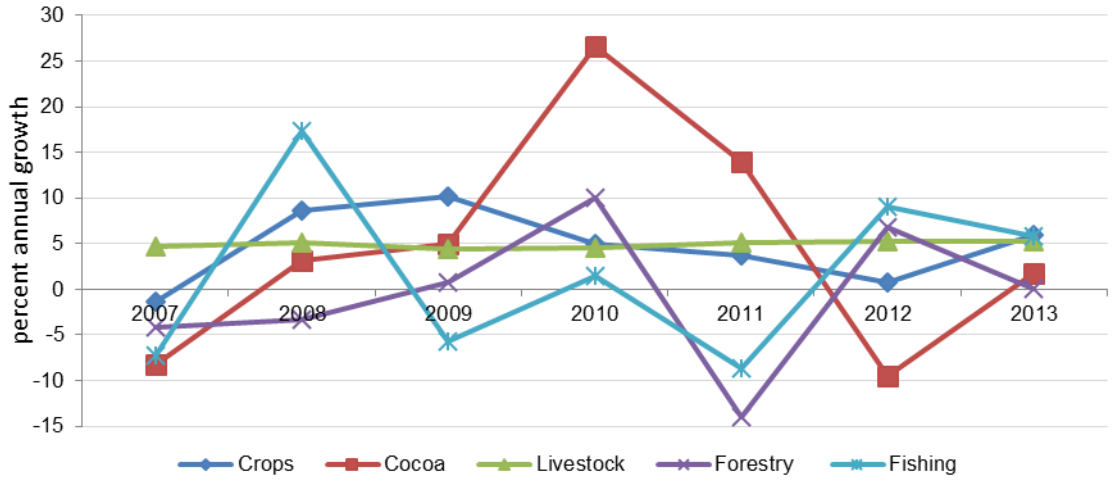
The overall contribution to GDP of the agricultural sector was 22 percent in 2013, down from 23 percent in 2012 and declining significantly over the last decade (see 0). The sub-sector with the biggest contribution to GDP (of all sub-sectors, not just agriculture) is the crops sub-sector (excluding cocoa). This sub-sector contributed 14.7 percent of GDP in 2013, though this has also been declining year-on-year over the last decade[64].

[63] Ministry of Food and Agriculture, Food and Agriculture Sector Development Policy (FASDEP II) http://mofa.gov.gh/site/?page_id=598

[64] Ghana Statistical Service, Gross Domestic Product 2014, available at http://www.statsghana.gov.gh/docfiles/GDP/GDP_2014.pdf

Despite a declining share of GDP, the agricultural sector has grown at an average of 3.8 percent per annum between 2007 and 2013. Annual growth over this period has been driven primarily by the crops (4.7 percent), cocoa (4.7 percent) and livestock (4.9 percent) sub-sectors, though the fishing sub-sector has shown significant growth in the last two years after a decline in 2011 (see Figure 3.12). The most volatile of these sub-sectors is cocoa, which is highly dependent on external prices determined by the world market, as well as weather conditions for production (see Box 5 below).

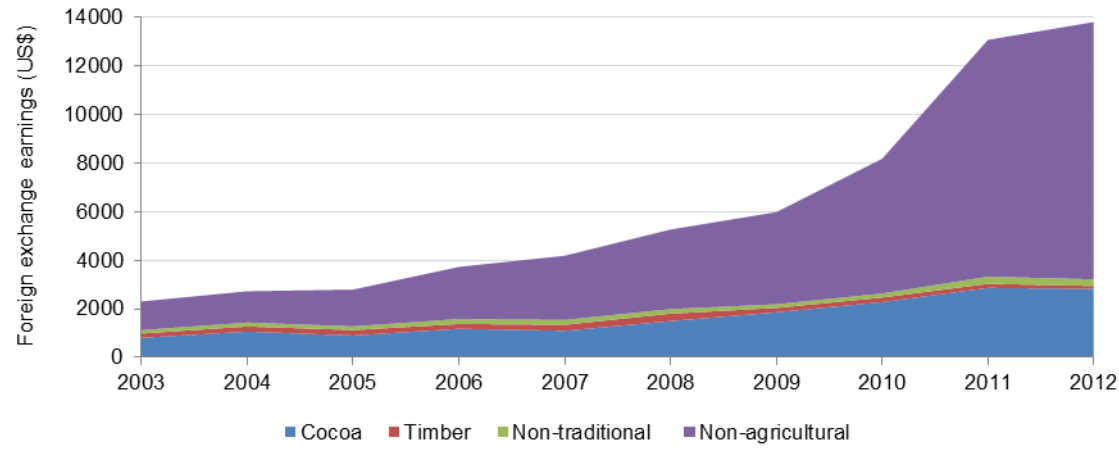
Figure 3.12 Performance of agricultural sub-sectors, 2007-2013



Source: Ghana Statistical Service, National Account Statistic, Gross Domestic Product 2014

The agricultural sector is an important earner of foreign exchange, in particular the cocoa sub-sector, as well as timber and other non-traditional agricultural products. The share of total foreign exchange earnings of these agricultural products is shown in Figure 3.13. The contribution of cocoa to foreign exchange earnings is immense in comparison to the sub-sector's contribution to overall output; in the period 2009-2012, the cocoa sub-sector contributed an average of only 3 percent to GDP, but 25.5 percent of foreign exchange earnings. The importance of the cocoa sub-sector to the Ghanaian economy is explained in Box 5 below.

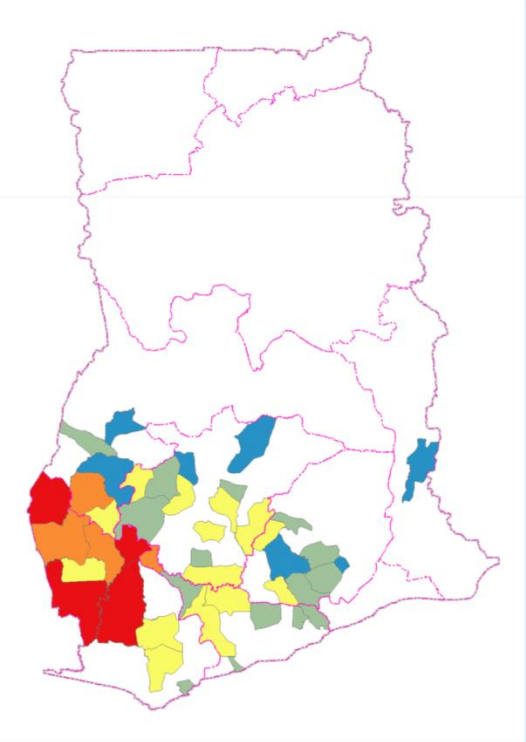
Figure 3.13 Foreign exchange earnings by sub-sectors/sectors, 2003-2012



Source: Bank of Ghana, 2012

Box 4 Cocoa production in Ghana

The significance of the cocoa industry in Ghana, both economically and culturally, should not be underestimated. Cocoa was introduced from Equatorial Guinea to the Gold Coast in the late 19th Century, and by the 1920s the colony was one of the world's largest producers. Cocoa was never a plantation crop and has always been grown by indigenous smallholder farmers. It has featured prominently in national economic strategies since independence as a vital earner of foreign exchange and a major employer in rural areas.



The cocoa industry accounts for about 3.4 percent of GDP and 28 percent of exports and provides direct and indirect employment to two million people. Ghana is currently the world's second largest cocoa producing nation in the world after Cote d'Ivoire. Production exceeded one million metric tonnes in 2011, but reduced to 880,000 in 2012. Only 30 percent of the beans are processed locally, while 70 percent are exported raw.

The majority of cocoa is grown in the south west of the country in the Western, Ashanti and Brong Ahafo regions (see map above). Cocoa is grown almost exclusively by smallholder farmers, with most farms not more than one hectare in size. These smallholder farms often rely heavily on family labour whose livelihoods are determined by the price of cocoa in the world market.

A total of 25 private, public and foreign firms are authorised by the Government as Licensed Buying Companies to purchase cocoa beans from farmers on behalf of the Cocoa Marketing Company (CMC). The CMC was established to develop and facilitate the production, processing and marketing of Ghana's cocoa.

Until recently there were just two cocoa processing facilities in Ghana, West African Mills in Takoradi and Cocoa Processing Company In Tema, both of which are partly state-owned. Today, however, there are six major private companies involved in the processing of cocoa into semi-finished and finished products, including cocoa cake, cocoa liquor, cocoa butter and cocoa waste, as well as some limited production of finished products such as cocoa powder and chocolate. The companies and their locations are: Barry Callebaut Ghana Limited (Tema); Real Products Limited (Apowa, Western Region); Plot Enterprise Ghana Limited (Takoradi); Cadbury-Kraft Foods Ghana Limited (Accra); Cargill Ghana Limited (Tema); ADM Cocoa (Ghana) Limited (Kumasi).

Source: Sutton, J. and Kpentey, B. (2012), "An Enterprise Map of Ghana", International Growth Centre; and Ryan, O. (2011), "Chocolate Nations: living and dying for cocoa in West Africa," Zed Books: London

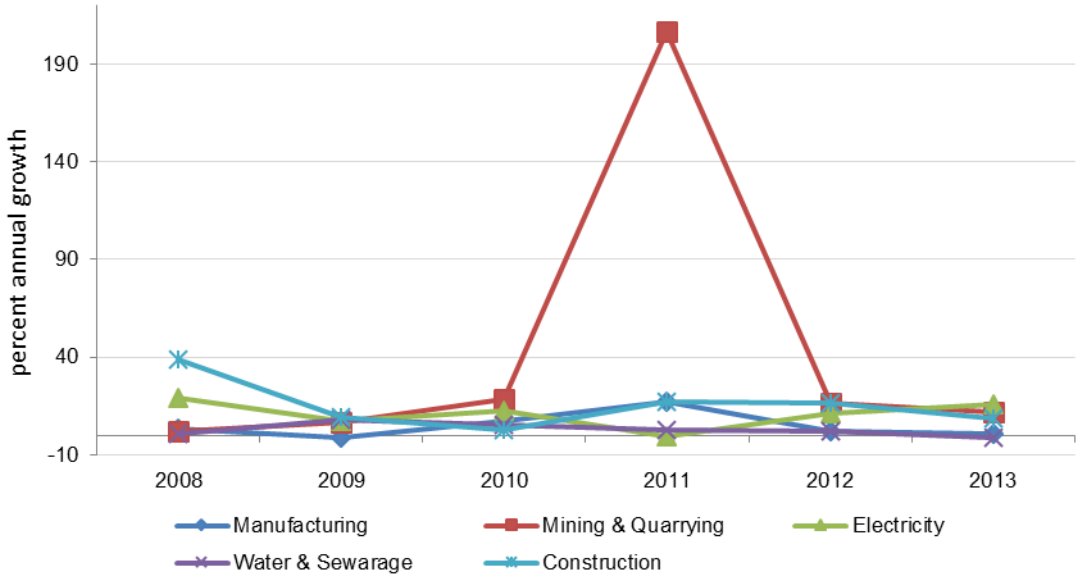
3.6.8 Industrial potential

The industrial sector's share of GDP was 28.6 percent in 2013. This remained at the same level as in 2012. Prior to this, industry's contribution to GDP had been increasing after suffering a decline in 2009 (see 0). The sub-sector with the highest contribution to total industrial sector GDP, and second highest in all sectors, was construction with 11.8 percent. Mining and quarrying followed with 9.8 percent, of which crude oil production was 8.1 percent. The contribution of gold mining to the

Ghanaian economy is explored further in Box 6 below. Manufacturing contributes just 5.8 percent of GDP in highest growth rate of all three major sectors of the economy[65].

The industrial sector has grown at an average annual rate of 14.4 percent in the period 2008-2013, driven primarily by the start of crude oil production, recorded in the mining and quarrying sub-sector, in the final quarter of 2010, which is responsible for the spike in growth of the sub-sector in 2011. The construction sub-sector has also experienced strong growth in this period. Manufacturing performed strongly in 2010 and 2011, after contracting in 2009; however this growth has fallen away again and the sub-sector grew at just 0.6 percent in 2013 (see 0).

Figure 3.14 Growth performance of industrial sub-sectors, 2008-2013



Source: Ghana Statistical Service, National Account Statistic, Gross Domestic Product 2014

Box 5 Linkages in gold mining industry

By 2009 Ghana had become the world's ninth largest producer of gold, amassing a 3.8 percent share of global production. Overall, the Ghanaian mining sector – of which gold represents 95 percent – contributed 5.8 percent to national GDP with a 2009 industry revenue of 2.8 billion. After a period of decline during the state-owned era, which started in the early 1960s, the gold mining industry has benefited from significant restructuring and modernisation.

There are four tiers of the mining industry value chain: (i) direct suppliers that produce equipment, consumables or services that are used directly in the mining process; (ii) indirect suppliers that produce intermediate goods such as components for capital equipment; (iii) direct mining services that employ geological and land planning services, and (iv) indirect producer services that include legal, financial and logistics services.

Backward linkages, whereby industry purchases its inputs from other industries as part of production, are increasing in Ghana. These linkages have the most significant impact on the Ghanaian economy. In 2010, the Surf Yellow Pages Business Directory listed more than 300 companies in categories related to mining, across all four tiers of the value chain. The vast majority were involved in gold mining. The gold mining sector's substantial intermediate inputs help support project engineering companies, original equipment manufacturers and

[65] Ghana Statistical Service, Gross Domestic Product 2014, available at http://www.statsghana.gov.gh/docfiles/GDP/GDP_2014.pdf

consumables suppliers producing chemicals and explosives.

Forward linkages create spillovers from upstream firms to downstream domestic firms. The linkage occurs with production of raw materials for use by other industries as an intermediate production input. In Ghana, industrial-scale gold mining creates linkages through the refinement process. Ore is mined and extracted by the mining companies into semi-pure ore bars. However, there is little actual refining of gold in Ghana.

There is also little evidence of downstream linkages to gold-using industries such as jewellery, electronics and computing. This is in part due to the high price of gold and weak local demand for gold jewellery.

Accra and the adjacent port and industrial city of Tema are home to about 80 percent of mining companies' headquarters. The mining towns spread throughout western Ghana and support many small local companies involved with direct operational activity. In recent years, the numbers of component manufactures and mining input providers have also been on the rise. These inputs include metals and metalworking, chemicals and plastics, business services and logistics companies.

Data from the Ghana Chamber of Mines in 2008 challenges the traditional view of industrial mining as an enclave activity with 20 percent of producing company's total expenditure being spent on local commodities. This further demonstrates increased backward linkages stimulating localised activities including both supplier and producer services.

Source: Bloch, R. and Owusu, G. (2012), "Linkages in Ghana's gold mining industry: Challenging the enclave thesis", Resources Policy 37, 434-442

In 2010, the industrial sector employed about 1.6 million people, more than 15 percent of Ghana's workforce. Despite contributing only 20 percent of industrial output, the manufacturing sub-sector was the largest industrial employer, employing 1.12 million people, of which 60 percent were female. The mining and quarrying sub-sector, though contributing substantially to output and foreign exchange earnings, employs only 114,000 workers (1.1 percent of total employment).

In the short to medium term, there is the potential for the industrial sector to be a major driver of economic growth. This will be achieved through an expected increase in contributions from the construction sub-sector and the mining and quarrying sub-sector (due to crude oil production). However, it is clear that a major constraint on growth is the performance of the other sub-sectors, particularly manufacturing, electricity, and water and sewerage.

Relatively rapid economic growth since 2000 has exposed the fragilities of the power and water sub-sectors as the needed public investments have not been made. Lack of adequate supply to meet the growing demand in the electricity sub-sector imposes a constraint on growth in the industrial sector, as well as the other sectors of the economy. To address this, the government has indicated a commitment to increase the total electricity generating capacity from 2,312 MW in 2012 to 5,000 MW in 2015 – more than doubling capacity in three years[66].

Industrial clusters have either developed spontaneously, such as the Suame Magazine described in Box 7 below, or were established in response to government policy. The enterprise zones at Tema, Sekondi, Shama and the Ashanti Technology Park are examples of clusters developing in response to government intervention. Currently, approximately 300 enterprises operate in the four enterprise zones, which provide dependable power and utility, in addition to tax benefits. The Shama zone,

[66] The State of the Ghanaian Economy 2012

located in the Shama Ahanta East Metropolitan area in Western region, is targeted for the petroleum-petrochemical sector[67].

Box 6 The Suame Manufacturing Cluster in Kumasi

The Suame manufacturing cluster in Kumasi – known as "Suame Magazine" is an industrialized area with many workshops for metal engineering and vehicle repairs, employing an estimated 200,000 workers. It is located 10 kilometres from the central business district of Kumasi in the Suame area. The Suame cluster is dominated by micro and small enterprises (MSEs). The average MSE in Suame employs five workers, though more sophisticated manufacturing workshops employ up to ten. Their main activities can be categorised as manufacturing, vehicle repair, metalworking and the sale of engineering materials, spare automobile parts. Communication centres are also playing an increasingly important role in cluster activities.

The Suame cluster is an example of the benefits of agglomeration. The cluster's concentration of vehicle-repair enterprises in one location brings together customers and repairers, thus reducing the need for aggressive marketing. Firms also benefit from labour market pooling, as the cluster attracts workers of varying skills levels from all over the country. Workers also benefit from the ability to move easily between firms when new opportunities arise.

The cluster brings together two types of complementary labour. The majority of workers have no formal training in engineering or manufacturing and have only a primary school education. These workers gain their skills through apprenticeships and on-the-job learning. The second group of workers have higher-level technical skills gained through formal training or in apprenticeships with larger enterprises. The presence of this second group enables the cluster to produce items that compare favourably with imports. For example, in April 2013, artisans of Suame Magazine designed and manufactured a prototype robust vehicle, the SMATI Turtle 1, intended for use in rough terrains in Africa[68].

The cluster also brings together manufacturing firms with intermediate producers and firms providing services to the cluster. Many of the tools used by artisans in Suame were produced locally, often with a high degree of specialisation for a specific task. Firms in the services sector, for example, food and beverages sales, telephone and fax services, internet, and computer typesetting, have also clustered in Suame. The clustering of similar firms also allows for greater efficiency through specialisation and division of labour; many of the firms subcontract among themselves enabling the entire group to achieve basic economies of scale.

Source: Adeya, C.N. (2008), "The Suame Manufacturing Cluster in Ghana", in "Knowledge, Technology and Cluster-based Growth in Africa", World Bank

It is clear that growth in the manufacturing sector, particularly in labour-intensive industries, is crucial for economic development. Oil production is beginning to change the structure of Ghana's economy, but policy interventions are needed to bolster and help accelerate growth in the manufacturing sub-sector to ensure abundant broad-based, gender-balanced employment opportunities for Ghanaians. Paramount to this is a regular and reliable supply of electricity to manufacturing firms.

3.6.9 Urban centres as important engines of growth

Ghana has seen a period of almost uninterrupted urbanisation since independence, which has accompanied the more recent developments in the spatial economy as outlined above. The overall urbanisation level has more than doubled from 22 to 51 percent from 1960 to 2010. The precise pattern of this urbanisation process is explored further in the next chapter.

[67] Achah, C., Adjasi, C. and Turkson, F. (2014), "Scoping study on the evolution of industry in Ghana"

[68] http://www.modernghana.com/news/458333/1/ghanas-model-vehicle-unveiled-by-suame-magazine-ar.html

Neo-classical economic theory views the development process as one of structural transformation from agriculture into manufacturing and services, involving a shift of labour from rural to urban settlements. In typical closed-economy models of this process, urbanisation and structural transformation are mechanically linked through a combination of a low-income elasticity for food and the assumption that manufacturing and services are predominantly or exclusively urban activities.

Contemporary research has emphasised the importance of agglomeration effects in cities that are the 'engines of growth'. The benefits of agglomeration stem from three main channels. The first is the deepening of local product and labour markets, which leads to more efficient matches and increased levels of productivity. The second is the availability of specialised intermediary inputs and services, which can only develop with a critical mass of firms. Finally, positive spillovers from human capital lead to higher productivity of workers, as skilled and unskilled labour are complements, and also to increased levels of innovation through knowledge transfer between individuals[69].

Recent studies have raised concerns, however, that Ghana, and Africa in general, is experiencing urbanisation without industrialisation. This second path to urbanisation is driven by the income effect of natural resource endowments; resource rents are spent on urban goods and services, which give rise to "consumption cities" made up primarily of workers in non-tradable services. This second path to urbanisation may not be conducive to long-run growth and development, as consumption cities are not able to reap the benefits of agglomeration economies. The mechanism that drives the rise of consumption cities is the same as in a Dutch disease model – a boom in resource rents shifts labour away from the tradable manufacturing sector and towards non-tradable services[70].

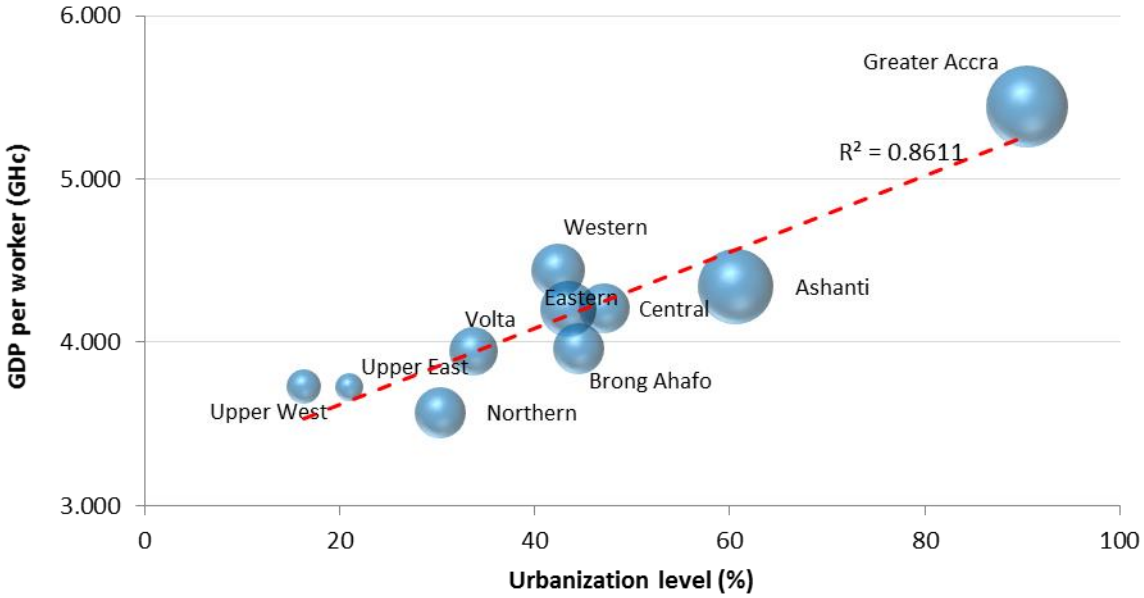
Despite these concerns, the experience of Ghana has shown a positive correlation between urbanisation and growth[71]. 0 3.15 charts the regional GDP per worker against the urbanisation level, demonstrating the positive correlation between the two. Furthermore, as mentioned above, although Ghana's structural transformation to an industrialised country is far from complete, manufacturing's share of exports has increased significantly since the reforms, registering an average share of 25 percent between 2005 and 2010, although its contribution to total GDP is still relatively small as seen above. This trend is a positive sign of Ghana's potential transition to an industrialised economy – and to cities which produce goods and services as well as consume them – thus driving growth.

[69] Moretti, E. (2014), "Cities and growth", *IGC Evidence Paper*

[70] Gollin, D., Jedwab, R. and Vollrath, D. (2013), "Urbanization with and without Industrialization"

[71] See Osiakro Logistics (2013), "Study on hierarchy and functions of urban settlements in supporting growth"

Figure 3.15 Regional GDP per worker by urbanisation level



Source: NSDF Study 2014 based on National Account Statics and Population & Housing Census, 2010

3.7 Growth, employment, informal sector and poverty

Economic growth is a means to achieve the goal of human development. While Ghana's recent growth in output is unquestionably positive, it is important to demonstrate the impact that this growth has had on key human development indicators. This impact is explored below, while social development in a spatial perspective is explored in greater detail in another chapter.

3.7.1 Low growth rate of labour force and an increasing dependency ratio

The working-age population (age 15-64) constitutes 58 percent of the total population. The age distribution of the population results in a dependency ratio of 73. This means that, on average, 100 working-age adults supports 73 dependents who, because they are too young or too old, cannot work. If factors such as physical and mental impairment are considered, an average working-age person would have one dependent. In other words, they must earn enough to support two people.

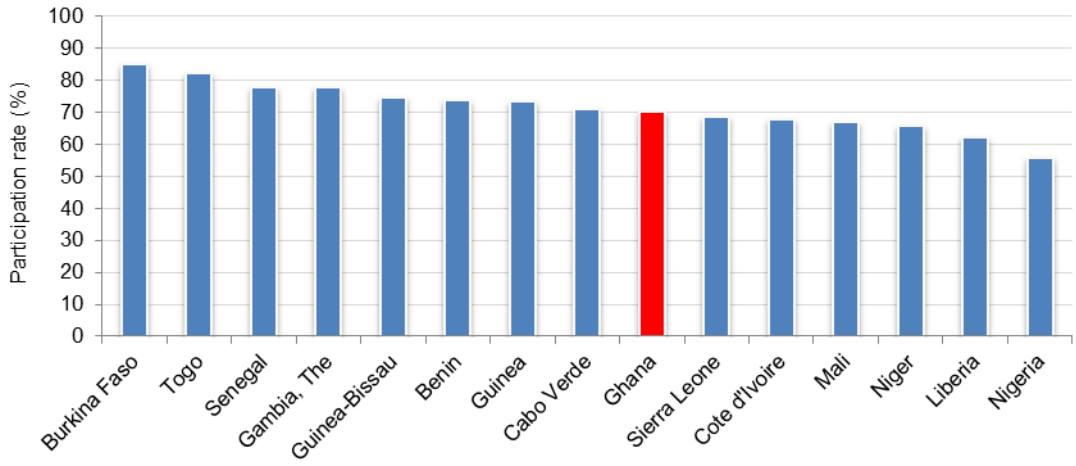
In recent years, the labour force has grown more slowly than the number of dependents, due to the rapidly falling infant mortality rate and increasing life expectancy rate. This is placing increasing pressure on workers and wages (earnings) must increase accordingly just for standards of living to be maintained before they can be improved. In 2012, labour force participation was 70 percent of the working-age population, a slight decrease on the 2003 figure of 73 percent. This gives a total of just over 10 million earners who must support themselves and 15 million dependents – a "real" total dependency ratio of 146.

Labour force participation is slightly below the average for ECOWAS of 72 percent (see Figure 3.16). However, and importantly, female participation in the labour force is higher in Ghana (69 percent) than in the other ECOWAS countries (64 percent) as is the ratio of female-to-male participation (96 percent compared to 80 percent)[72]. In contrast, youth population (age 15-24) participation is significantly lower (39 percent) than the ECOWAS average of 55 percent and has declined markedly in the last

[72] World Bank DataBank

decade from 47 percent in 2003. This worrying trend needs to be reversed before it leads to growing disillusionment and social unrest in the country.

Figure 3.16 Labour force participation rates, 2012, ECOWAS



Source: World Bank, World DataBank, Online Database, 2014

3.7.2 A rapidly growing informal sector

As outlined in the section above, formal employment opportunities in Ghana are limited and the majority of the workforce is consequently engaged in the informal labour market. The informal sector or economy is defined as the part of an economy that is not taxed, monitored by any form of government or included in any gross national product, unlike the formal economy. It is estimated that the informal sector employs more than 80 percent of the total labour force in Ghana and contributes an estimated 20 to 40 percent of total GNP[73]. Furthermore, this share of employment is growing, as indicated above by the decline in formal employment. One report estimates that of the 250,000 young people that enter the labour market each year, only two percent find a job in the formal sector[74].

Informal employment is found across the country and in every sector. The share of informal jobs is highest in trade and commerce (81 percent); agriculture (77 percent); transport, communications & storage (77 percent) and manufacturing (70 percent) and lowest in utilities (25 percent) and finance and real estate (23 percent)[75]. Major features of the informal economy are its ease-of-entry (little or no capital start-up required and mostly no skills are required), small scale, high labour intensity, use of adapted technology, family ownership, unregulated and competitive market, and reliance on indigenous resources and skills acquired outside formal school system.

The informal economy remains the largest employer among all sectors of employment and continues to grow. Between 2000 and 2010, the number of informal sector jobs increased from 6.2 to 8.4 million, accounting for 92 percent of the total increase (see 0). By the close of the decade, it employed 86 percent of all workers. During the same period, the shares of public sector jobs and private formal

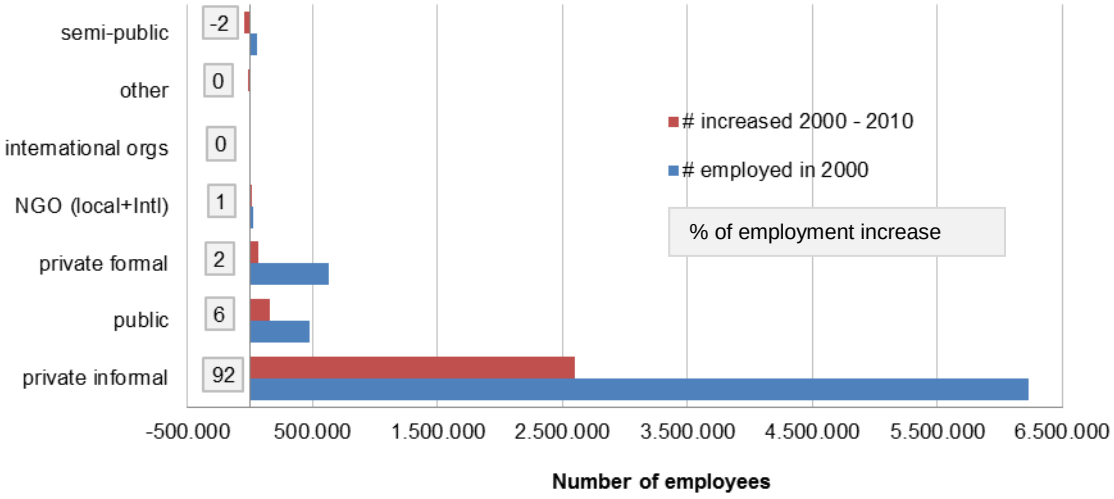
[73] Ghana - Labour Market Profile 2013
http://www.ulandssekretariatet.dk/sites/default/files/uploads/public/PDF/LMP/ghana_2013_final_web.pdf

[74] ibid

[75] ibid

jobs declined, and semi-public jobs declined absolutely. Employment in the informal sector is expected to continue to increase in both the medium and long term.

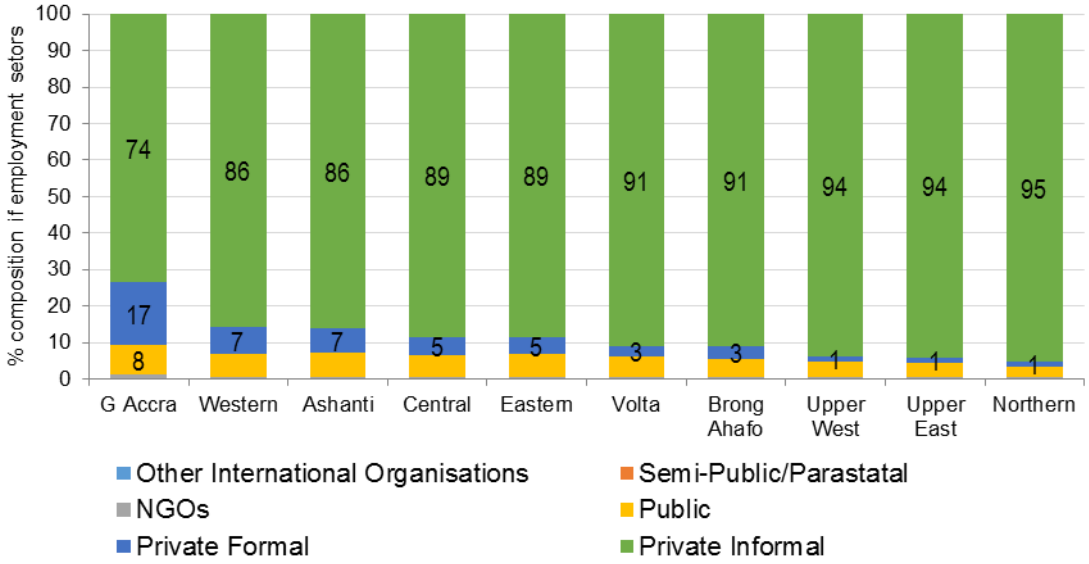
Figure 3.17 Changes in employment from 2000-2010



Source: Ghana Statistical Service, Population and Housing Census, 2010

There are some regional variations in the role of informal economy, largely as result of urbanisation level. With the exception of Greater Accra, with 74 percent, all the other regions had more than 86 percent of their employees engaged in the informal sector (see Figure 3.18). The difference in Greater Accra was its higher share (almost 20 percent) of the private formal sector, which was almost negligible in the other regions.

Figure 3.18 Employment by sector, 2010



Source: Ghana Statistical Service, Population and Housing Census 2010

The low level of skills in informal economy coupled with the low level of technology adopted results in low productivity, production and income levels. Currently, the

educational attainment level of the economically-active population and the low skills base partly contributes to the huge size of the informal economy.

While the majority of informal sector workers are self-employed and are in control of their income, incomes in the informal sector are irregular and are subject to weather, climate and market fluctuations. For instance, street vendors depend on profits made on goods sold or services rendered. Those that are employed by firms in the informal sector inherently have no job security and little bargaining power. The majority are paid below the national minimum wage. The informal sector is also characterised by poor environmental and working conditions and many workers engage in hazardous practices that may jeopardise their health or damage the local environment.

Another significant negative feature of Ghana's informal labour market is the high proportion of economically active children. The majority of child labourers are unpaid family workers engaged in either the agricultural or fishery sub-sectors. However, children are also engaged in urban centres, often as street sellers. While some work after school time, a significant number drop out or miss school days to the detriment of their education, increasing their vulnerability in the labour market now and in the near future[76].

The informal economy remains a major challenge to urban planning and management in Ghana, with both positive and negative sides. On the positive side, it employs most of the labour force, particularly unskilled and semi-skilled persons, and keeps the cities running[77]. On the negative side, informal economic activities result in a loss of municipal revenue, are often unsightly and chaotic, and sometimes encroach on walkways and roads. Many local authorities respond by prohibiting informal activities, issuing fines, destroying informal structures and confiscating merchandise. This friction between the informal workers and the authorities reduces productivity and restricts the growth potential of the informal economy.

3.7.3 Increasing inequality

As seen above, sustained output growth in the last decade has not been matched by employment growth: total employment increased 3.5 percent a year on average between 2000 and 2010 (with most of the new jobs in the informal sector), while output increased by an average of 5.6 percent a year[78]. Consequently, the fruits of Ghana's economic prosperity have not been shared evenly by all. The income share of the top 10 percent of earners has increased from 30 to 32.8 percent between 1992 and 2006, while that of the lowest 10 percent has declined from 2.8 to just 2 percent. In fact, all divisions of society have seen their share of income decrease, except for the top 20 percent. Moreover, since 1998 this increase has accumulated to the top 10 percent of society with the second 10 percent actually seeing their share of income also decline, from 16.7 percent to 15.8 percent[79].

The Gini index measure of inequality rose from 36 in 1990 to 42.7 in 2005. Ghana is the fourth most unequal country in ECOWAS, based on each country's latest available Gini coefficient score. The average score for the region as a whole is 40.32.
In addition to the growing inequality in income distribution, the effects of growth have also not been distributed evenly spatially across the regions of Ghana. This is explored below in the context of poverty reduction.

[76] ibid

[77] UN Habitat (n.d) *Supporting the Informal Sector in Low Income Settlements*

[78] 2014 African Transformation Report

[79] World Bank, World DataBank, Online Database, 2014

3.7.4 Despite recent progress, the north lags behind in poverty reduction

Since the transition to sustained democracy in 1993, Ghana has made remarkable progress in reducing poverty and is on target to meet MDG (1) to reduce by half the proportion of the population below the national poverty line between 1990 and 2015. The national poverty rate, measured by the Ghana Living Standards Survey (GLSS), has been reduced from 51.7 percent in 1992 to 24.2 percent in 2013. Nevertheless, regional poverty reduction tells a different story. While rural development and urbanisation have led to significant poverty reduction in the south, similar dynamics have been largely absent in the north. Between 1992 and 2006, the proportion of the poor declined in the south from 47.9 to 19.8 percent, while in the north it declined from 68.8 to 62.7 percent. The number of poor decreased by 2.5 million in the South, but *increased* by 0.9 million in the North. This has led to the claim that "Ghana's success story in poverty reduction is the success story of its south"[80].

The majority of the country's poor live in Northern Ghana[81], where the poor are also poorer. They are also predominantly rainfall-dependent farmers who are highly vulnerable to external shocks such as droughts and flooding. The north is isolated economically and unable to integrate with the more dynamic South, despite adequate connectivity through infrastructure. Improvements in the level of education in Northern Ghana do not seem to have provided greater livelihood opportunities. In fact, the last two decades have seen a convergence in human capital endowments between the north and the south, but a divergence in poverty and outcomes. This reflects a divergence in returns to economic factors – especially human capital – as well as poor mobility of these factors[82]. In other words, education has less impact in reducing poverty in the north than in the south. This can be explained by the factors discussed in preceding sections; the more rural north has fewer employment opportunities outside agriculture for increased human capital to be fully utilised which will generate fewer positive spillovers.

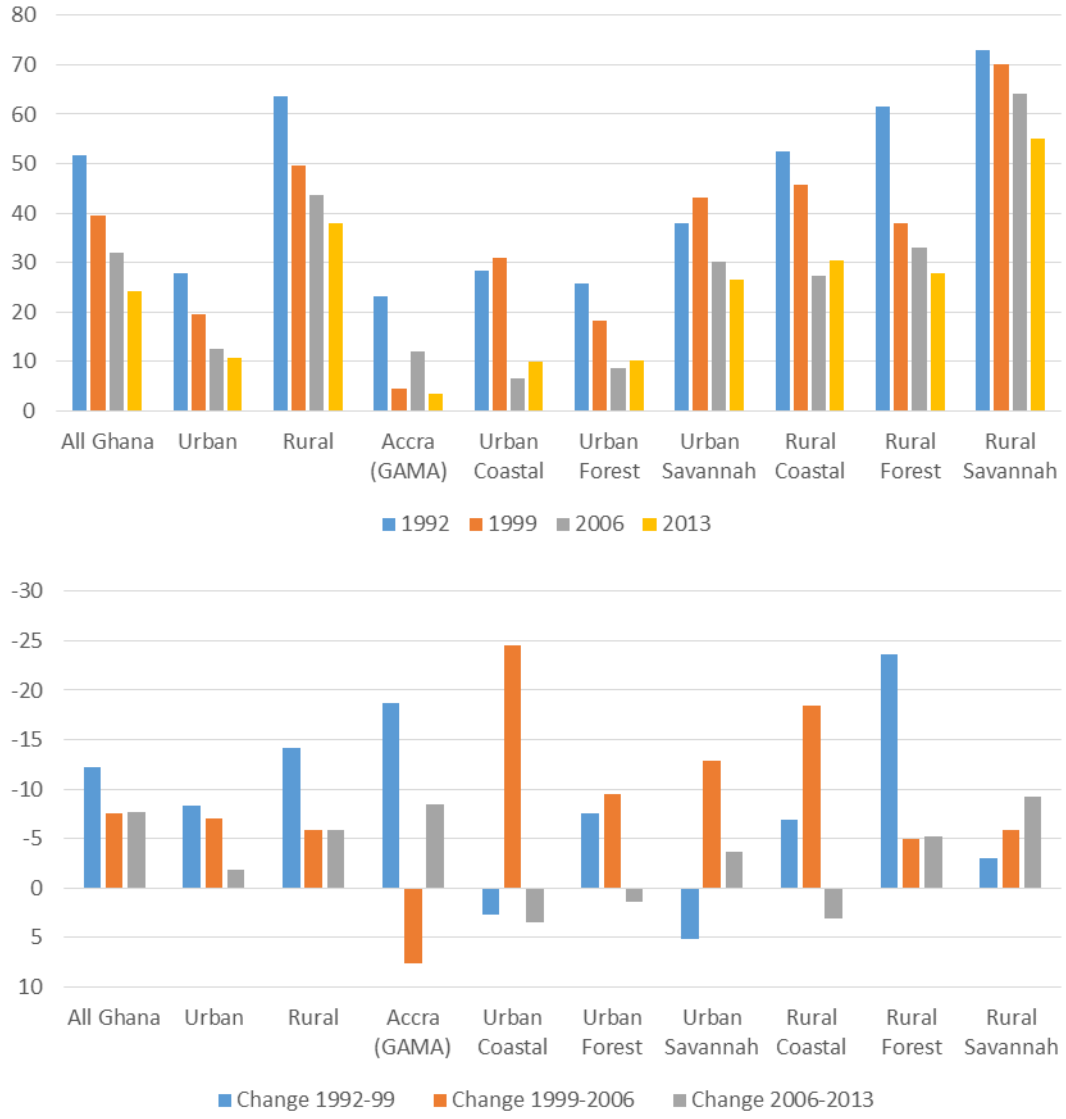
Despite these findings, Figure 3.20 reveals a picture of poverty in Ghana more akin to the urban industrial core-new periphery-old periphery spatial model described in Section 3.5.1 than a simple North-South divide. This is supported by 0, which shows poverty incidence by geographic locality rather than administrative region. There is a clear difference in poverty incidence between urban and rural localities, reflecting the dominance of the urban industrial core, but also an even greater difference between the forest zones of the new periphery and the old periphery of the Northern savannah. Poverty continuously declined in the majority of localities, with the most notable exception being Greater Accra, which saw poverty increase from 4.4 percent in 1999 to 12 percent in 2006, although by 2013 it had reached its lowest level of 3.5 percent.

[80] World Bank Report No. 53991-GH, "Tackling Poverty in Northern Ghana"

[81] Northern Ghana constitutes the three regions of Northern Region, Upper East and Upper West

[82] World Bank Report No. 53991-GH, "Tackling Poverty in Northern Ghana"

Figure 3.19 Poverty incidence and change by geographic locality, 1992-2013

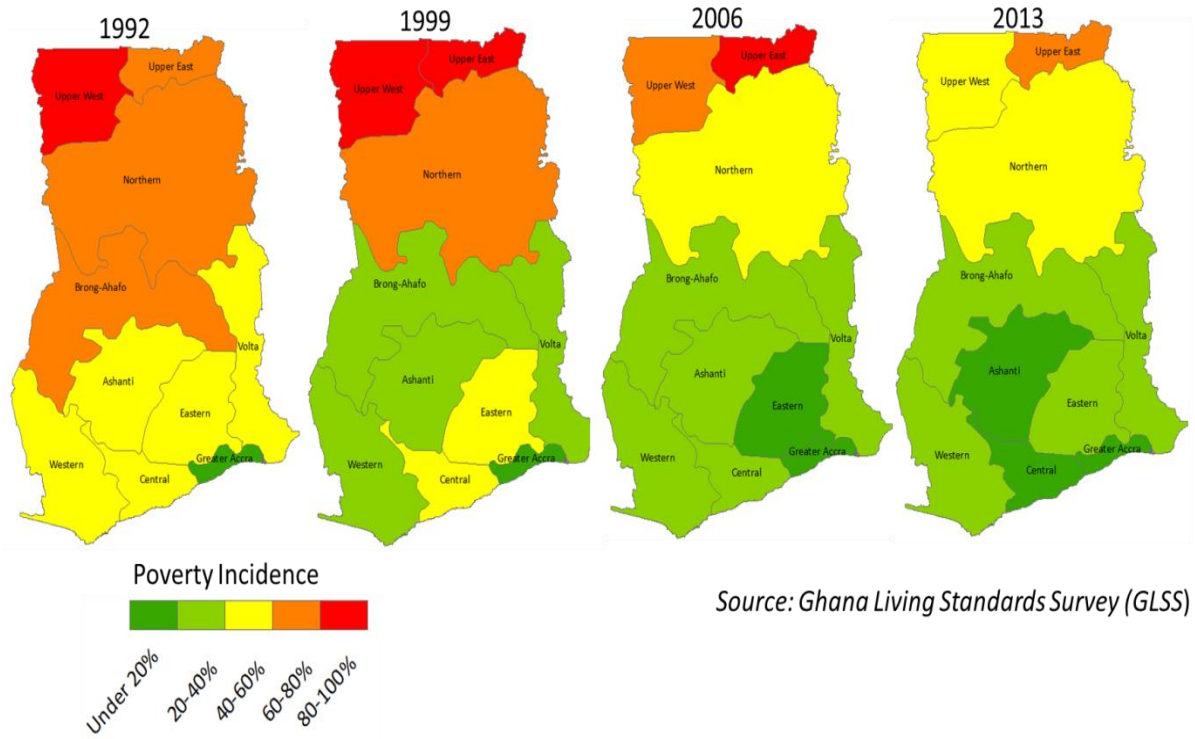


Source: Ghana Living Standards Survey (GLSS)

Every locality made significant progress in reducing poverty between 1992 and 2013. In particular, the rural forest areas saw a remarkable improvement in poverty reduction, driven by improving agricultural performance, specifically cocoa production. The savannah zone fared less well, though the Northern region saw a continuous reduction in poverty between 1999 and 2013. The most substantial progress was made in the Upper West region, particularly between 2006 and 2013, when poverty incidence reduced from 72.9 percent to 44.4 percent. However, the Upper East region witnessed no improvement in poverty levels in the time period, with poverty increasing to a high of 89.1 percent in 2006, before reducing to 70.7 by 2013 – still 46.5 percentage points above the national average.

The lack of opportunities in the old periphery of the north, coupled with the poor returns to human capital, compels some of the North's poor to migrate to the south in search of work. Most of these migrants move out of desperation rather than aspiration and do not do as well on average as their southern counterparts. At present, the ability of North-South migration to alleviate poverty is inhibited by the South's low capacity to absorb large numbers of migrants for cultural, social, economic and urban planning reasons.

Figure 3.20 Poverty rate by region, 1992-2006



Source: Ghana Living Standards Survey (GLSS)

3.8 Characterising the contemporary spatial economy

Ghana's spatial economy in 2014 is the product of the historical and present day factors described in the preceding sections. As this chapter makes clear, the recent performance of the Ghanaian economy has been impressive. However, economic growth and its benefits are not shared evenly across the country; growth is driven by particular sectors of the economy and concentrated in the localities that have comparative and competitive advantages in these sectors. A comprehensive analysis of the location of economic activities is therefore essential to understand the uneven pattern of growth at the regional and district level and to identify both lagging and leading areas for targeted policy intervention.

3.8.1 Economic activity is concentrated in Greater Accra and Ashanti

The analysis of the Ghanaian space economy reveals contrasting realities at the national, regional and district levels. On a national regional scale, the leading economic core areas are the highly urbanised and dense regions of Greater Accra and Ashanti, with the city region of Kumasi to the fore. The zones lagging behind are largely the more rural districts of less urbanised regions with low population densities and little economic diversity. The two leading regions contribute almost 42 percent to Ghana's entire GDP, as shown in 0[83]. This is attributable to agglomeration effects derived from economies of scale and the presence of more diversified industrial employment with higher value addition jobs, mostly in the service sector (see section 3.6.9).

[83] The contribution to GDP was derived by dividing a sector's actual monetary contribution in 2010 by the total number of employees in that particular sector. This resulted in obtaining per capita contribution in each industrial sector. The per capita contribution in each sector was later multiplied through all the regions based on the industrial sectors' number of employees in each of the regions to arrive at the GDP contribution.

Table 3.1 Regional contribution to GDP and share of employees in 2010

Region	GDP 2010 in cedi '000,000	Contribution to GDP (%)	no. of employees	Share of employed persons (%)
Greater Accra	10,067	22.39	1,849,114	17.83
Ashanti	8,521	18.95	1,963,012	18.92
Eastern	4,711	10.48	1,121,536	10.81
Western	4,313	9.59	971,703	9.37
Brong Ahafo	3,925	8.73	991,189	9.55
Central	3,742	8.32	889,465	8.57
Northern	3,530	7.85	988,658	9.53
Volta	3,474	7.73	881,313	8.50
Upper East	1,645	3.66	441,288	4.25
Upper West	1,030	2.29	276,400	2.66
Total	44,959	100	10,373,678	100

Source: NSDF Study 2014 based on GPHC, 2010 and GSS, National Accounting Statistics, 2014

This current economic landscape is a result of multiple factors resulting from historical, cultural, political and institutional factors as well as the present nature of jobs in such regions (see Section 3.5). Ghana's economic landscape, which is dominated by its metropolitan regions, is in line with global trends and similar to comparator countries in early to intermediate stages of urbanisation (30 to 50 percent), such as Vietnam and India[84].

The concentration of economic activity in a single primate city and surrounding area is not an issue that is confined to developing countries, nor is it necessarily a negative feature of a country's spatial economy. This is illustrated in Box 8 below using the example of Greater London.

Box 7 Regional Disparities in the UK: London

London, the capital of the UK, is a global city and, along with New York, one of only two cities in the world to be regarded as Alpha ++ in the Globalization and World Cities Research Network[85] rankings, meaning that it is vastly more integrated with the global economy than other cities. In the context of the UK, London generates approximately 22 percent of the country's GDP[86], with an economy that is roughly the same size as Sweden or Iran and 13 times larger than that of Ghana. The city is home to many high value sectors, particularly financial services and professional services and output per capita in London is 171 percent of the national average[87].

There are negative aspects to London's primacy. These arise largely from diseconomies associated with agglomeration. Businesses in London face higher costs than in other parts of the country. High demand for space raises rents, for commercial properties and also for residential properties. This has a secondary effect of increasing the wages that firms must pay to their workers to match the increased living costs. The cost of intermediate business support services can also be higher for firms in London, as these firms face similar high input costs. Traffic congestion is also a problem in the city and a congestion charge was implemented to combat this issue in 2003.

In London, however, these diseconomies are, at present, far outweighed by the benefits of

[84] World Bank (2014) Ghana Urbanization Review Summary

[85] http://www.lboro.ac.uk/gawc/

[86] "ONS Regional GVA 2013". Office for National Statistics. Retrieved 7 January 2014.

[87] http://www.ft.com/cms/s/0/b91d7d4c-2cb9-11e1-8cca-00144feabdc0.html#axzz3Go4nxqtI

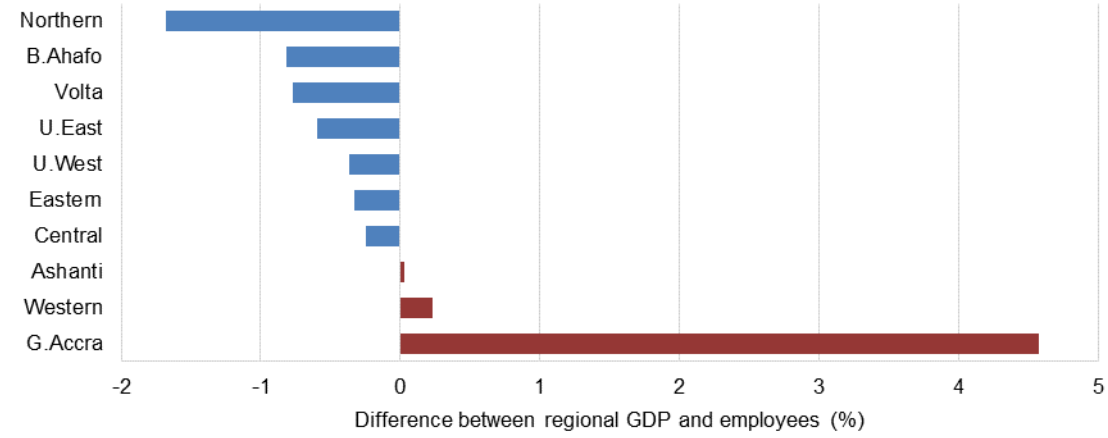
agglomeration, as the recent success of the city has demonstrated. London's status as a global city enabled it to avoid the recent recession and maintain economic growth, while the rest of the UK and Europe suffered a downturn.

While the primacy of London in the UK economy has been interpreted by some as a drain on the rest of the country, it is important to note that many of the economic activities located in the city, such as financial services and banking, are there because of its high level of interconnectivity with the global economy compared to other world cities. If these firms were not located in London, they would be located in another global city, such as New York or Tokyo, and not in another region of the UK. In this sense, London is not competing with other cities in the UK, such as Birmingham and Manchester, but competing on a global scale with other major world cities. Viewed from this perspective, London is attracting economic activity to the UK from other countries, as opposed to concentrating activity that could be otherwise located in other regions of the country.

The important lesson for Ghana is to view Greater Accra in the context of the ECOWAS region. That it concentrates a high proportion of FDI into the country is not necessarily a concern, because it is in competition for much of this investment with other West African cities, like Lagos and Abidjan, and not with other regions within Ghana. Rather than discouraging investment in Accra, which may mean that firms choose to locate in other West African cities and not in other Ghanaian cities, Accra's status as an important regional hub should be acknowledged and harnessed to attract FDI, acting as a catalyst for growth nationwide. At the same time, attention must be paid, and actions taken, to minimise the diseconomies of agglomeration.

The percentage of GDP contribution exceeds the percentage of people employed in Greater Accra as shown in Figure 3.21. This provides a general overview of employees' contribution to GDP per worker. It connotes a sense of the significance of the spatial contribution of the highest value additions in the country's GDP by the regions. It is based on the nature of economic products and the diversification of the region's economic base regarding the type of industrial sector in which employees are engaged. The type of economic activities in the region determines the GDP contribution and hence the difference presented in Figure 3.21. Greater Accra stands out because of the high value services in the region.

Figure 3.21 Difference between regional shares of GDP and employees, 2010



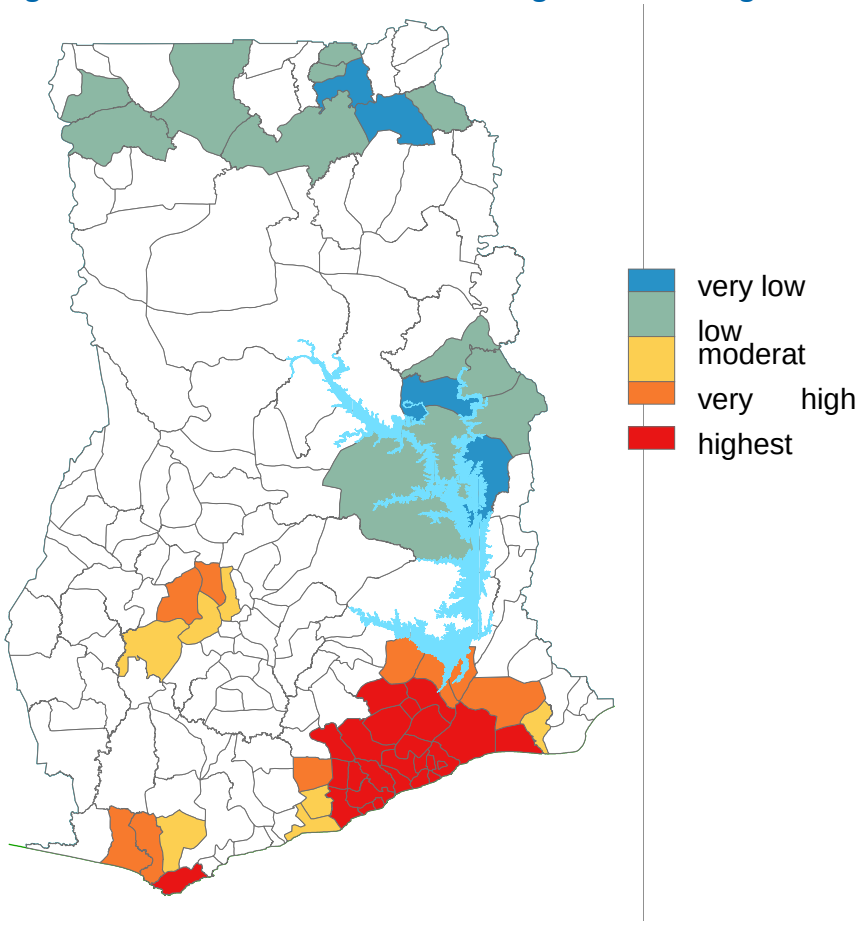
Source: NSDF Study based on National Accounts Statistics, 2010 and Population & Housing Census

Concentration of GDP in leading regions is more apparent when one considers GDP density, or the value of GDP per unit of land area. The Greater Accra and Ashanti regions together cover only 7 percent of the national land area but constitute 41 percent of the entire national GDP. At the local level, Accra, Kumasi and Sekondi-Takoradi metropolitan areas together cover only 0.15 percent of national land areas

yet generate over 30 percent of the entire GDP of the country. Figure 3.22 shows clustering of economic activity in three areas: around Kumasi; Sekondi-Takoradi; and the largest area stretching for approximately 100 km in all directions around Accra.

Analysis of other indicators also points to the economic primacy of Greater Accra. The region accounts for 72 percent of all business listings in the Surf Yellow Pages Directory of Ghana, with Ashanti following with 10 percent. Greater Accra also has 50 percent of all banks in the country, 41 percent of tertiary education facilities and 28 percent of telecoms towers.

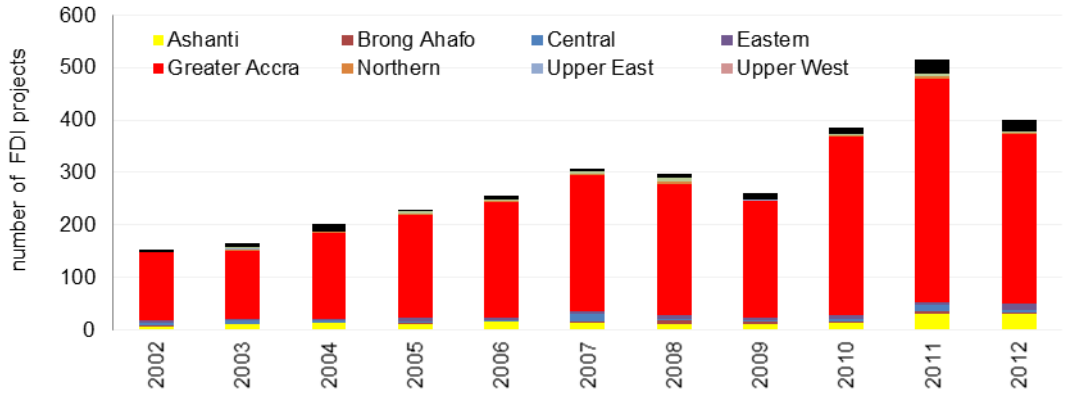
Figure 3.22 Districts with increasing and decreasing GDP 2009-2012



Source: NSDFStudy 2013 based on World Bank analysis of night-time lights from satellite images

This concentration of economic activity has been strengthened by the concentration of FDI in the core regions, especially Greater Accra, which has consistently received the most FDI in terms of both the number of projects and the total value. Between 2002 and 2012, 84 percent of all FDI *projects* were located in Greater Accra, with 6 percent in Ashanti and 4 percent in Western Region (see Figure 3.23).

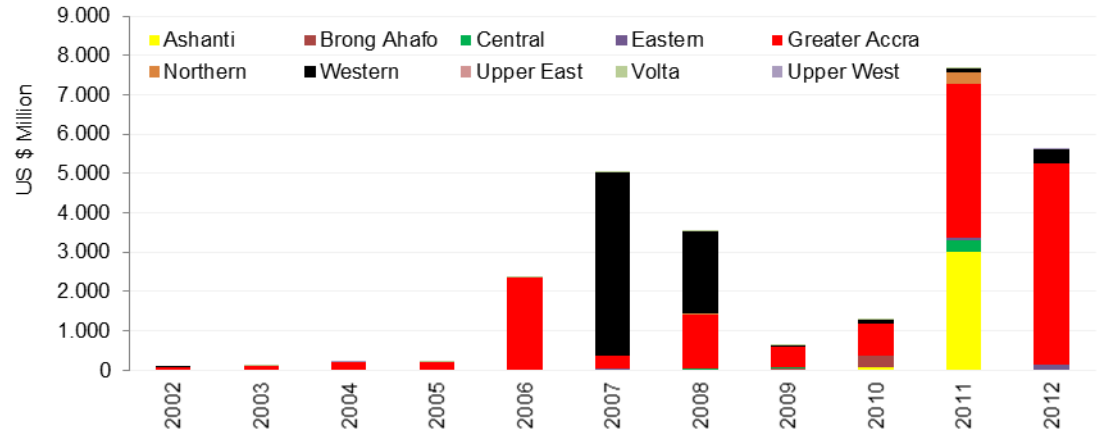
Figure 3.23 Number of FDI projects by region, Ghana, 2002-2012



Source: Ghana Investment Promotion Council, 2013

The *value* of FDI, however, is less concentrated in Greater Accra (see Figure 3.24), due to the relatively high value of a few individual projects in other regions, particularly those relating to the extraction of natural resources. For example, the high value in the Western Region in 2007 and 2008 reflects a major project(s) in the oil and gas sector following Ghana's oil find in the preceding year.

Figure 3.24 Regional distribution of FDI by value, Ghana, 2002-2012



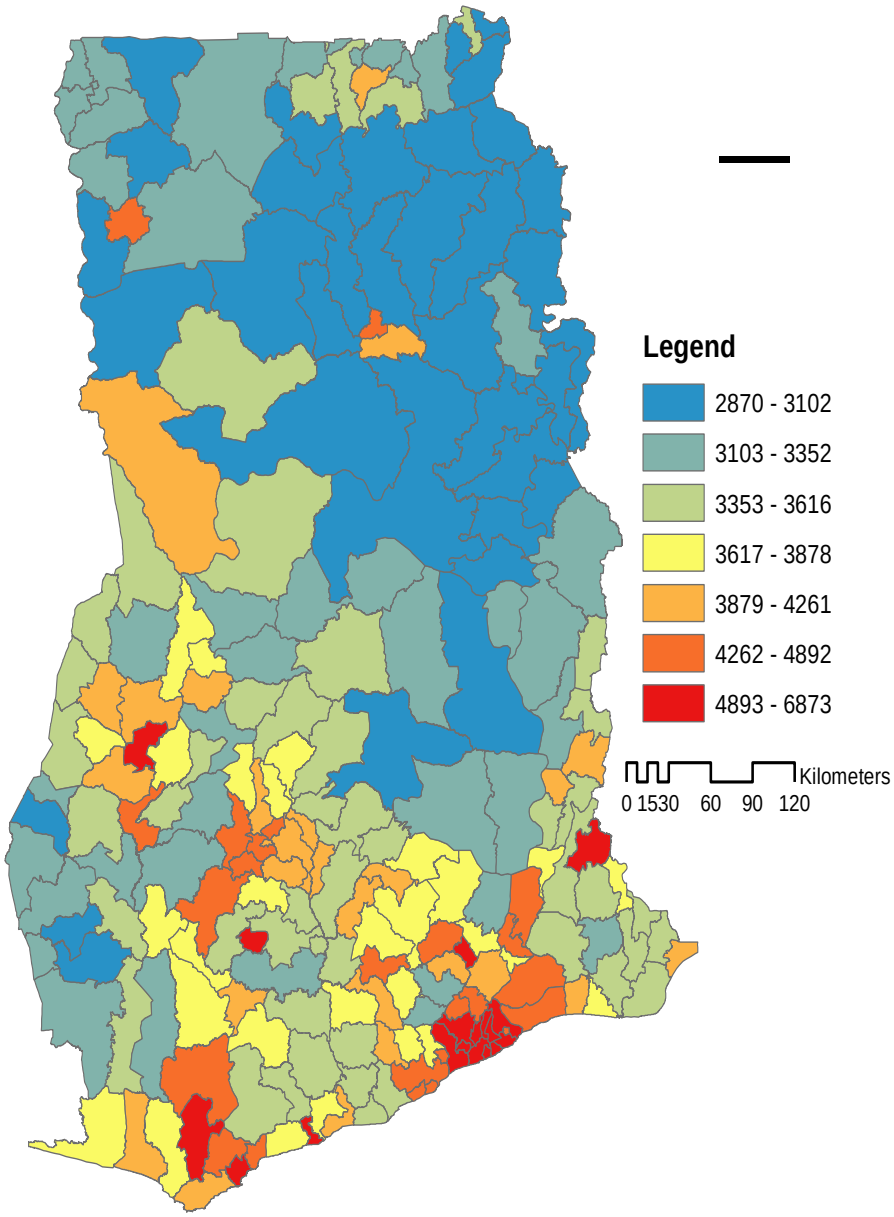
Source: Ghana Investment Promotion Council (GIPC) Database, 2013

Concentration of FDI in the most urbanised areas is consistent with the global trend. Investment in these areas offers higher returns because of agglomeration economies, readily available infrastructure, access to markets for products and services and access to a larger labour pool. Increased investment in an area will further increase the potential return on investment due to the positive nature of agglomeration spillovers discussed in section 3.6.9. Consequently, it may be difficult to attract a larger share of investment to other regions of the country.

In addition to the high contribution to GDP and attraction of Fids, the most urbanized regions have the highest value addition per worker (productivity levels). Figure 3.25 shows the value-addition per worker in the MMDAs across Ghana. The highest value-addition per worker is in the Greater Accra region (particularly the GAMA area). This is the area with the hottest value addition in the whole of the country.

This is followed by the Ashanti region with Obuasi and the areas around Kumasi possessing the highest productivity levels. Obuasi high productivity level is as a result of the mining activities and its high associated value addition. The Sekondi-Takoradi area and its surrounding districts with high level mining activities like Tarkwa-Nsuaem and Prestea-Huni Valley areas remain the most productive areas in Western region. In the northern parts of the country, the regional capitals that are the most urbanized areas are the hot-spots in value addition. The only exception is Bole district which has a relatively high level of worker value addition due to the mining activities taking place in the area.

Figure 3.25 Value-added per worker in MMDAs, 2010



Source: NSDF Study 2014 based on Population and Housing Census, 2010 and National Accounts Statistics, 2014

3.8.2 Economic activity is dispersing nationally—and at metropolitan scale

Despite the economic primacy of Greater Accra, followed by Ashanti, it is promising that economic activity is becoming more dispersed, with manufacturing activities in particular moving away from Greater Accra.

While manufacturing employment grew by just 1.3 percent per annum in Greater Accra between 2000 and 2010, it grew the most in the three neighbouring regions of Volta (5.6 percent), Central (3.8 percent) and Eastern (3.1 percent). In Accra city centre, manufacturing employment actually declined by 0.6 percent per annum between 2000 and 2010, while its' suburban areas grew at a rate of 3 to 4 percent[88]. This trend, along with the high growth rates experienced in neighbouring regions, indicates a dispersal of manufacturing activity from the core of Accra to the fringes of the metropolitan area.

Dispersal of economic activity to other areas of the country can also be seen in other sub-sectors of the economy, including: construction; wholesale & retail; accommodation & food; transportation; finance and insurance; professional, technical & scientific, and art, entertainment & recreation. This is summarised in Table 3.2 below. The high growth rates in employment in the regions bordering Greater Accra indicate that economic activity is spreading from Greater Accra to the neighbouring regions. There is also evidence of dispersal of economic activities into Brong Ahafo. However, there is little evidence of significant dispersal of economic activity to the Northern, Upper East and Upper West regions in these sub-sectors.

Table 3.2 Average employment growth per annum (2000-2010), by sub-sector

	Volta	Eastern	Central	Brong Ahafo	Western	Ashanti	G.Accra	Northern	Upper East	Upper West
prof. technical & scientific	32	35.3	23.9	23.6	29.7	26.3	27.6	25.8	26.1	27
arts, entertainment, recrea	22.6	18.2	19.9	15.3	17.3	15.7	16.1	11.1	13.2	8.7
accommodation & food	12.5	10.9	14.3	12.5	10.9	10.3	10.8	10.1	10.5	10.8
wholesale, retail	3.6	4.3	6.8	6.6	5.1	5.3	3.4	5.4	0.8	3.9
transportation & storage	5.8	4.7	6.1	5.3	4.5	4.1	2.8	3.5	1.7	0.6
finance and insurance	5.1	5.1	5.6	7.1	4.3	3.8	5	-0.1	0.2	-5.1
manufacturing	5.6	3.1	3.8	2.4	1.7	0.4	1.3	2.1	-1.3	1.6
construction	3.3	3.7	4.7	3.1	1.8	2.7	1.5	0	-1.7	-3.4

Source: NSDF Study 2014 based on World Bank (2014) Ghana Urbanization Review

3.8.3 Services are particularly concentrated in Greater Accra and Kumasi, while agriculture is concentrated in the North of the country

It is worth emphasising that although economic activity is dispersing away from Greater Accra, this process is happening gradually and, at present, many sub-sectors are still concentrated in the region. Table 3.3 shows the employment location quotients (LQ) by sub-sector for each region. A LQ is a measure of geographic concentration of a sector or sub-sector in a location, in this case defined as the ratio of a location's share of a sector's employment to its share of national employment. Values above one indicate that the location is relatively more specialized in that sector than the national average. Greater Accra has a specialisation in the majority of sub-sectors, with the exception of agriculture and mining.

[88] World Bank (2014) Ghana Urbanization Review

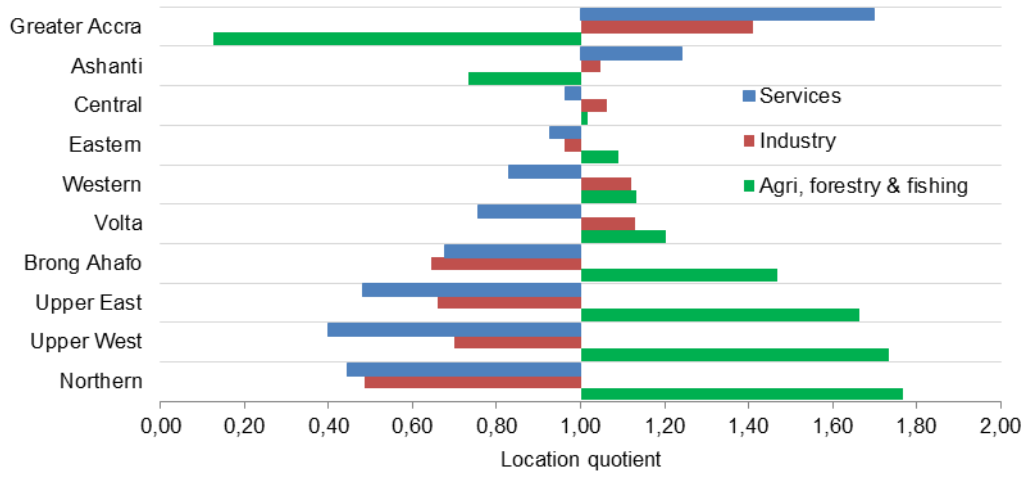
Table 3.3 Sub-sector employment location quotient by region, 2010

	Ashanti	Brong Ahafo	Central	Eastern	G. Accra	Northern	Upper East	Upper West	Volta	Western
agri, forestry, fishing	0.6	2.6	1.4	1.4	0.2	2.6	2.2	1.4	1.5	1.1
mining and quarrying	1.1	1.1	0.7	1.5	0.4	0.1	0.7	0.2	0.2	4.1
manufacturing	1.0	0.7	1.1	0.9	1.1	0.8	0.8	1.1	1.2	1.1
electricity, gas, ac	0.8	0.5	0.7	1.8	1.2	0.5	0.6	1.2	0.8	1.4
water sup, sewers, swm	0.8	0.7	0.9	0.9	1.1	0.6	1.0	1.4	1.3	1.5
construction	1.0	0.7	1.0	0.9	1.2	0.5	0.6	0.9	0.8	0.9
wholesale, retail	1.2	0.7	0.9	0.9	1.1	0.8	0.8	0.7	0.8	0.9
transportation and storage	1.1	0.7	0.8	0.9	1.2	0.5	0.5	0.7	0.8	1.1
accommod., food service	1.0	0.7	1.1	0.9	1.2	0.8	0.8	0.7	0.9	1.0
ICT	0.7	0.4	0.6	0.5	1.9	0.3	0.4	0.6	0.5	0.7
financial, insurance	1.0	0.7	0.6	0.6	1.5	0.4	0.6	0.7	0.6	0.9
real estate activities	0.5	0.1	0.4	0.1	2.5	0.1	0.1	0.2	0.1	0.3
prof, scientific, tech	0.8	0.6	0.9	1.5	1.3	0.8	0.6	0.9	0.6	0.6
admin	0.8	0.6	0.7	0.9	1.5	0.8	0.6	0.9	0.5	0.9
pub admin, soc security	0.7	0.8	0.7	0.8	1.3	0.7	1.4	2.0	1.1	1.3
education	1.1	1.0	1.2	1.2	0.8	1.1	1.1	1.7	1.2	0.9
health and social work	1.0	0.9	0.9	1.1	1.0	0.9	1.5	1.9	1.2	0.8
arts, entertainment, recrea	1.0	0.6	0.8	0.8	1.4	0.4	0.5	0.6	0.9	0.8
households as employers	0.8	0.8	0.8	1.0	1.4	1.0	0.8	1.2	0.7	0.5
extraterritorial orgs	0.1	0.1	0.3	0.1	2.7	0.6	0.3	0.9	0.1	0.1

Source: NSDF Study 2014 based on GSS Population and Housing Census, 2010

Figure 3.26 shows the LQ by region at the sector level. Service sector jobs are significantly concentrated in Greater Accra and Ashanti region and industrial employment is heavily concentrated in Greater Accra. While no other region is specialised in the service sector, four regions show some specialisation in the industry sector: Volta, Eastern, Central and Ashanti. Agriculture remains a major specialization of most regions as eight of the regions - Northern, Upper West, Upper East, Volta, Western, Central and Brong Ahafo have LQs greater than one as shown by the green bars. Concise profiles of each region's economy are presented below.

Figure 3.26 Sector employment location quotient by region, 2010



Source: GSS Population and Housing Census 2010

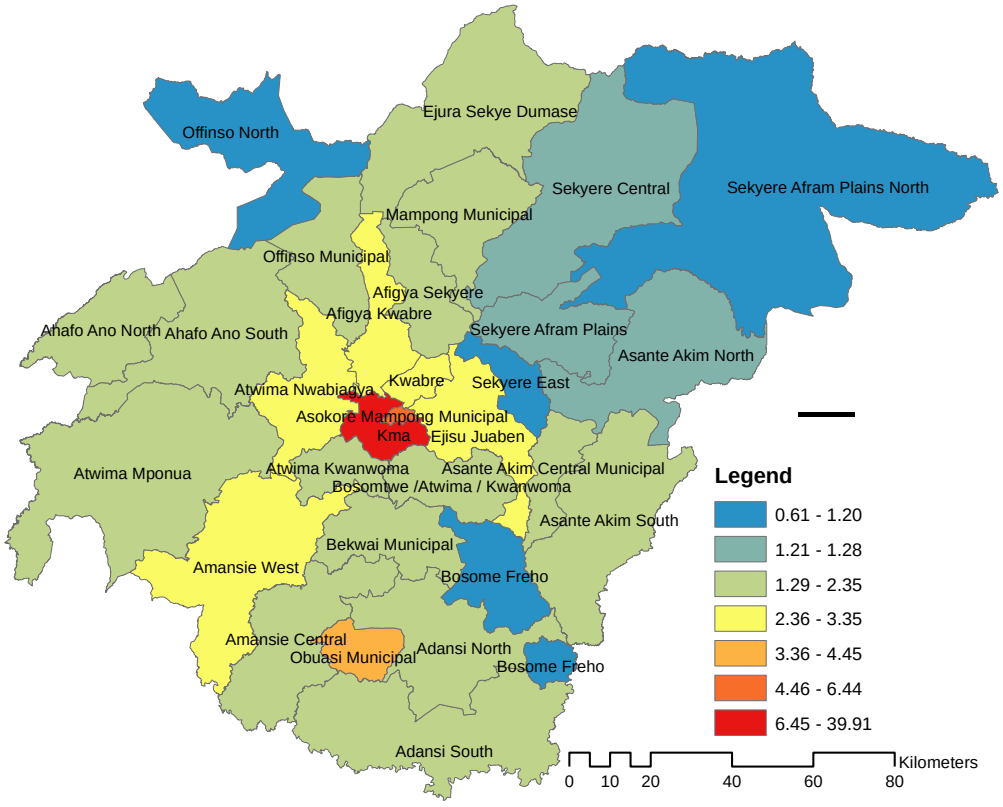
3.8.4 Economic profiles of the regions in Ghana

In addition to the inter-regional disparities described above, there are significant variations in the spatial concentration of economic activity within each of the regions. These intra-regional spatio-economic variations aid in identifying the potentials of the districts as well as identifying the leading economic contributors as well as the lagging areas. The subsequent section focuses on the specializations, trends and production and productivity levels in all the ten regions of Ghana.

Economic Profile of Ashanti region

Ashanti region is one of the most economically diverse regions in Ghana and the second most significant contributor to the national economy, generating nearly a fifth (19%) of the national GDP. The region is also the third most productive in the country with per worker value addition of GHc 4,115 compared to the national average of GHc 4,022. Kumasi Metropolitan Area is the leading contributor to the region's GDP generating 40 percent of the region's GDP (refer to Figure 3.27). Kumasi together with its immediate surrounding district Asokore Mampong contribute almost a tenth of the total national GDP. Obuasi, located in the southern part of the region is another leading municipality regarding contribution to the region's GDP. Obuasi's high contribution is as a result of the intense mining activities that are undertaken in the area.

Figure 3.27 Percentage contribution to GDP, Ashanti region, 2010

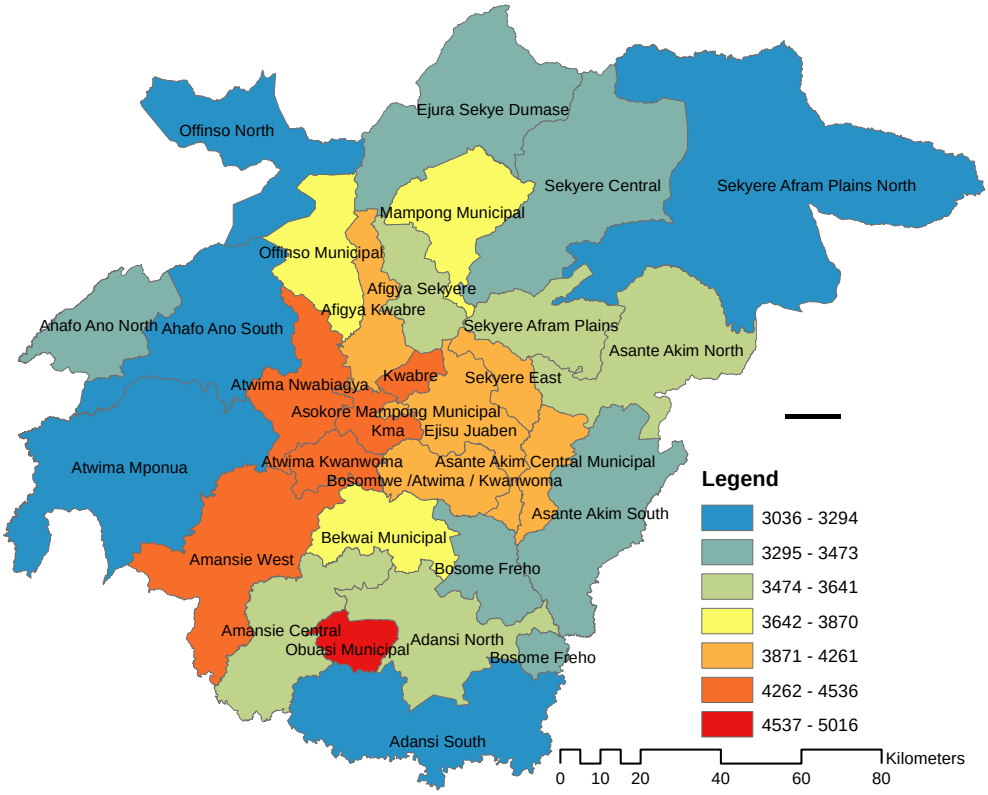


Source: NSDF Study 2014 based on Population and Housing Census, 2010 and National Accounts Statistics, 2014

Productivity levels in the Ashanti region are highest in the Obuasi Municipality as shown in Figure 3.28. This is mainly resulting from the relatively high concentration of workers in the mining sector which has relatively higher value addition. KMA, Asokore-Mampong Municipal, Atwima Nwabiagya, Amansie West and Amansie

Central are the next level of MMDAs with high level of productivity reflected in their per worker contribution ranging between GHc 4262 and 4536. Their levels of productivity are higher than the regional average of GHc 4115.

Figure 3.28 Value addition per worker, Ashanti region, 2010



Source: NSDF 2014 based on Population and Housing Census, 2010 and National Accounts Statistics, 2014

The Ashanti region's economy is led by the services sector which employs more than half (52%) of the entire active labour force of the region. The services sector has a LQ of 1.24, which is the second highest of all the ten regions in Ghana. The region's services sector is however dominated by the wholesale and retail which is low-skill based. Ashanti region alone houses a quarter of all national employees in the Wholesale and retail business. The region is host to Kejetia which is the biggest open market in the entire country and it is well-known for its Wholesale and retail activities in the West African sub-region. From, 2000 to 2010, an additional 265,057 jobs in the Wholesale and retail sub-sector had been created. This translated into an increase of 107 percent higher than the national increase of 79 percent. With the exception of education sub-sector where the region has the highest concentration of employees, the region comes second only after Greater Accra in terms of specialization in almost all the other service sub-sectors. Spatially, almost all of the service sector jobs are heavily concentrated in the Kumasi metropolis.

At the national level, the Ashanti region shows substantial strength in the industrial sector as it is among the four regions with specialization in the industrial sector. However this industrial strength seems to be declining. Over the decade, the growth of the industrial sector employment in the region has been relatively lower compared to the national growth. As the region's industrial employment grew by only four percent, the national growth was 35 percent.

Industrial sub-sectors contributing to the region's industrial strength and growth include the Mining & quarrying and the Construction sub-sectors. Mining & quarrying sub-sector increased its employees by 307 percent while the nation as a whole experienced a decline of 17 percent. Most of these increases were recorded in the Amansie West and Obuasi Municipal which are the mining hot-spots in the region. The construction sector jobs grew by 171 percent far higher than the national growth of 71 percent. The construction jobs unlike the Mining and quarrying jobs which are spatially-bound because of the required propinquity to the specific location of mineral deposits are more widespread in the region. The MMDAs with high concentration of construction workers are Atwima Kwanwoma, Ejisu, Kwabre East, Kumasi, Bosomtwi and Afigya Kwabre. These areas represent the direction of growth from within the capital city along the major arterial roads from the city centre. These are the areas with high residential developments because of the relatively cheaper land value coupled with the proximity to the capital city via good road network.

The only industrial sub-sector with job losses in the region is the manufacturing industry. From 2000 to 2010, a fifth of the region's manufacturing sector jobs were lost while a growth of more than 36 percent was recorded for the nation. Notwithstanding the contraction in the sub-sector, manufacturing sector employees remain clustered in Asokore Mampong, Kumasi, Kwabre East, Afigya Sekyere and Obuasi.

The region's agriculture sector's employees are dwindling over the decade though it continues to be a major source of livelihood as almost a third (31%) of the region's active labour force. By 2000, the sector engaged almost half (47%) of the region's employees and yet contributed a little over a fifth (22%) of the region's GDP depicting a low productivity level. Between 2000 and 2010, the sector had lost more than a tenth (11%) of its original working labour force. The loss of agriculture-related jobs in the region is partly attributable to the high rate of urbanization in the region coupled with the ease of entry to other economic activities like Wholesale and retail activities. The predominantly rural districts like Sekyere Afram Plains North, Atwima Mponua, Offinso North, Ahafo Ano South, Sekyere Central and Adansi South are the hot-spots regarding specialization in the agriculture sector.

Economic Profile of Brong Ahafo

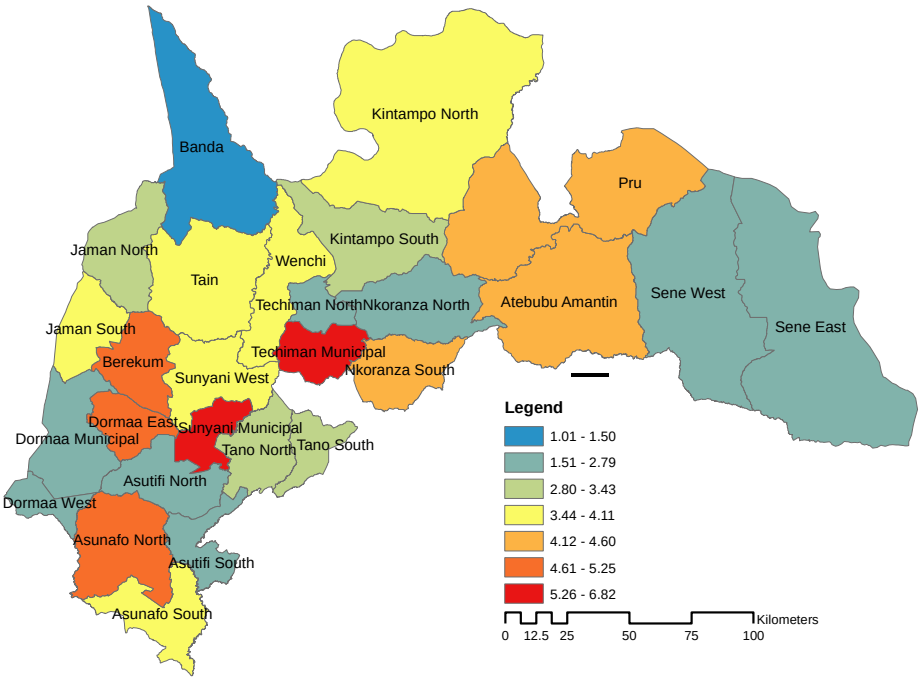
Brong Ahafo region employs nearly a tenth of Ghana's total economically active labour force and generates a little under nine percent of the nation's GDP. The region is the fourth highest regional contributor to the national GDP (see 0). The region's economic structure is dominated by the agricultural sector, which employs 63 percent of the total workforce and generates more than half of the region's GDP. Between 2000 and 2010, agricultural employment increased by 77 percent reflected as additional 296,000 jobs in the sector. The region employs over a tenth (13%) of all agricultural workers in the country.

Techiman Municipal is the highest contributor to Brong Ahafo's GDP, generating almost eight percent of the region's GDP, followed by Sunyani Municipal contributing seven percent of the GDP. These are the two main most economically vibrant settlements in the region. Techiman is the main commercial hub of the region full of wholesale and retail commercial activities, while Sunyani acts as the main administrative centre. Other districts with high GDP contributions include Berekum, Dormaa and Asunafo North as illustrated in Figure 3.29.

Sunyani Municipal, the regional capital and administrative centre, has the highest GDP per worker value of GHS 5,041 compared to the regional average of GHS

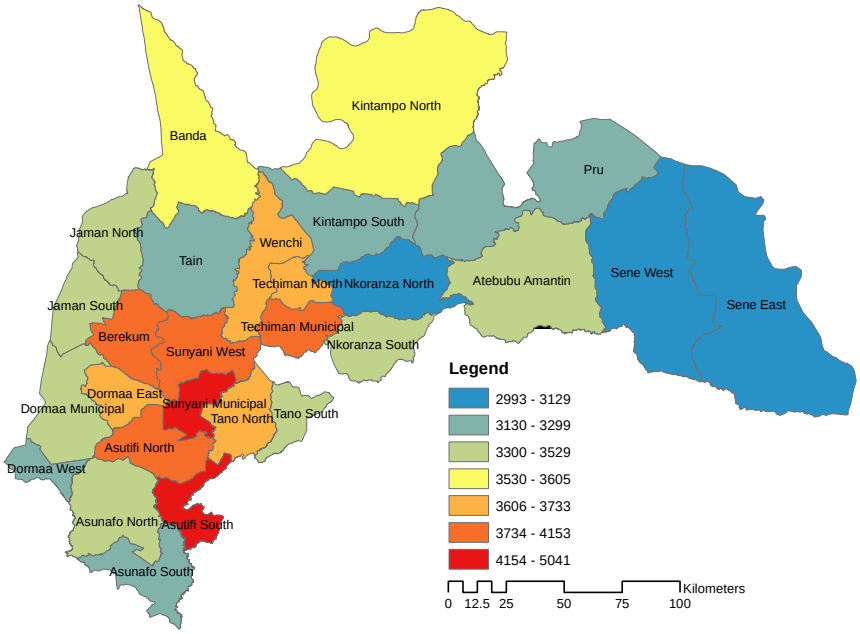
3,613. The neighbouring MMDAs of Sunyani West and Asutifi North also have relatively high value addition per worker, as does Asutifi South; due to gold mining in the district (see Figure 3.30). Techiman Municipal also possesses a high value addition per worker just like the afore-mentioned districts.

Figure 3.29 Percentage contribution to regional GDP, Brong Ahafo, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Figure 3.30 GDP per worker GHc, Brong Ahafo, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Agriculture is the main source of employment and the only specialized economic sector of the region (LQ of 1.47). Out of the 27 municipalities and districts in the region, 17 of them have a LQ greater than one which indicates a high percentage of specialization by most districts in the region. Cocoa is the primary crop, particularly in the South Western part of the region. The districts with highest relative specialisations in the primary sector include Nkoranza North, Tain, Dormaa West and Kintampo South. These are also the districts with the lowest GDP per capita. Sunyani and Techiman remain the least specialised in the primary sector as a result of their high urbanisation levels.

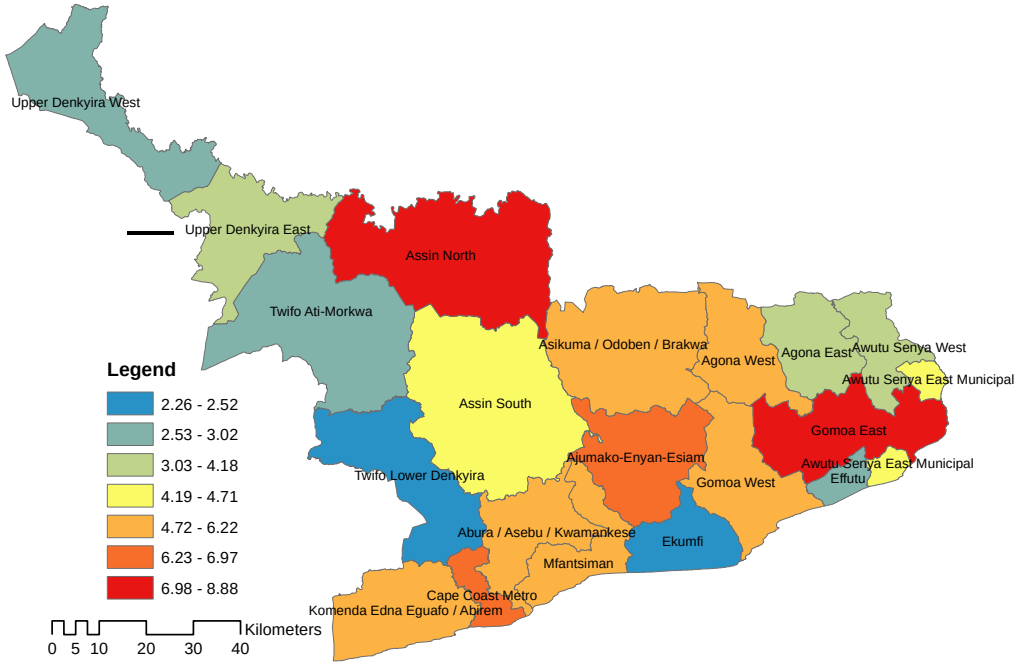
The services sector has a LQ of just 0.68, though several services sub-sectors have increased their employment at rates above the national average. Brong Ahafo's services sector is predominantly constituted of low-skilled service activities, in the wholesale & retail sub-sector. Highly-skilled services like public administration, finance & insurance and real estate & professional services account for less than 5 percent of the region's labour force and are concentrated in Sunyani municipal. Techiman Municipal and Techiman North have the highest concentrations of transport & communication services, as well as wholesale & retail trade, due to their status as a commercial trading hub for the region.

The industrial sector economic activities remain very marginal in Brong Ahafo region with huge job losses over the decade and even reduced its employees over the decade. The region's industrial LQ of 0.64 ranks it among the lowest of the regions in Ghana. From 2000 to 2010, Brong Ahafo's share of industrial sector jobs shrank from 17 percent to 10 percent. Manufacturing engages just 7 percent of the workforce and is concentrated in the East of the region in Sene East (LQ 2.83), Sene West (LQ 1.22) and Pru (LQ 1.61). Another manufacturing cluster exists in Techiman Municipal (LQ 1.33) and Techiman North (LQ 1.34). Mining activities are located in Asutifi South (LQ 23.47) and Asutifi North (11.27). The final concentration of industrial employment of note is in the construction sub-sector and is located in Banda district, which has an LQ of 2.95.

Economic Profile of Central Region

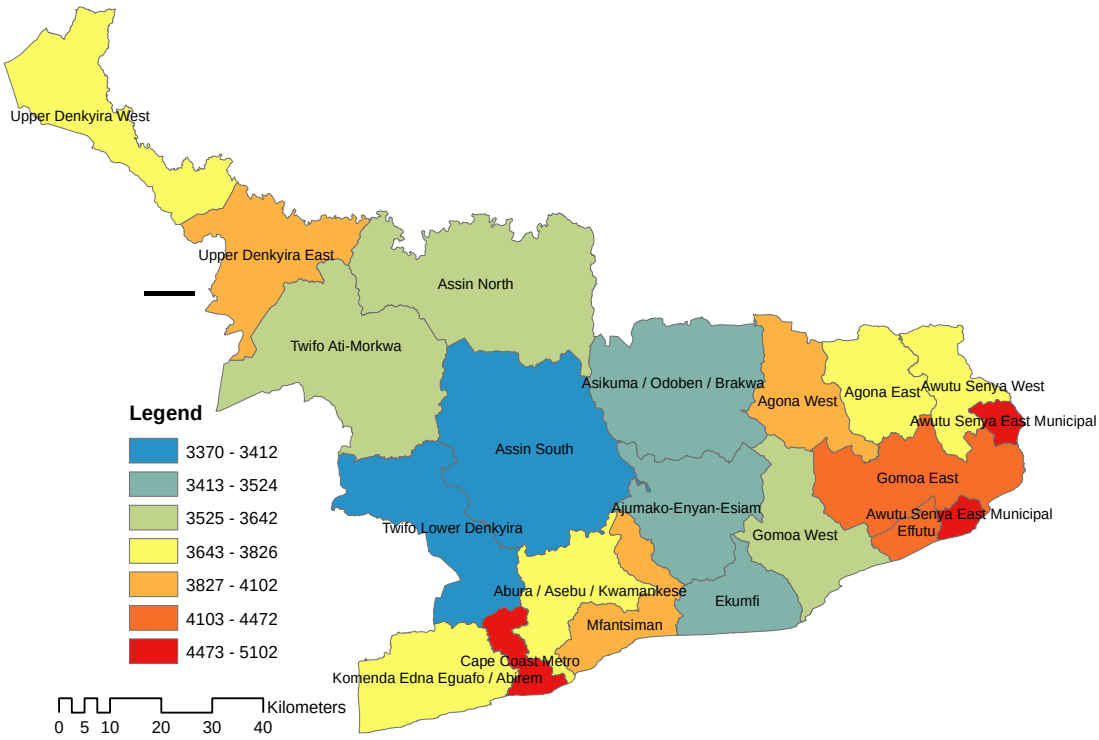
The Central region is the sixth largest regional economy in Ghana. It employs 8.6 percent of Ghana's economically active populace and generates 8.3 percent of the nation's total GDP. GDP per worker is the fourth highest (GHc 3918) of all the regions in the country, though lower than the overall national average (GHc 4022). GDP hotspots in Central region are Assin North and Gomoa East, as shown in Figure 3.31. Value addition per worker, however, is highest in Cape Coast Metropolis, where the average per worker value contribution of GHc 5,102 is significantly higher than the average regional per worker contribution of GHc 3,918 (see Figure 3.32).

Figure 3.31 Percentage contribution to GDP, Central Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Figure 3.32 GDP per worker GHS, Central Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

The central region's strongest economic specialisation is within the industrial sector. With a LQ of 1.06, which is slightly higher than the national average, the region falls within the category of the four regions with specialization in the industrial sector. The region employs just under a tenth (9.3%) of all industrial workers in Ghana in a range of industrial sub-sectors. From 2000 to 2010, the manufacturing sub-sector recorded the highest industrial growth of 9 percent, followed by construction, which grew by 3 percent. Employment in the mining and quarrying sub-sector, however, declined slightly by 2 percent, though this was lower than the national decline of 17 percent for the same sub-sector.

A spatial locational analysis of industrial activities in the Central region shows that mining & quarrying employees are concentrated in the North-western part of the region particularly in Upper Denkyira West (LQ 9.02), Upper Denkyira East Municipal (LQ 5.73) and, to a lesser extent, Twifo-Ati- Morkwa (LQ 3.09). Manufacturing jobs are mostly concentrated in Effutu municipal (LQ 1.90), Gomoa West (LQ 1.45) and Mfantsiman municipal (1.34). Lastly, there is a strong clustering of construction workers in the eastern part of the region, along the border with Greater Accra, in Awutu Senya East Municipal (LQ 2.42), Effutu municipal (LQ 1.96) and Gomoa East (LQ 1.90). These developments in the eastern part of the region are related to the expansion of Greater Accra due to the rapid demand for housing coupled with the on-going sub-urbanization process. Cape Coast also has a high concentration of construction workers (LQ 1.70) due to the increasing construction of residential buildings, hotels and hostels to meet the increasing housing demand for workers, residential needs of students of the numerous educational institutions as well as accommodation for tourists.

Agriculture, forestry and fishing remain the second specialization of the Central region (with a LQ of 1.2 slightly higher than national average). It is an important employer in the region engaging 44 percent of the economically active populace. Furthermore, between 2000 and 2010 employment in the sector experienced a relative increase of 44 percent exceeding the national growth of 31 percent. Out of the 20 districts in the region, 13 of these are specialized in Agriculture. The five leading areas with the highest level of specialization in Agriculture in the region include Upper Denkyira West (LQ-1.66), Assin South (LQ-1.55), Assikuma-Odoben Brakwa (LQ-1.53), Twifo-Heman-Lower-Denkyira (LQ-1.53) and Assin North Municipal.

The services sector is the second largest employer and the least specialized sector of the region. It engages 40 percent of the region's workforce. The share of service sector employees rose from 30 to 40 percent between 2000 and 2010, while the absolute number of workers in the sector rose by over 50 percent. All services sub-sectors increased their employment in the period, but at a much slower rate than the national average. Cape Coast, the capital of the region, is the centre of public administration, health and education services, as well as highly productive sub-sectors such as finance & insurance and real estate & professional services. Wholesale & retail trade and accommodation & food services are more dispersed throughout the region, but still mainly concentrated in Cape Coast. Awutu Senya East Municipal, which borders Greater Accra, also has a high concentration of employees in the services sector having a LQ of 3.06 in finance & insurance. However, these workers will most likely be employed in neighbouring Greater Accra, rather than in Central Region.

Economic Profile of Eastern Region

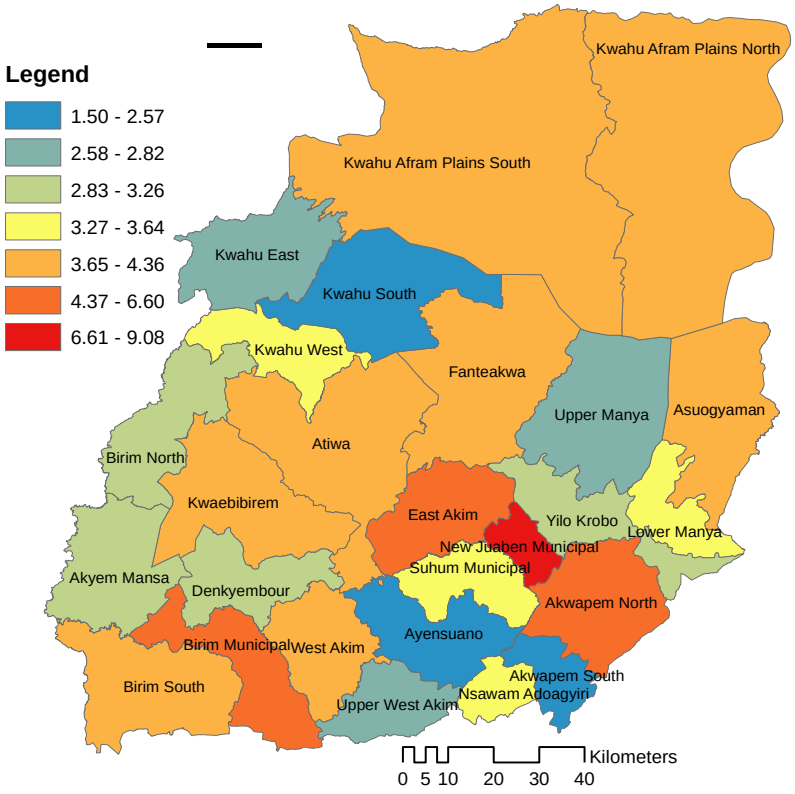
The Eastern Region is the third largest regional economy in Ghana, behind Greater Accra and Ashanti, contributing a little over a tenth of the national GDP and

employing a similar share of the national labour force. It is the fifth most productive region in terms of value addition per worker (GHS 3,909) though still lower than the national average of GHS 4,022.

New Juaben Municipal, home to the regional capital Koforidua, generates almost a tenth of the total GDP for the region making it the main economic hotspot in the region as shown in Figure 3.33. The next rank of districts with relatively higher contributions to the region's GDP includes East Akim, Akuapem North and Birim Municipal, each contributing between 4.36 to 6.60 percent of GDP.

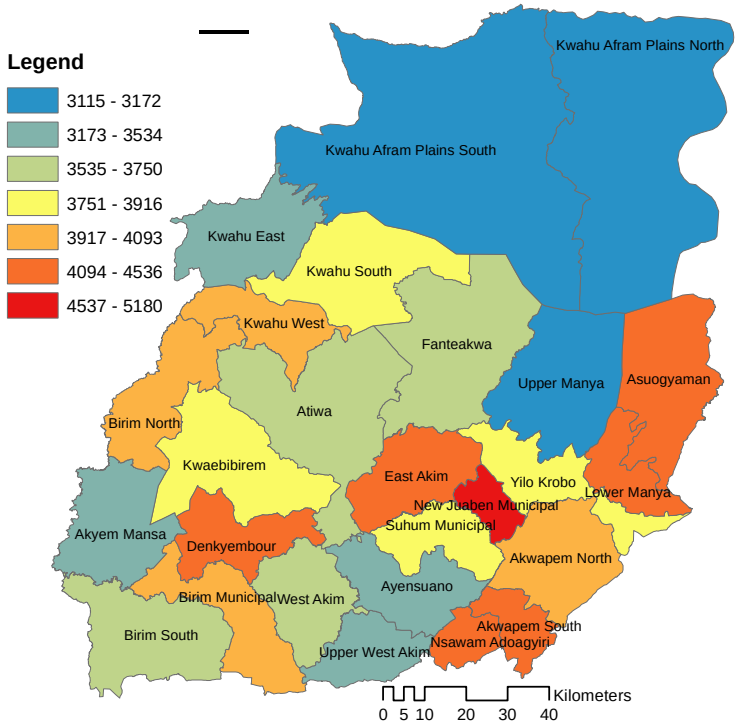
New Juaben Municipal stands out as the most productive district regarding value addition per worker. On the average, each worker contributes GHS 5,180 which exceeds the regional average of GHS 3,909. Nsawam Adoagyir, Lower Manya Krobo Denkyembour, Asuogyaman and East Akim are the next level of districts with relatively higher contribution per worker as illustrated in Figure 3.34.

Figure 3.33 Percentage contribution to regional GDP, Eastern Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Figure 3.34 GDP per worker GHS, Eastern Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

The agricultural sector remains the largest employer and the only specialization of the region (with a LQ of 1.09). Agricultural sector's share of employment plummeted from 55 percent in 2000 to 47 percent in 2010. In absolute terms, employment in the sector grew by more than 130,000, a 31 percent increase. MMDAs with a high concentration of agricultural workers in the region include Kwahu Afram Plains South, Upper Manya Krobo and Kwahu Afram Plains North, Akyem Mansa and Ayensuano. These agrarian districts also have lowest GDP per worker due to the low value addition in the sector.

The services sector in the region experienced a tremendous upsurge though it is not a specialized sector of the region. It increased its share of regional employment from 27 percent in 2000 to 40 percent in 2010. This rise is driven in particular by the real estate & professional services sub-sector. Employment in this sub-sector grew by more than 360 percent during the decadal period. Real estate & professional services employment is clustered in New Juaben Municipal and neighbouring East Akim Municipal and in Akwapem South and Nsawam Adoagyiri Municipal, which border Greater Accra region. The concentration of professionals in these areas is as a result of the propinquity to Greater Accra and the relatively cheaper rent. New Juaben Municipal has the highest concentration of workers in almost all the services subsectors, including finance & insurance (LQ 3.27) and public administration & defence (LQ 3.29).

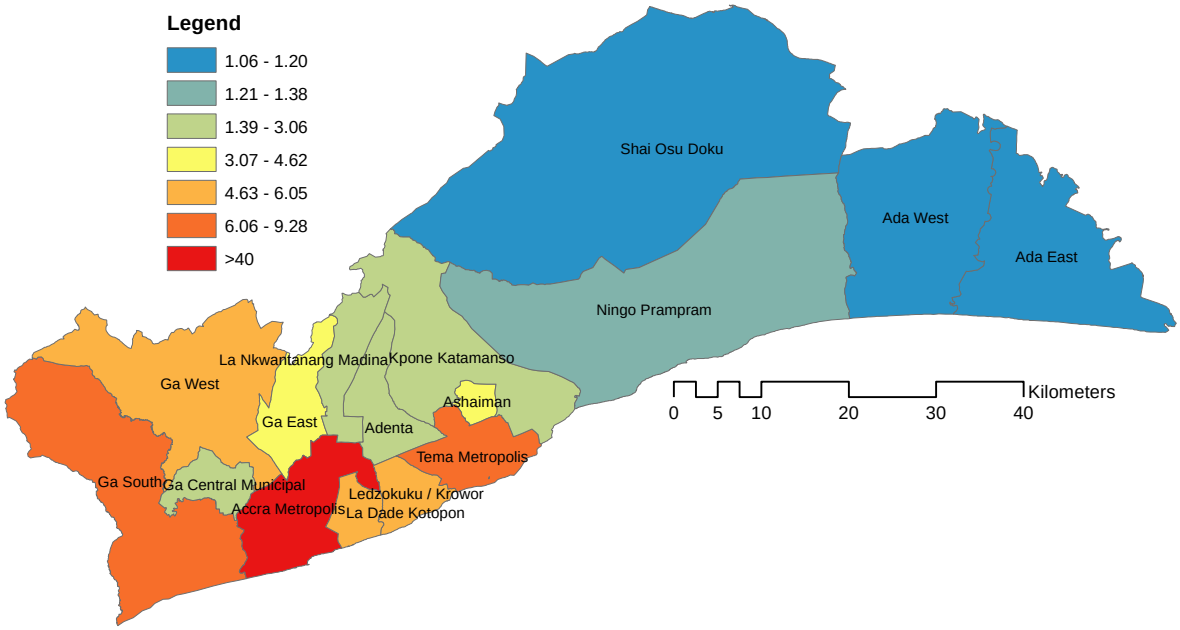
The industrial sector is the least of the three main sectors of the economy in Eastern Region. Its share of employment fell from 18 percent in 2000 to 15 percent in 2010. Nevertheless, there are some significant clusters of industrial activity in the region. Lower Manya Krobo district, which is well noted for the manufacturing of ceramics and beads, has a manufacturing LQ of 3.83, while a manufacturing belt appears to exist between Birim Municipal (2.42), West Akim Municipal (2.62), Asuogyaman

(2.13) and Suhum Municipal (2.40). Nsawam Adoagyiri Municipal also has a high concentration of employees in the manufacturing sector particularly in agro-processing (2.53). Asuogyaman district which is host to Akosombo dam and head-quarters of Volta River Authority has a high concentration of workers in the electricity, water & gas sub-sector (LQ of 7.87). Lastly, Diamond mining occurs in the Birim Valley, with employment predominantly concentrated in the MMDAs of Denkyembour (26.87), Birim North (9.10) and Atiwa (4.43).

Economic Profile of Greater Accra

Greater Accra region is the main economic driver and the most significant contributor to the national economy, generating more than a fifth (22%) of total GDP. The region is also the most productive in the country; value addition per worker is GHS 5,250, compared to the national average of GHS 4,022. In terms of contribution to national output, eight of the leading 12 MMDAs are located in the region. These eight, which are all located within Greater Accra Metropolitan Area (GAMA) contribute almost a fifth (19%) of national GDP, while Accra Metropolitan Area (AMA) alone contributes nine percent of national GDP (or 41% of regional GDP). The contribution of MMDAs to Greater Accra's GDP is illustrated in Figure 3.35.

Figure 3.35 Percentage contribution to regional GDP, Greater Accra, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

The economy of Greater Accra region is dominated by services subsector. Being the most specialized region in the services sector, the region has a LQ of 1.70, which the highest of any region in Ghana. The sector employs 74 percent of workers in Greater Accra. Greater Accra is the financial hub of the country. Its LQ in the finance & insurance sub-sector increased from 1.55 to 2.73 between 2000 and 2010. The region employs 46 percent of all workers in the sub-sector, as well as being the location of all the major financial institutions' headquarters. The Finance & Insurance sub-sector is highly productive, employing less than one percent of workers but generating 10 percent of the region's GDP. The region is also highly specialised in real estate, professional, scientific, administration & support services activities. The transport, storage & communication sub-sector has a LQ of 2.03 which is the highest in the nation. The region is home to the country's largest port in Tema, and the only international airport in AMA. AMA also hosts the majority of headquarters of the leading telecommunications companies.

Being the national capital city, Greater Accra is also the administrative centre of the country, employing 37 percent of all public administration & defence workers in Ghana. However, as a result of decentralisation, the region's share of employees in the sector had declined from 42 percent in 2000 to 37 percent in 2010. Public administration employees are heavily concentrated in La Dade Kotopon district bordering the AMA to the east with a LQ of 3.88.

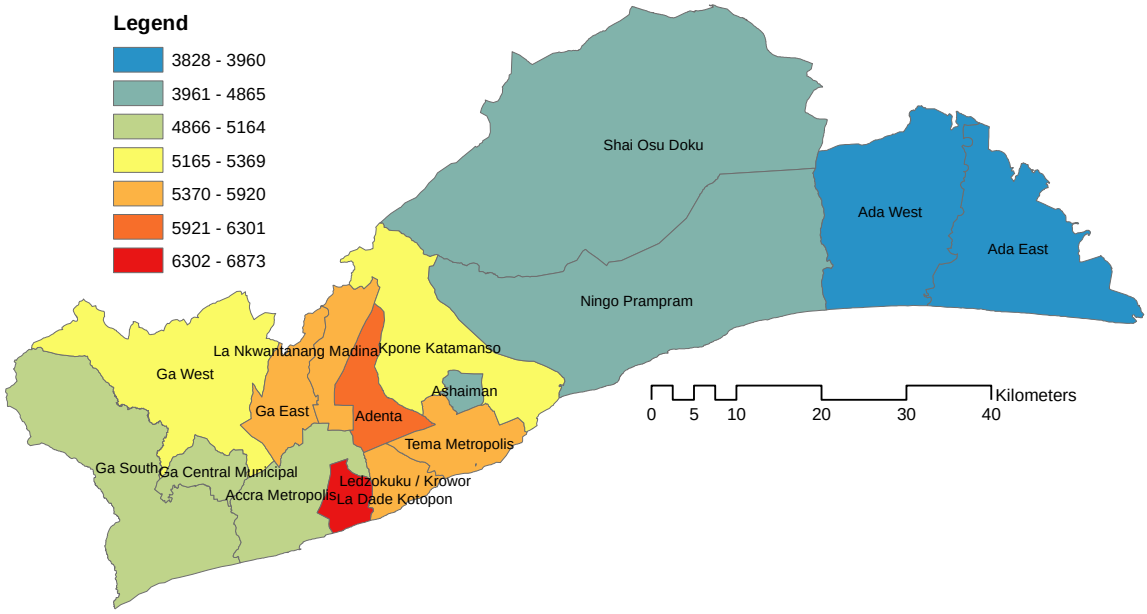
Despite the specialisation in high value-added services sub-sectors, the majority of services workers are employed in low or semi-skilled sub-sectors, particularly wholesale & retail trade, which employs just less than a third (32%) of the economically active population but contributes just 7 percent of GDP. Employment in wholesale & retail trade is concentrated in AMA, Ga West and Ga Central, which are host to Oboso Okai, Makola and Kantamanto markets that are the hubs of retail trade.

The region is also the most industrialised in terms of its employment structure (LQ of 1.41) in the whole of Ghana and also has the highest number of industrial firms. Manufacturing sector employs 15 percent of the total workforce in Greater Accra, but productivity is low, with the sector contributing just seven percent of the region's total GDP. As the location of the main port in Ghana and the Tema Export Processing Zone, Tema in particular is home to many of the country's largest and most advanced manufacturing plants, while the corridor along the Spintex road area between Accra and Tema is also home to many of the country's major firms. As outlined above under section 3.8.2, however manufacturing activity in general is dispersing away from Greater Accra to the neighbouring regions and, within the region; it is dispersing outwards from AMA to the other MMDAs.

The construction sub-sector employs 6 percent of workers in the region and generates 12 percent of GDP making it one of the most productive sectors in the region. Construction employment is concentrated in Adenta, Ga East, Ga Central, Ga South and Ga West. These are driven by the growth in real estate developments on the periphery of GAMA.

Agriculture contributes the least to the overall economy of the region, though it is still a significant employer in the less urbanised MMDAs of Ada East, Ada West, Ningo Prampram and Shai Osu Doku. As Figure 3.36 shows, these rural MMDAs, outside of GAMA have the lowest GDP per worker. The MMDAs with the highest output per worker are Ledzokuku and Adentan Municipalities.

Figure 3.36 GDP per worker in GHS, Greater Accra, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

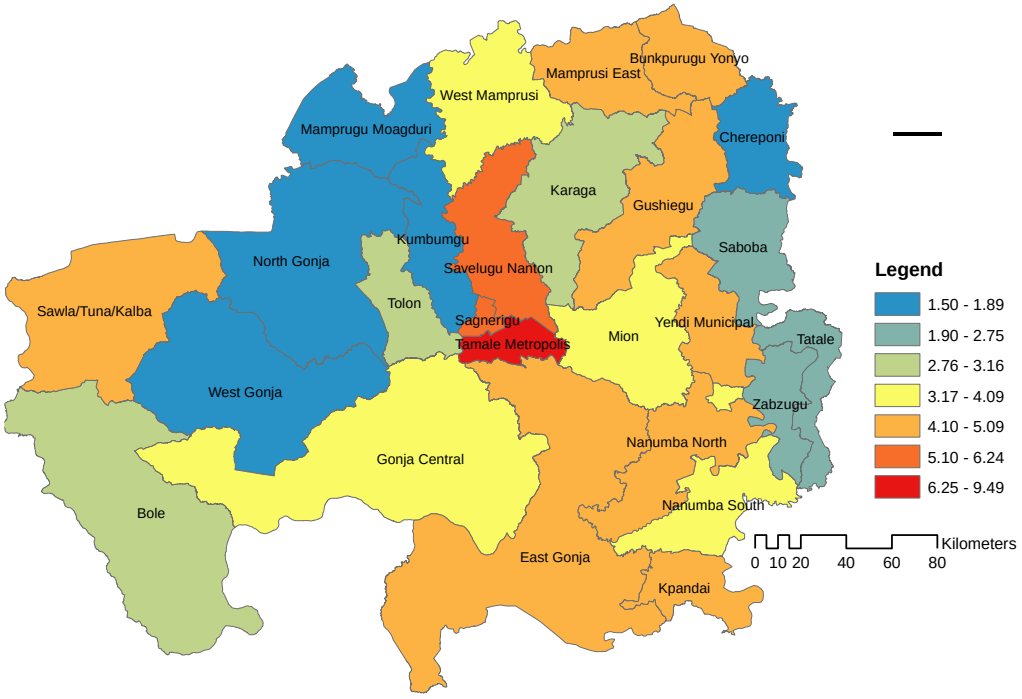
Northern Region's Economic Profile

The Northern Region is the largest and most sparsely populated region of Ghana. The region's rural nature is reflected in the large share of the workforce engaged in agriculture, which was 76 percent in 2010. The region has the highest specialization in agriculture LQ (1.77) and accounts for almost a fifth (19%) of all agricultural sector employment in Ghana. Between 2000 and 2010, employment in the sector increased by 590,000 representing a 50 percent rise. Agricultural activity in the region is almost exclusively subsistence in nature. Consequently, GDP per worker is

the lowest in the country, at GHS 3,181. Despite its vast area, the region generates less than 8 percent of total GDP.

Tamale, the primary city of the region, generates almost a tenth of the region's GDP and has the eighth highest GDP of all MMDAs nationally. Sagnerigu and Savelugu-Nanton also contribute substantially to the region's GDP adding over 5.10 percent each to the region's GDP as shown in Figure 3.37 below.

Figure 3.37 Percentage contribution to regional GDP, Northern Region, 2010



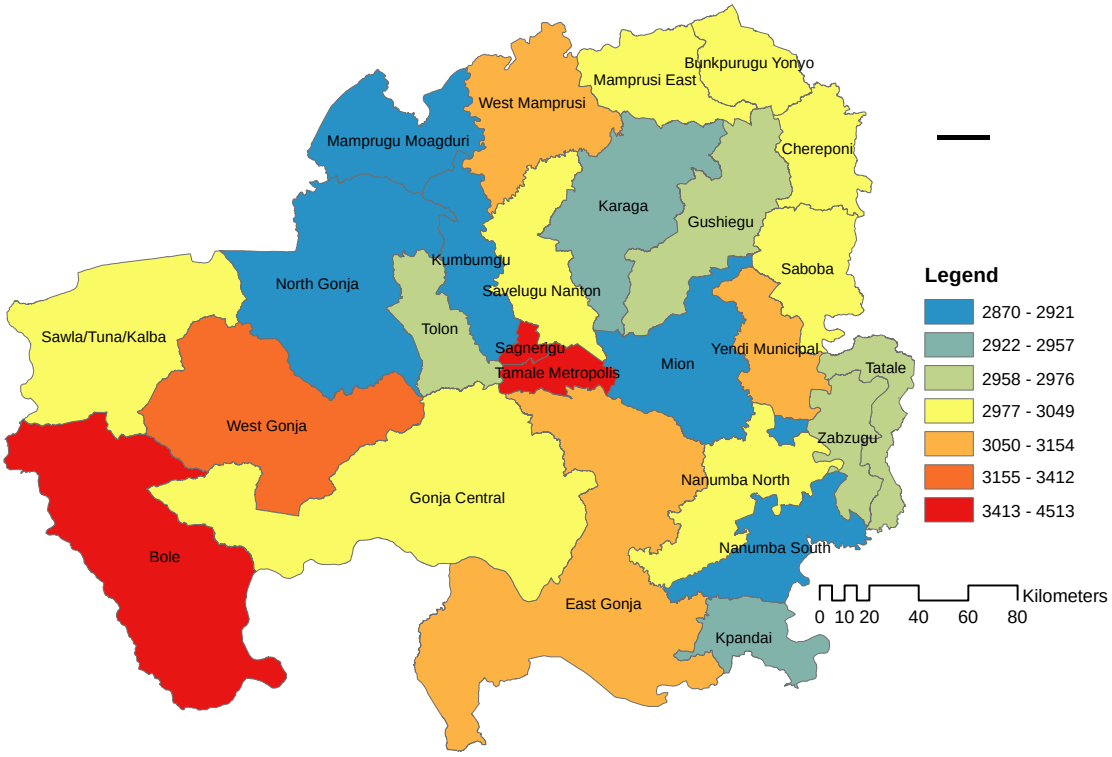
Source: NSDF Studt 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

In terms of value addition per worker, Sagnerigu, Tamale and Bole stand out as the most productive MMDAs in Northern region (See Figure 3.38). Sagnerigu's high worker value addition is because the district was initially part of the Tamale and hence a host to high value service professionals. Bole District's high productivity level is mainly because it is the main mining centre for the whole of Northern region. The mining industry has relatively higher value addition and hence the high per worker contribution.

Unlike the primary sector, the services sector constituted only 17 percent of total employment in Northern Region as of 2010. The majority of the sector's employment is in wholesale & retail trade and is concentrated in Tamale and Sagnerigu. The more productive sub-sectors in the Services industry, such as financial & insurance and real estate & professional services are also concentrated in the aforementioned MMDAs, along with manufacturing.

The industrial sector in Northern region remains very marginal engaging about ten percent of the working populace. Bole District which is well-known for is industrial activity is mainly within the Mining and quarrying sub-sector. Over 90 percent of all employees in the mining industry are all located in the district.

Figure 3.38 GDP per worker in GHS, Northern Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

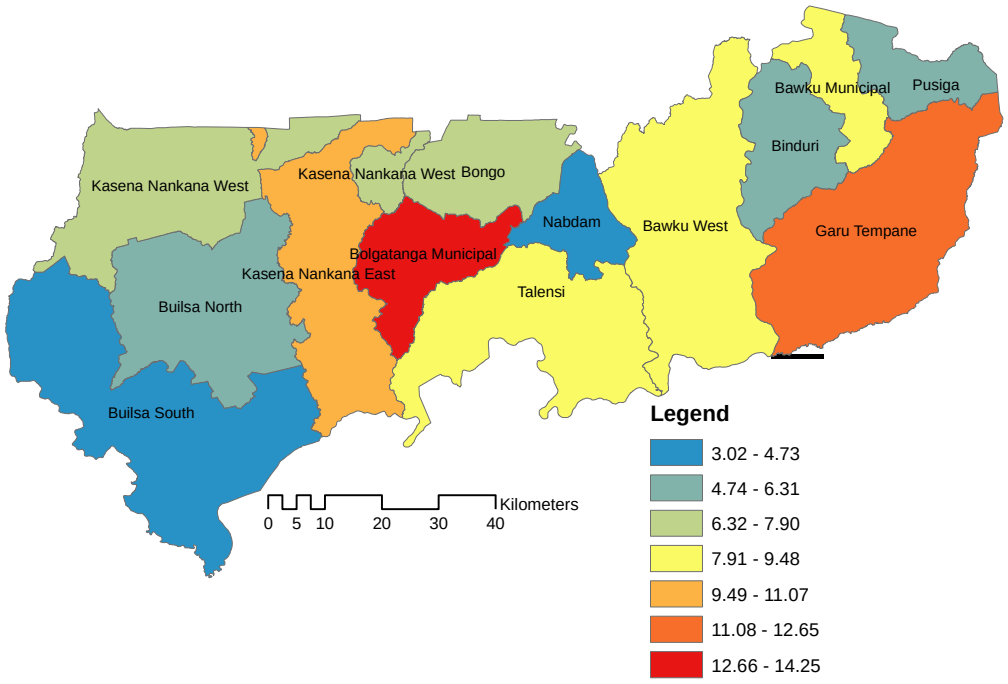
Economic Profile of Upper East Region

The Upper East Region is the second smallest of the 10 regions, after Greater Accra, and has the second smallest economy, after Upper West. The region contributes less than four percent of total GDP and engages over four percent of the total national labour force. Subsistence agriculture is the main source of livelihood for the majority of the population, with 70 percent engaged in the agricultural sector. The regional GDP per worker of GHS 3,346 of the region is substantially lower than the national average of GHS 4,022.

The regional capital and main urban settlement, Bolgatanga generates 14 percent of the region's GDP. Garu Tampane, the second largest contributor to the region's GDP produces over a tenth (12%) of the region's total output. The other leading contributors include Bawku Municipal, Bawku West and Talensi Nabdam generating between seven to nine percent each to the entire regional economic output as illustrated in Figure 3.39.

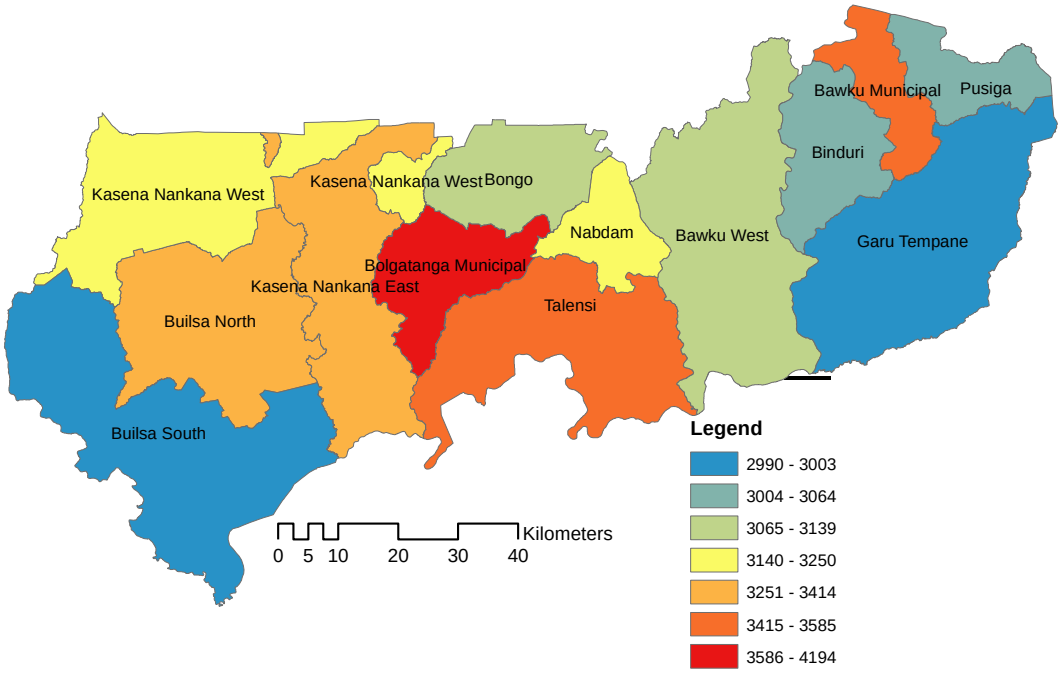
Bolgatanga Municipal, the main economic hotspot of the region is also the most productive administrative area with GDP per worker of GHS 4,194. It is the only administrative area in Upper East Region with a higher GDP per worker than the national average. The next most productive MMDAs are Talensi and Bawku Municipal (see Figure 3.40). Just like most areas in the country, the more rural districts are the least productive in the region as reflected in their lower value added per worker.

Figure 3.39 Percentage contribution to regional GDP, Upper East, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Figure 3.40 GDP per worker in GHS, Upper East, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Agriculture is the main economic specialization of Upper East region. Albeit the specialization in agriculture with a high LQ of 1.70, subsistence farming remains the main feature of agriculture in the region and it is almost ubiquitous throughout the region. The sector continues to expand and maintains its position of leading source of livelihood; the sector rose by 122 percent between 2000 and 2010, or by more

than 200,000 jobs in absolute terms. The growth of employment in the sector is driven by the lack of alternative employment opportunities. Barriers to entry into agriculture are low, requiring little skills or capital, and land is readily available in the region. However, productivity is extremely low as Figure 3.40 illustrates.

Upper East's services sector is amongst the weakest in the entire nation and its share of the regional economy declined over the decade. Services employ less than a fifth (19%) of the region's workforce. Even the low skilled services sub-sectors of wholesale & retail trade and accommodation & food have grown at a slower rate than in the rest of the country, employment in transportation, communication & storage has decreased tremendously.

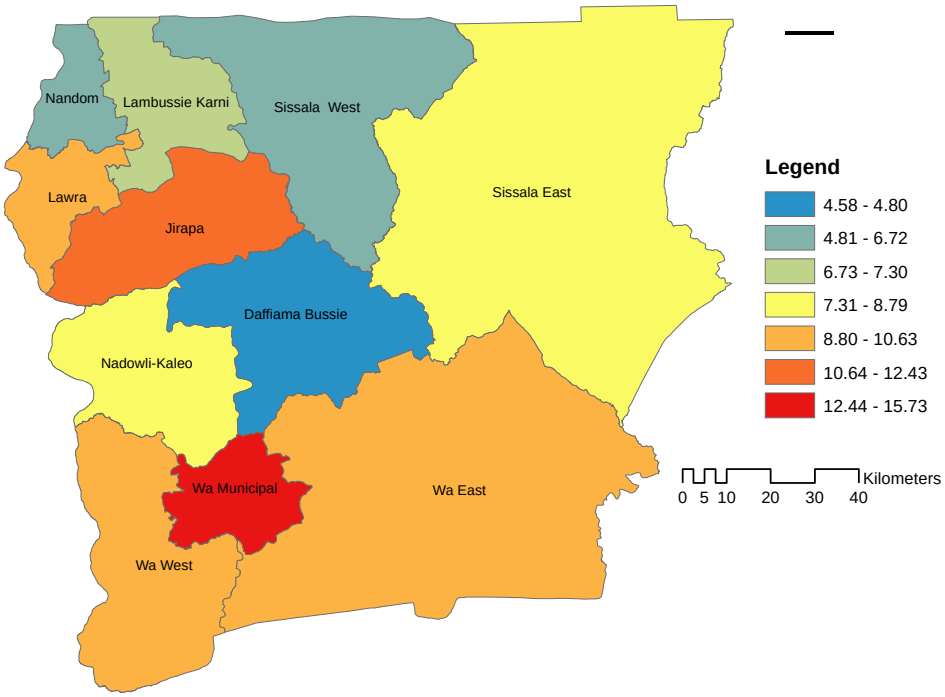
Employment in the industrial sector, the region's least specialised sector of the region grew by nearly 70 percent between 2000-2010, though its share of total regional employment dropped from 11 to 9 percent, due to the huge increase in agricultural employment. Moreover, the region has the second lowest share of employment in industry. The most significant growth in the industrial sub-sector was in the mining & quarrying, which grew by over 500 percent. This is concentrated in two districts: Talensi, with a LQ of 6.28 and neighbouring Nabdam, with a LQ of 3.82. Manufacturing employment grew by 60 percent and is concentrated mainly in Bolgatanga (LQ 2.42) and Bongo (LQ 1.83). Construction employment also increased, by 71 percent, and is concentrated in the two main towns: Bolgatanga (LQ 3.42) and Bawku (LQ 1.79).

Economic Profile of Upper West Region

Like the other two regions in the north of the country, Upper West Region is a sparsely populated rural economy. Its output is the least of all regions and it contributes a little more than 2 percent of total GDP and employs less than 3 percent of the labour force. Three quarters of the population are engaged in agriculture and a further 10 percent are involved in unskilled, low productivity services activities, primarily retail & wholesale trade. These are the two least productive sectors of the economy, resulting in the region having the second lowest GDP per worker in the country, GHS 3,328, after Northern Region.

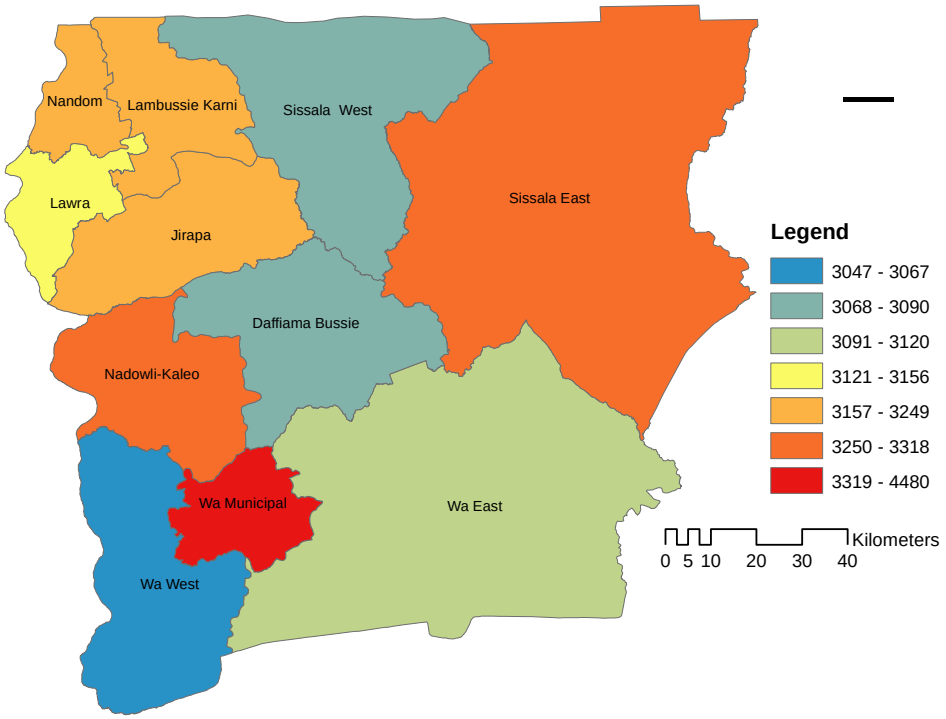
The capital of the region, Wa, is the centre of the vast majority of non-agricultural economic activities. It contributes 15 percent of GDP and has a GDP per worker of (GHS 4,480) that is considerably higher than all other districts in the region, as well as being higher than the national average. The economic dominance of Wa's output to the regional GDP is illustrated in Figure 3.41 and Figure 3.42 below. Jirapa District also contributes quite substantially to the region's GDP by providing over a tenth of the region's total output. However, Sissala East remains the second highest most productive area in the region with a GDP per worker contribution of GHS 3,318.

Figure 3.41 Percentage contribution to regional GDP, Upper West, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014.

Figure 3.42 GDP per worker, Upper West, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014.

Agriculture remains the main economic specialization of Upper West region with a LQ of 1.74 ranking it as the second most structurally concentrated in terms of employment. Agricultural activity in the region is predominantly subsistence farming and productivity is lower than in other regions due to the crude methods practiced and the less fertile land conditions in this part of the country. Nevertheless, the sector accounts for 65 percent of the region's GDP. Like the Upper East Region, the growth of employment in the sector is driven by the lack of alternative employment opportunities; agricultural employment grew by 120 percent between 2000-2010 and the regional LQ increased from 1.31 to 1.70 depicting an upsurge in specialization in the sector.

The services sector jobs in Upper West Region are mainly concentrated in Wa. The sector increased substantially between 2000 and 2010; public administration & defence rose by 230 percent, education expanded by 132 percent and health & social services grew by 62 percent. However, the largest services sub-sector, wholesale & retail trade, witnessed a decline in employment between 2000 and 2010 of 11 percent.

There is little industrial activity in the region. However, mining & quarrying activities have started in recent years and 28 mineral concessions were granted to companies to mine for gold between February 2005 and January 2013[89]. This has resulted in an increase in mining & quarrying employment of 117 percent between 2000 and 2010. Manufacturing employment also rose during the same period, by 108 percent. However, just like most regions in the country manufacturing jobs are mostly simplistic food processing related jobs.

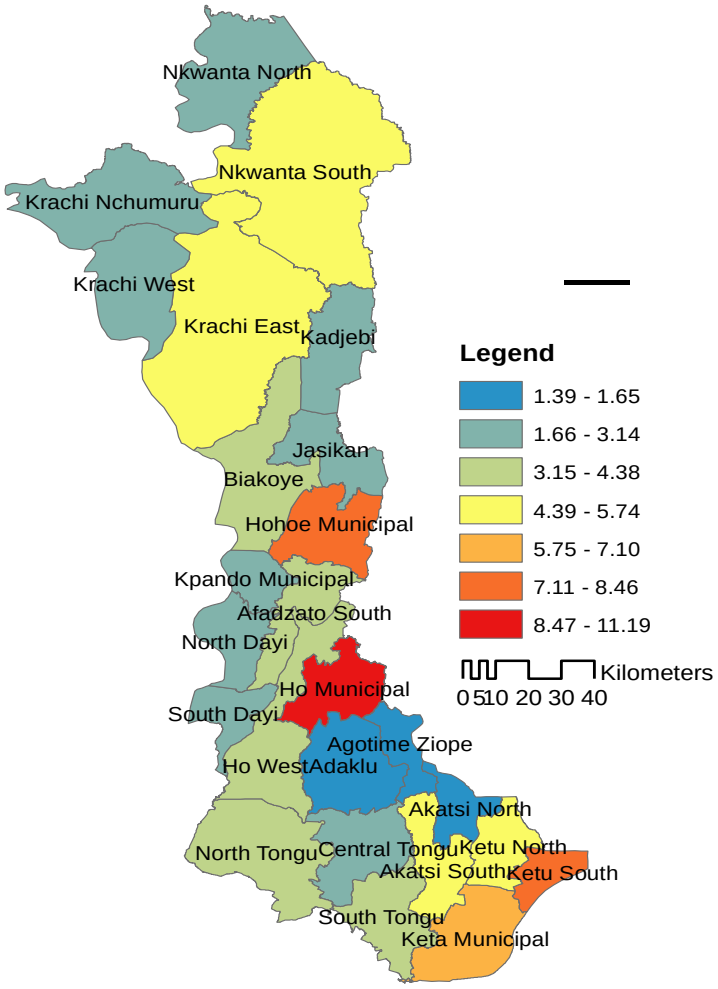
The major challenges of Upper West's economy emanate from the small and scattered nature of its settlements, with their sparse population concentrations. Agricultural productivity is hampered by an unfavourable climate, crude methods and poor transport links, owing to the remote location of settlements. The undiversified nature of the economic structure leaves the region susceptible to external shocks, for example, poor harvests. With the exception of Wa, the sparse and scattered population nature in the region does not provide the critical mass or population threshold needed to support industrial economic activities and service provision.

Economic profile of Volta Region

Volta region is the eighth largest economy in Ghana in terms of contribution to GDP. The region generates about eight percent of the national GDP and employs almost the same percentage of employees. The productivity level of the region is lower than the national average. With an average per worker value addition of GHS 3,641, the region's production level is lower than the national per worker value addition of GHS 4,022.

[89] http://www.myjoyonline.com/news/2014/September-12th/upper-west-chiefs-against-28-gold-mining-concessions.php

Figure 3.43 Percentage Contribution to GDP (GHS), Volta Region, 2010

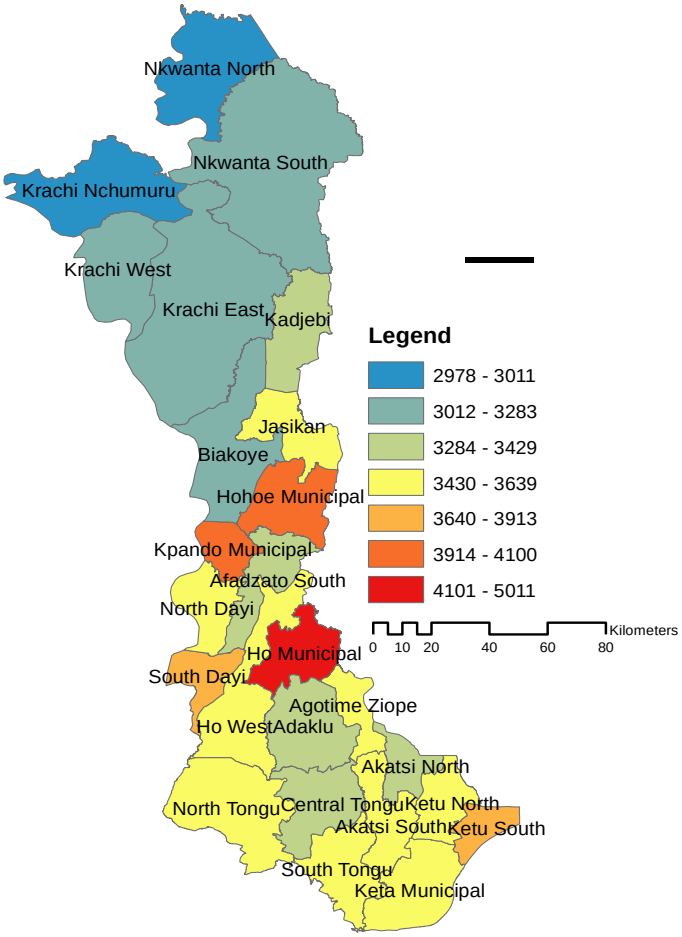


Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Ho, the regional capital is the leading economic hotspot in the region generating more than a tenth (11%) of the region's GDP. The high contribution of the regional capital is due to the high-skilled value addition jobs (mostly in the Services sector) in the municipality. The other leading economic hotspots in the region include Ketu South and Hohoe municipal. These municipalities generate GDP contributions that are between seven to eight percent as depicted in Figure 3.43.

The highest production levels in terms of value addition per worker in the region are within Ho Municipal, possessing an average value addition of GHS 5,011 that exceeds the regional average of GHS 3,641. Kpando Municipal and Hohoe Municipal are the other municipalities with per worker value addition superseding the regional average as shown in Figure 3.44.

Figure 3.44 GDP contribution per worker in GHS, Volta Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Agriculture, forestry and fishing is the most specialized economic activity of the Volta region. These Volta region's activities' sector engage more than half (52%) of the region's entire active labour force and possess a LQ of 1.20 ranking it as the fifth most specialised region in the sector. From 2000 to 2010, the sector increased its employees by almost 170,000 workers making it the largest absolute growth of all the sub-sectors in the region. The Volta Lake remains a major source of fishing and has helped increase fish-farming in the region in recent years. The predominantly rural nature of the region shows the sector will continue to be a major source of employment in the region. The districts with high concentration of workers in the Agriculture, Forestry and Fishing as part of their employment structure include Nkwanta North, Krachi Nchumuru, Nkwanta South, Krachi East and West, Central Tongu, Akatsi North and Adaklu.

The industrial sector is the second most specialised economic sector of the Volta region. The region has a LQ of 1.13 positioning it as the region with the second highest concentration of industrial workers among all the regions. The industrial sector employs 14 percent of the region's workforce. Over the decade, the number of employees in the industrial sector grew by over 100 percent (134%). The sub-sectors with the highest relative increases include manufacturing (326%), construction (140%) and Electricity, water and gas supply (41%). The mining and quarrying sub-sector however experienced massive decline of 92 percent which was higher than the national rate of decline equivalent to 17 percent. The Mining and

quarrying sub-sector jobs in the region are mostly concentrated with North Tongu and North Dayi districts. The manufacturing sector jobs in the region are more concentrated in Ketu South and Keta municipal, while the Electricity, gas and water supply jobs are mostly clustered in Ho, South Dayi, Keta and Kpandai.

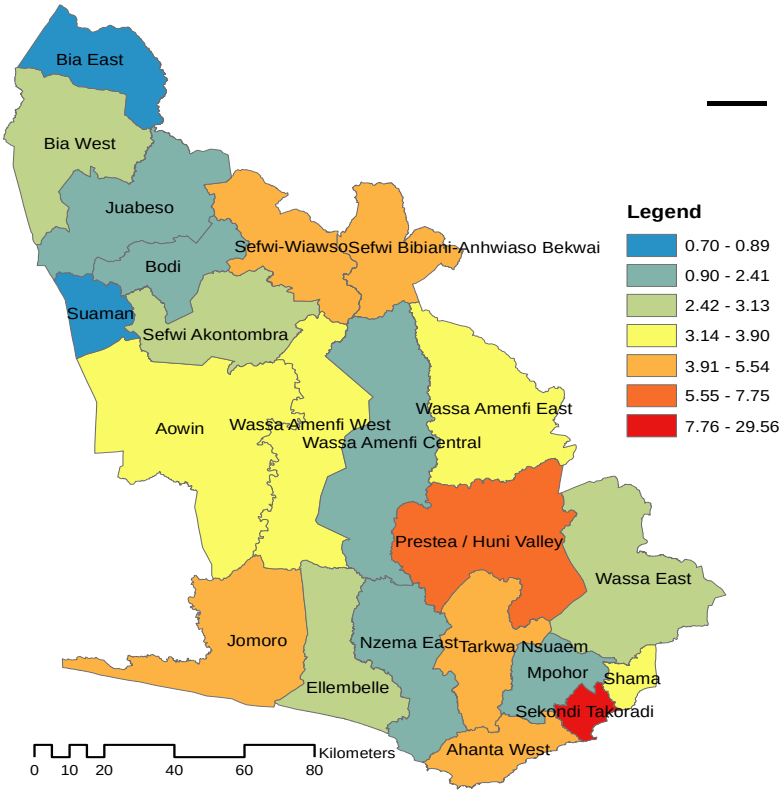
The Services sector is the weakest economic sector of the region, it is though increasing its share of employees over the decade. Between 2000 and 2010, the Service sector's share of employment grew from 29 to 31 percent. Akin to the service structure of most regions in Ghana, the services sector in the Volta region is dominated by the Wholesale and retail sub-sector that engages 43 percent of the entire services sector workers. The high value adding Service sub-sectors constitute small proportions of the Service sector. Over the decade, all the service sub-sector jobs increased tremendously with the least growth recorded in the Health and social work sub-sector which grew by 56 percent. The Service sector jobs are highly concentrated in Ho, Hohoe, Kpandai, Keta and Ketu South which are the most urbanized settlements of the region.

Economic Profile of Western Region

Western Region plays an important role in the national economy. It is the fourth highest contributor to national GDP, contributing just less than a tenth of total output (see Table 3.1) and GDP per capita is second only after Greater Accra. Moreover, with its abundance of natural mineral resources and the highest cocoa production in the country, the region produces vital export commodities.

Although economic activity is undertaken in every part of the region, the most urbanised MMDAs generate the most regional GDP. Sekondi -Takoradi is the most productive centre of the region, generating nearly a third of the total GDP and employs more than a fifth (22 %) of the total workforce. Sekondi-Takoradi's contribution to national GDP is just less than 3 percent – the third highest of any MMDA, after Accra Metropolitan Area and Kumasi Metropolitan Area. The Sekondi-Takoradi Metropolitan Area also has the highest GDP per capita in the region. Prestea-Huni Valley is the second highest contributor to the region's GDP generating over 5 percent of the region's GDP. The high contribution of Prestea-Huni Valley is due to the high concentration of mining activities in the district. The other leading contributors to the region's output include Tarkwa-Nsuaem, Ahanta West, Sehwi Wiawso and Sefwi Bibiani Anwiaso as illustrated in Figure 3.45.

Figure 3.45 Percentage Contribution to GDP (GHS), Western Region, 2010

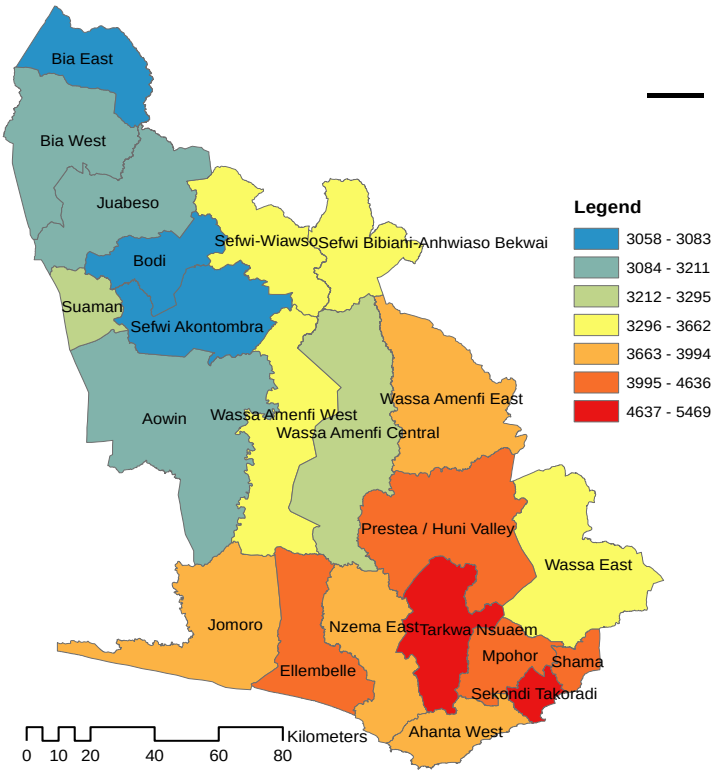


Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

Quite akin to the contribution to the region's GDP, the value addition per worker is highest in the Sekondi-Takoradi Metropolitan Area generating GHS 5,469 per worker. This is higher than the regional per worker value addition with GHS 4,142. Other MMDAs with higher than the regional average GDP per worker contribution are primarily those with high level mining activities including Tarkwa-Nsuaem Municipal, Prestea-Huni Valley District, Mpohor District and Ellembele District. Shama, which borders Sekondi-Takoradi to the east also has a higher than average per worker contribution to GDP as illustrated in Figure 3.46. The districts with relatively lower levels of per worker contribution to GDP are the rural districts in the north of the region which are mainly agrarian.

The primary sector remains the main economic backbone of Western region. The primary sector is the largest in terms of both GDP and employment. It employs nearly half (48%) of the region's workforce and generates a third (33 %) of the region's GDP. However, the primary sector remains one of the least productive sectors. Agriculture in Western Region is primarily within cash crop production, rather than subsistence farming as in the northern part of Ghana. The region is the largest producer of cocoa in the country, as well as producing other cash crops, such as rubber, oil palm, and timber. Agricultural employment is more concentrated in the north of the region in the districts of Sefwi-Akontombra, Bodi, Aowin, Juabeso and Bia East, with location quotients of 1.78, 1.76, 1.66, 1.63 and 1.61 respectively. Farming is almost ubiquitous throughout the region where 17 out of 22 districts in the region have LQs greater than 1.

Figure 3.46 Per Worker contribution to GDP (GHS), Western Region, 2010



Source: NSDF Study 2014 based on GSS PHC, 2010 and National Accounts Statistics, 2014

The industrial sector is the second specialised economic sector of Western region, particularly in the Mining & quarrying sector. Having a LQ of 1.12, it remains the region with the third highest concentration of employees in its employment structure. Mining & quarrying is the most economically vibrant and fastest growing industrial sub-sector in Western Region, due to the region's unparalleled endowment with mineral resources. The region has the highest concentration of employees in the sub-sector, with a LQ of 3.44. The number of employees also grew by 58 percent between 2000 and 2010, as compared to a decrease nationally of 17 percent. Mining & quarrying jobs are concentrated in Tarkwa-Nsuaem and Prestea/Huni Valley, which have LQs of 6.20 and 4.90, as well as Mpohor and Wassa Amenfi East, with LQs of 3.60 and 2.21.

Furthermore, the start of Oil & gas production which falls under the Mining & quarrying sector provides an opportunity to diversify the region's economy through the development of direct and indirect linkages with the sub-sector. These could include backward linkages, such as the provision of input services to firms in the oil & gas industry and forward linkages to develop manufacturing industries using oil & gas inputs such as oil refineries, plastics and petrochemicals production and servicing the production chain.

Manufacturing employment in Western Region is in decline; while manufacturing employment increased nationally by 36 percent, it decreased in the region by 20 percent. In 2010, a tenth of the population were engaged in manufacturing activities, primarily in low productivity sub-sectors, such as agro-processing. Consequently,

the average GDP per capita in Western Region is lower in manufacturing employment than in the agriculture sector. As mentioned above, efforts are to be made in order to diversify the economy into more productive manufacturing activities through linkages with oil & gas. Manufacturing employment in the region is concentrated in Shama, Sekondi-Takoradi and Jomoro.

The Services sector is the least specialised economic sector of the Western region's economy. The region's LQ in the services is 0.83 which falls far below the national average of specialization. Like most regions, its services' sector is dominated by the low-level-skill-based service activities. The low-skill-based services are mainly within the Wholesale & retail sector mainly because of its ease of entry and low level of capital required. The wholesale & retail sub-sector is the second largest employer in Western Region, employing 15 percent of the workforce, yet it contributes less than 5 percent of GDP; this makes it the least productive of all the economic sub-sectors. Wholesale & retail trade employment is concentrated in Sekondi-Takoradi, Ahanta West, Jomoro and Ellembelle. An increasingly important services' sub-sector is accommodation & food services, which is growing to meet demand for high-end hotels and restaurants from the oil & gas industry. The region has the second highest concentration of employment in accommodation & food services after Greater Accra, partly due to its attractiveness as the destination of choice for the tourism industry.

3.8.5 Spatial economy is structured around metropolitan centres supported by secondary cities

An analysis of the Surf Yellow Pages business listings[90] provides further useful insights into spatial economic concentration. Greater Accra region accounts for 72 percent of all listings, with 64 percent in the city of Accra itself. As mentioned in section 3.8.1, this indicates the economic primacy of Accra. The metropolitan areas of Kumasi and Sekondi-Takoradi account for 9 percent and 4 percent respectively. Significantly, this comprises 92 percent of all listings within the region in the case of Kumasi and 82 percent in the case of Sekondi-Takoradi. Tamale, the third largest settlement in Ghana, accounts for just 2 percent of all business listings, but 91 percent of all listings in Northern Region. In total, regional capitals account for 85 percent of all listings and, on average, 74 percent of the listings in their respective region; the highest is Wa in Upper West with 95 percent, while the lowest is Koforidua in Eastern with 44 percent of their region's listings.

The metropolitan areas within the "golden triangle" (Accra - Tema, Kumasi, Sekondi-Takoradi) account in their integrity for 86 percent of total business listings at national level. In particular, they have 92 percent of all 'transport' listings, 92 percent of all 'building, construction & engineering' listings, 90 percent of all 'business services' listings and 90 percent of all 'manufacturing' listings. They also account for 91 percent for 'media & communication' and 94 percent of 'computers & internet' listings, though 77 percent of these were in Accra alone. The seven remaining regional capitals (excluding Accra, Kumasi, Sekondi-Takoradi) between them account for only 8 percent of total listings, but 22 percent of 'public & social services'. They also account for 11 percent of 'education' listings, 11 percent of 'tourism' listings and 10 percent of 'bars & restaurants' and 'sport & leisure' listings.

0 shows the share of business listings by sub-sector type for metropolitan areas and the other regional capitals. The relatively higher share of public services in regional capitals is indicative of their role as administrative centres and providers of public services to their regions. The higher share of business services, manufacturing and

[90] 2012 Edition of the Surf Yellow Pages Business Directory of Ghana

construction in the metropolitan areas is indicative of their role as the core centres of industry.

Table 3.4 Percentage of business listings by urban settlement type

	business services	home & garden	construction & engineering	shops	media & communication	computers & internet	financial & legal	public & social services	manufacturing & wholesale	entertainment	education	sports & leisure	bars & restaurants	tourism	health & beauty	automobile & motorcycle	transportation	agriculture, fishing & mining
Metropolitan	21	8	9	8	7	6	5	3	5	4	4	3	3	3	3	3	3	2
Regional Capital	14	8	4	7	4	2	7	15	4	5	6	5	4	5	3	3	2	2
Other	15	11	4	3	3	2	10	17	3	5	6	2	5	5	2	2	1	3
Total	**20**	**8**	**8**	**7**	**6**	**6**	**5**	**5**	**5**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

Source: Yellow Pages, 2012

Table 3.5 shows that the economy of urban areas varies according to their size. For example, real estate jobs are concentrated in the second largest size-class 250-500k followed by the highest size-class >500k. ICT activities are concentrated in the three highest size-classes, as is administration and financial services, though, not to the same extent. Jobs in extra-territorial organizations, as well as in arts and entertainment, are mostly concentrated in the largest size-class and less so in the next two classes. Smaller settlements also show economic specialisation. Some 50 smaller settlements displayed high specialisations in mining & quarrying, with LQs that ranged from 2 to 41. Eleven had specialization in manufacturing with LQs that ranged from 2 to 3, 18 with high LQs in transportation and storage and 27 with LQs of 2 or more in health and social work services.

Table 3.5 Employment location quotient by urban settlement size-class, 2010

	5-10k	10-25k	25-50k	50-100k	100-250k	250-500k	>500k
extraterritorial orgs	0.1	0.2	0.5	0.2	1.1	1.4	1.7
real estate activities	0.1	0.1	0.7	0.2	1.3	2.2	1.4
ICT	0.2	0.3	0.5	0.5	1.3	1.4	1.4
arts, entertainment, recreation	0.4	0.5	0.6	0.8	1.1	1.1	1.4
financial, insurance	0.4	0.5	0.7	0.6	1.2	1.3	1.3
administration	0.5	0.6	0.8	0.7	1.2	1.2	1.3
households as employers	0.7	0.7	0.9	0.8	1.0	1.2	1.2
wholesale, retail; veh repair	0.6	0.7	0.9	0.9	1.0	1.1	1.2
accommodation ,food service	0.7	0.8	0.8	1.0	1.0	1.0	1.2
pub admin, defence, soc sec	0.6	0.8	0.9	0.8	1.2	0.9	1.2
prof, scientific, technical	0.5	0.6	0.8	0.9	1.3	1.3	1.1
transportation and storage	0.6	0.7	0.9	0.9	1.1	1.3	1.1
water supply, sewers, waste	0.9	1.0	1.0	0.9	1.0	1.0	1.1
construction	0.6	0.7	0.9	0.9	1.3	1.5	1.0
electricity, gas, air conditioning	0.4	1.2	0.8	0.7	1.3	1.4	1.0
manufacturing	0.8	0.9	0.9	1.0	1.0	1.1	1.0
health and social work	0.8	1.0	1.0	1.0	1.1	1.0	1.0
education	0.9	1.1	1.1	1.1	1.2	0.9	0.9
mining and quarrying	1.6	1.8	2.6	0.5	1.6	0.6	0.3
agri, forestry, fishing	2.9	2.1	1.6	1.5	0.6	0.4	0.2

Source: NSDF Study 2014 based on GSS Population Census 2010

An analysis of the Ghana enterprise map by Sutton and Kpentey (2012)[91] reveals that the majority of the major firms in Ghana's key industries are located in one of the metropolitan areas. Together, these firms generally account for the majority of output and employment in each of their respective industries. This is summarised in Table 3.6 below.

Table 3.6 Location of major firms in Ghana's key industries

Industry	Accra	Tema	Kumasi	Sekondi-Takoradi	Other
Food processing	2	3	0	1	0
Cocoa processing	2	0	1	1	1
Non-alcoholic beverages	4	1	1	0	0
Alcoholic beverages	4	0	1	0	0
Textiles and garments	1	2	0	0	1
Wood products	0	0	1	1	0
Construction materials	2	2	0	1	0
Metal fabrication	2	4	0	0	0
Pharmaceuticals	4	0	0	0	0
Chemicals	3	1	0	1	0
Plastics and rubber	3	0	0	1	0
Total	**27**	**13**	**4**	**6**	**2**

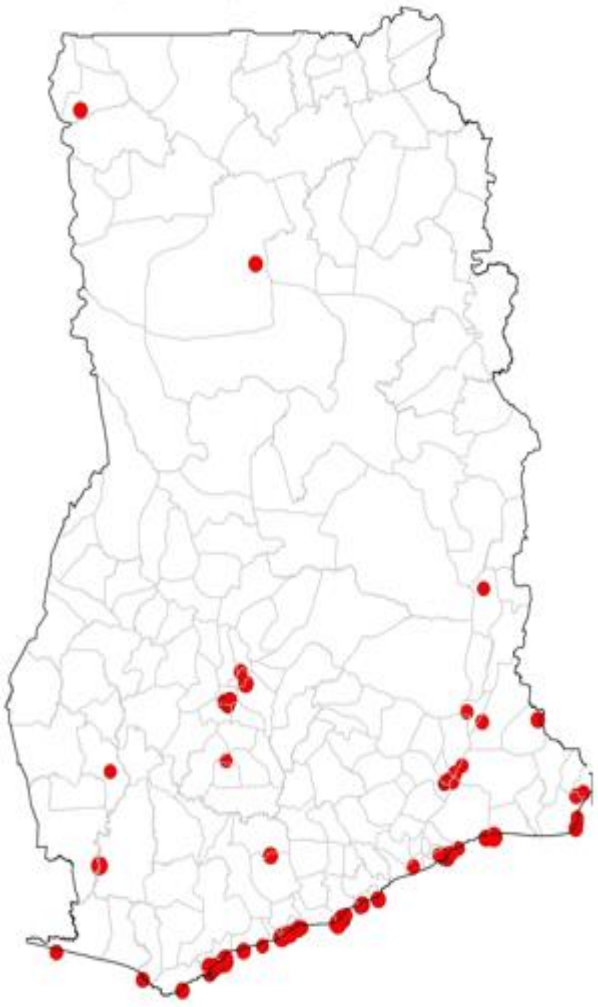
Source: Sutton, J. and Kpentey, B. (2012), "An Enterprise Map of Ghana"

[91] Sutton, J. and Kpentey, B. (2012), "An Enterprise Map of Ghana"

The major port cities of Tema, and to a lesser extent Sekondi-Takoradi, are the primary manufacturing centres in the country outside of Accra. Both show a relatively high specialisation in manufacturing in terms of employment (18 percent and 17.5 percent respectively), as well as the highest growth in manufacturing employment between 2000 and 2010 (3 percent and 3.9 percent per annum) [92]. With many of the country's largest and most advanced plants located near the harbour, Tema represents a key national asset. Data from the (latest) 2003 Industrial Census indicate that Tema accounted for 54 percent of national manufacturing output[93].

Further analysis of location quotients of urban settlements reveals the prominence of manufacturing along the coast, forming a corridor between Tema and Sekondi-Takoradi (see Figure 3.47).

Figure 3.47 Location quotient – manufacturing jobs in urban centres, 2010



Source: NSDF Study 2014 based on GSS Population Census 2010

In summary, the analysis above provides an illustration of the structure of Ghana's spatial economy as follows: Economic activity is concentrated in the metropolitan centres of Kumasi, Sekondi-Takrodi and especially Greater Accra Metropolitan Area, which includes Tema. Between these, the metropolitan areas generate almost a third of total GDP. These main economic centres are supported by the remaining

[92] World Bank (2014) Ghana Urbanization Review

[93] http://www.statsghana.gov.gh/nada/index.php/catalog/33

regional capitals, which act as secondary cities and commercial and administrative centres for their respective regions.

3.9 Recommendations to address current and future challenges

This final section identifies key recommendations for the NSDF, based on the challenges identified in the preceding analysis of Ghana's spatial economy.

3.9.1 Recognise and strengthen Accra as a gateway to international trade

Accra is a vital strategic asset to the country. Greater Accra region, which includes Tema, contributes 22 percent of total GDP – approximately the same share as Greater London contributes to the economy of the UK (see Box 7). The metropolitan region's contribution, however, goes beyond that of economic output; it acts as a magnet for investment into the country and as a gateway for international trade for Ghana and for the ECOWAS region as a whole. This role is to be reckoned with and supported, as well as Accra's connectivity to international markets enhanced. Rather than attempting to shift industry and services to secondary cities, these centres need to grow naturally, in a mutually-beneficial fashion as spatial development is not a zero-sum game.

Furthermore, the development of Accra must be viewed in the context of the regional, continental and even global economy. The city has be supported in order to compete with other regional centres, such as Lagos and Abidjan, to attract investment in the activities associated with the role of a regional business, trade and investment hub. This is a role that no other city in Ghana could realise.

3.9.2 Reinforce the role of Kumasi as a national driver of economic growth

Kumasi is Ghana's second largest city. However, it is underperforming in its role as a key driver of economic growth. Like, Accra, Kumasi is a vital strategic asset and its role must be recognised and strengthened. The city is located at the peak of the 'golden triangle' and has an important role to play in linking the coastal industrial corridor with the rest of the country, as well as the cocoa producing regions with the ports of Tema and Takoradi. This role can be supported through infrastructure improvements, for example the completion of the Boankra Inland Port.

3.9.3 Satellite cities offer opportunity for further dispersal of manufacturing

In addition to rapid growth of the core cities, many satellite towns are growing rapidly on the periphery of these metropolitan areas. These satellite settlements offer an opportunity for the further natural dispersal of manufacturing activities away from the metropolitan core (i.e. Greater Accra). Should this process be achieved, infrastructure links must be improved between these satellite settlements and the metropolitan centres where economic inputs, infrastructure (e.g. ports) and business services are located.

3.9.4 Enhance the role of secondary cities and regional capitals

The analysis in section 0 indicates much under-utilised potential in secondary cities, which at present act more as administrative and basic commercial centres than as drivers of economic growth. Regional capitals in particular need to be supported to transcend their role as just centres of local government and public services and to become attractive locations for business. This can be achieved through economic development initiatives initiated at the regional and district level.

Moreover, these cities need to be recognised and incentivised as the key nodal points for the integrated network of human settlements that is proposed as the spatially-structuring concept for the NSDF. As nodal points, they serve to facilitate

the flows of goods, services and people across national space. Equally, they provide a variety of facilities, goods and services for their immediate hinterlands.

3.9.5 Use the potential of district capitals to create employment

At the level below secondary cities, the smaller urban settlements (e.g. remaining district capitals) also have a role to play in the provision of services to their hinterlands and as nodal points and to facilitate the flows of goods, services and people. Their role as drivers of economic growth is more limited in comparison to secondary cities, but they still have the potential to become centres of agro-processing activities and to generate potential opportunities for non-farm employment.

3.9.6 Strengthen infrastructure to support the coastal industrial corridor

As Figure 3.47 shows, a manufacturing corridor has developed along the coast, from Tema to Sekondi-Takoradi. Industrial activity in this corridor must be strengthened and supported though appropriate infrastructure investments.

3.9.7 Take a more disaggregated approach to the North-South divide

Finally, the analysis of the spatial economy in this chapter has reaffirmed the North-South divide in income and poverty previously identified by a multitude of studies. Our analysis shows, however, that this issue is more nuanced than previous studies have indicated. Progress has been made to reduce poverty in the Northern Region, but it remains prevalent in Upper East and Upper West. There is also an equally large disparity between urban and rural poverty rates. Moreover, poverty incidence is similar in urban areas of the North and rural areas in the rest of the country, it is, therefore, not simply a case of all of the North being poorer than all of the south. Consequently, it is recommended that a more disaggregated approach is taken when discussing the issue of poverty and more spatial factors are considered than North-South location.

Volume I

Chapter 4

Agriculture

4 Agriculture

4.1 Introduction

Ghana has enormous agricultural potential with respect to land and manpower. According to the World Bank, about 148,000 km^2, or 65 percent of the national territory, is agricultural land, defined as having agricultural potential.

Agricultural land comprises permanent crops, permanent pastures and arable land. Only 24,000 km^2 of agricultural land, or about 10 percent of the national territory, are presently under permanent crops, 83,500 km^2 or 56 percent are permanent meadows, and 41,000 km^2 or 27 percent are arable. Ghana's arable land—with rich soils, ample water resources and access to both domestic and international market—constitutes a huge untapped resource for agricultural development.

Food production is practiced primarily on small-scale, family-operated farms that are plagued by poor infrastructure, low technology, and lack of access to finance— all resulting in low productivity. Despite this, the estimated 2.74 million household farmers produce about 80 percent of Ghana's total agricultural output (MOFA, 2012).

The agriculture sector is important to the overall economic growth and development of Ghana. In 2010, it contributed about 30 percent of the GDP and employed about 42 percent of the total labour force. According to the draft Ghana Shared Growth and Development Agenda (GSGDA-II) for 2014-2017, agriculture is expected to lead the growth and structural transformation of the economy and maximize the benefits of accelerated growth. However, there is a huge potential for improvements in the productivity of the agriculture sector to significantly raise the incomes of agricultural households. Securing property rights will have a positive impact in this development.

Ghana's food production system may be characterised as natural resource-based. It includes extensive crop and livestock production systems, hunting, rain-fed agriculture, and fish from natural water bodies. Traditional agricultural practices, such as bush burning and improper use of modern technologies, such as irrigation and agro-chemicals, affect the sustainability of resource use. For example, according to MOFA, almost 70 percent of the total land surface is prone to severe erosion, accounting for a loss of about two percent of GDP. Although the problem is prevalent in all the agro-ecological zones, the savannah regions are most affected.

Land degradation, desertification and soil erosion hit hardest at the local level. Communal ownership of land and absence of demarcated grazing lands result in over-grazing and conflicts between livestock-keeping and crop-farming. The practice of bush burning for crop production is a source of loss of fodder for livestock during the critical dry season period.

4.2 Food production policies, institutional framework, and key projects

4.2.1 Institutional framework

Ghana's Ministry of Food and Agriculture (MOFA) is the responsible agency for the development and growth of agriculture in the country. MOFA's role is to formulate appropriate agricultural policies, plan and coordinate various development projects, and monitor and evaluate projects and programmes. It is though inconsistent for the cocoa, coffee and forestry sectors, to fall under the jurisdiction of the Ministry of Finance and Ministry of Lands and Natural Resources.

The MOFA is headed by the Minister for Agriculture and two deputies in charge of crops and livestock. A number of technical directorates cover areas that include husbandry or animal production, veterinary services, women in agriculture development, plant protection,

agricultural engineering services, agricultural extension and crop services. Other relevant organisations under MOFA include the Grains and Legumes Development Board (GLDB), Ghana Irrigation Development Authority (GIDA), Irrigation Company of Upper Region (ICOUR), the Veterinary Council and the Fisheries Commission.

4.2.2 Food production policies

The relevance of agriculture has been recognized since independence and continues to the present day. The National Physical Development Plan (1963-1970) acknowledged agriculture as the cornerstone of Ghana's economic development and articulated three key policies: (i) improve nutritional levels and eliminate food deficits; (ii) raise rural incomes, especially in the Northern, Upper East and Upper West regions; and (iii) increase production of agricultural raw materials for both exports and domestic industrial purposes.

Government policies in the agriculture sector are articulated in three key documents: the Comprehensive African Agriculture Development Program (CAADP 2003-2015); the Food and Agriculture Sector Development Programme (FASDEP II 2009- 2019); and the Medium-Term Agriculture Sector Investment Plan (METASIP 2011-2015). Agricultural policies are also embedded in the Ghana Shared Growth and Development Agenda (GSGDA) 2014-2017.

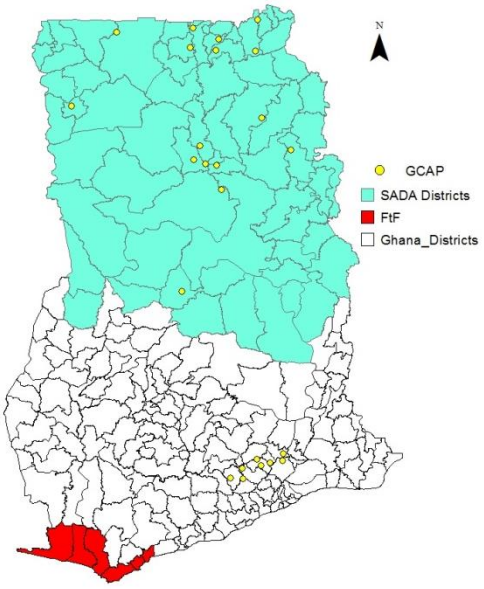
The Comprehensive African Agriculture Development Program (CAADP) is an Africa-wide policy for food security that aims at achieving sustainable land development and reliable water control systems; improve rural infrastructure and trade-related capacities for better access to market; enhance food supply and hunger reduction; develop, disseminate and adopt agricultural research; and sustainably develop livestock, fisheries and forestry resources.

FASDEP II is the government's long-term policy for the development of the agriculture sector. It is consistent with and integrates the policies of CAADP. Its key spatially-relevant strategies aim to improve food security and emergency preparedness; improve agricultural incomes; increase competitiveness and enhance integration into domestic and international markets; sustainably manage land and environment for food production and diversify agriculture production.

The government considers food security as the most important priority. 'Food security', according to FAO, is a situation where all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. According to MOFA, 'food security' is good quality nutritious food, hygienically packaged and attractively presented, available in sufficient quantities all year round and located at the appropriate places at affordable prices.

4.2.3 Key interventions, programmes and projects

There are at least three large interventions that are executing various aspects of the government's food production policies. These are Savannah Accelerated Development Authority (SADA), Feed the future (FtF), and Ghana Commercial Agricultural Project (GCAP). The geographic coverage areas are shown in the figure below.



Savannah Accelerated Development Authority (SADA)

The Savannah Accelerated Development Authority (SADA), an independent agency, was created to coordinate a comprehensive development agenda for the northern savannah ecological zone. The SADA area covers about 54 percent of the national territory stretching over 63 districts. It includes the three northern regions plus districts in the northern part of Brong-Ahafo and Volta

regions. The total land area of SADA may be considered as one of the government's adaptation responses to climate change, specifically to address floods and draught.

The agency's main aim is to create a "forested and green north by 2030". Two key strategies are tree-planting (for food production) and eco-system protection, especially in flood-prone river-beds. The trees provide a protective buffer against floods, help renew soils and enhance environmental regeneration to create an ecology similar to the rain forest zone. The target beneficiaries are poor peasants, especially women.

Feed the Future Project

Feed the Future (FtF) project, launched by USAID in northern Ghana in 2010 for an initial five-year period, aims at (i) improving the competitiveness of the value chains of three crops—maize, rice and soya—by increasing access to appropriate farming technologies and (ii) improving coastal fishery production in specific districts in Western and Central regions. Key strategies aim at improving the seed sector, increase access and use of agricultural inputs and technologies, and provide machinery to support mechanized rice and maize farming. At the coast, the project is establishing a sustainable fishery management program (SFMP). FtF operates in the SADA region and the coastal districts in Central and Western regions.

Ghana Commercial Agricultural Project (GCAP)

GCAP is a US$ 145 million project, funded by the World Bank and USAID, to develop the commercial agriculture sector in the SADA zone and in Accra Plains. Target beneficiaries are small-holders and out-growers. GCAP seeks to increase access to land, private sector finance and input-output markets, by smallholder farms through (PPPs) private-public partnerships. The project has hard and soft components. Its hard component includes land acquisition and development of large-scale irrigation canals, roads, power connections, warehouses and storage facilities. Its soft component includes supporting and extending investments, establishing a one-stop shop for investment; processing and ancillary businesses; providing assistance for the establishment and expanding farms with suitable linkages to out-growers. The project was launched in 2012 and preliminary field work in securing lands for farmers in the Accra Plains is under way.

4.2.4 Factors of production

There are different factors that influence production. The underlying causes of low productivity are poor soil conditions, low rainfall, diseases and pests, as well as limited access to planting materials, seeds and livestock breeds. There is also low adoption of existing technologies due to poor market incentives and inaccessibility to relevant inputs. Animal husbandry, especially rural poultry rearing, is plagued by high mortality rates due to diseases and poor management practices. There are limited appropriate technologies for processing, transporting, handling and storing crop, fish and livestock products. Also, limited knowledge of post-harvest management, particularly of perishable produce, has resulted in large losses, about 20 to 50 percent for fruits, vegetables, roots and tubers and about 20-30 percent for cereals and legumes, according to MOFA. Traditional processing techniques are arduous, and their widespread use, mostly by women, has resulted in low yields and in some cases poor product quality.

Agro-ecological zones and soil suitability

There are five main agro-ecological zones defined on the basis of climate, reflected by the natural vegetation and influenced by the soils. These are Rain Forest, Deciduous Forest, Transitional Zone, Coastal Savannah and Northern Savannah (Guinea and Sudan Savannah). The Rain Forest zone recorded the highest amount of rainfall of 2,200 mm in 2011 followed by the Deciduous Forest zone with 1,500 mm. The transitional zone recorded 1,300 mm while the Coastal Savannah received 800 mm of rainfall. The Northern Savannah recorded a total of 1,100 mm of rainfall. These rainfall patterns largely determine the length of growing periods (LGP) and, invariably, crop output. Generally, regions in the rainforest zones have high LGP and productions levels compared with the regions in the northern savannah. Policies towards provision of infrastructure like irrigation should consider these agro-ecological zones. Soil suitability has a major influence on crop type choice and crop

yield. Factors that determine soil suitability include the use of manure, irrigation, and water-holding capacity, these elements arguably play the most pivotal role in soil suitability. Soil suitability also reflects on the different ecological zones in the country.

Irrigation

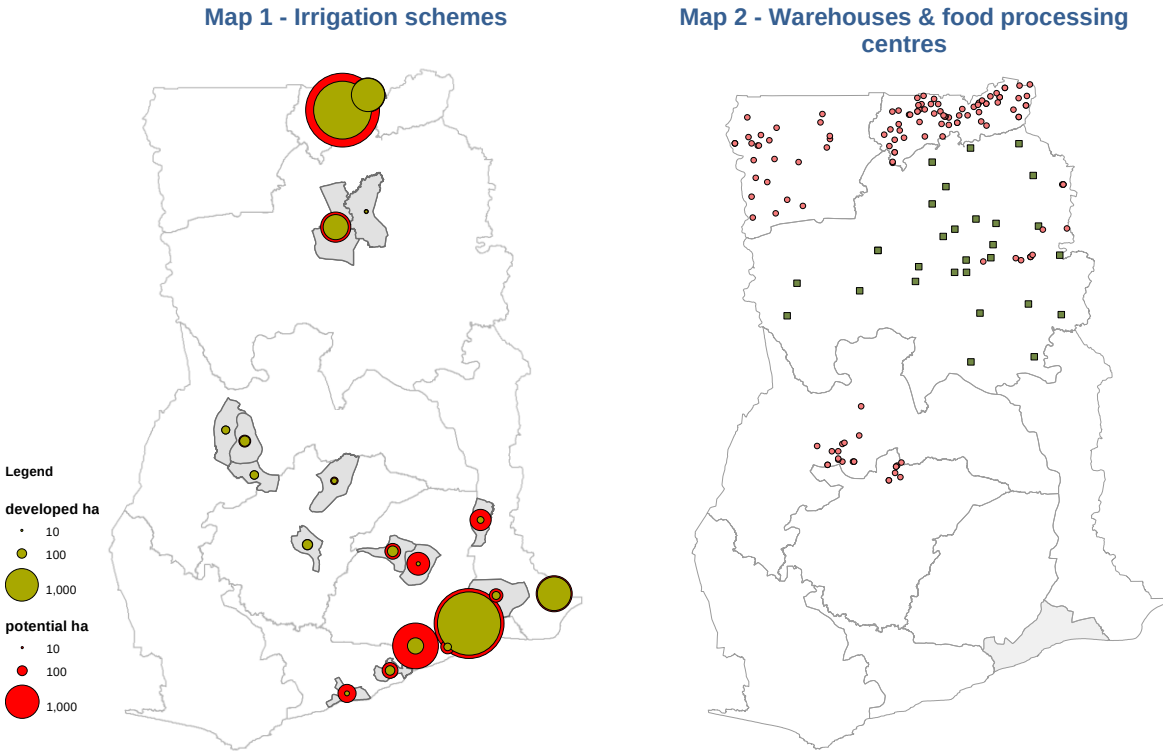
Ghana has few irrigation schemes and they only cover one percent of arable land. Further, most schemes are underperforming.

Irrigation is provided through formal and informal irrigation schemes. There are 22 formal schemes, implemented by GIDA, totalling 6,505 hectares; 22 schemes by the small-scale irrigation project (SSIDP); and six schemes under the small farms irrigation project (SFIP)[94]. Indigenous small-scale farmers are the main beneficiaries of all schemes.

Map 1 on Figure 4.1 shows the districts with existing and potential irrigation schemes, as well as the area covered. Table 4.1 provides a list of these schemes. A significant number of the schemes are located in the Greater Accra region where it may be argued that there is a lower need (it has relatively high rainfall) and where farm area is limited. Alternatively, it may be argued that the large urban market justifies this location.

[94] There are no data on the coverage of SSIDP and SFIP schemes.

Figure 4.1 Location of irrigation schemes / warehouses & food processing centres



Source: NSDF Study based on data from GIDA

Table 4.1 List of national irrigation schemes

District Name	Scheme Name	Town	Region	Potential Hectares	Developed Hectares
Kassena Nankana	Tono	Tono	Upper East	3840	2490
Dangme West	Dawhenya	Dawhenya	Greater Accra	3478	2986
Ga West	Weija	Kokrobite/Tuba	Greater Accra	1500	220
Ketu	Afife	Avalavi	Volta	950	880
Bongo	Vea	Vea	Upper East	850	850
Tolon Kumbungu	2schemes	2towns	Northern	670	490
Fanteakwa	Dedeso	Dedeso	Eastern	400	20
Kpando	Kpando Torkor	Kpando-Torkor	Volta	350	46
Mfantsiman	Mankessim	Baifikrom	Central	256	27
Kwahu-South	Amate	Amate	Eastern	202	101
Gomoa East	Okyereko	Okyereko	Central	200	81
Tema Municipality	Ashaiman	Ashaiman	Greater Accra	155	56
North Tongu	Aveyime	Aveyime	Volta	150	60
Techiman	Tanoso	Tanoso	Brong Ahafo	115	96
Ejisu-Juaben	Anum Valley	Nobewam	Ashanti	89	89
Offinso-North	Akumadan	Akumadan	Ashanti	65	65
Wenchi	Subinja	Subinja	Brong Ahafo	60	60
Sekyere West	Sata	Sataso	Ashanti	56	34
Savelugu Nanton	Libga	Libga	Northern	20	16
				13,406	8,667

Source: Ghana Irrigation Development Authority, 2013

Formal irrigation schemes are operating at only a third of their design capacity, with low yield and low cropping intensity as a result of poor management, poor maintenance and inadequate cost recovery. Informal schemes as well, have not realized their potential and are rarely serviced due to unclear institutional mandates (GIDA, 2013).

GIDA aims at improving existing irrigation schemes, develop new small-scale and micro-scale irrigation schemes and improve rainwater harvesting and storage, particularly in flood plains. Nevertheless, high capital costs are constraining the rate of new scheme development; for example, the 13 potential irrigation sites in the Upper West Region have yet to be developed.

Roads and transportation

Road and transport infrastructure are essential for moving agricultural commodities to markets and inputs to farmers. Poor road infrastructure and lack of suitable vehicles increases the cost of inputs such as fertilizer and increases the time and work in moving produce from farm to village or market. Poor infrastructure is constraining the development of agriculture in high potential areas such as the Afram Plains and northern parts of Western region. Reference is made to Chapter 5 for a detailed depiction of trunk and feeder road infrastructure.

Warehouses

Warehouses are an essential yet presently under-supplied component in the food system. Before harvests, warehouses store seed that would otherwise have been at the mercy of the weather. Postharvest losses are considerably reduced if warehouses are available. Where warehouses are available, farmers and investors tend to increase production because of the assurance of storage.

Map 2 on Figure 4.1 shows that only five regions (Upper West, Upper East, Northern, Brong Ahafo and Ashanti) have warehouses. However, according to USAID, many of these warehouses are in poor condition with no roofing, and construction is done with poor building materials. Recognizing the financial relevance of a warehouses system; the private sector and several other stakeholders including international donors have started to promote and provide warehouses, particularly in the northern regions, through assistance to farmers with building materials and technical support.

Markets

Most markets are decrepit, unhygienic and lack suitable commodity-specific storage facilities. Many are over-crowded, indicating that the demand for market space exceeds the supply. Other market-related constraints include lack of marketing skills, inadequate product development for effective use of farm produce, and generally weak commodity value chains. The value chain refers to the string of different processing steps that add value to a product. It includes input dealers involved in the production system and transporters, traders and processors involved in forward linkage activities. There is generally a lack of market orientation among producers and processors.

Fish landings, storage and aquaculture equipment

Fishery-related infrastructure includes landings, storage and processing facilities, and cages for aquaculture. Storage is needed for the fishing communities to prevent spoilage before processing and shipping. There are over 300 landing sites, but many are unsuitably located. For example, there is only one landing site (at Sekondi) in the Western Region even though it is one of the major fishery regions in the country. Further, aquaculture production facilities and equipment, such as hatcheries, ponds and cages, are inadequate with a limited capacity, particularly along the Volta Lake (MOFA 2012).

4.3 Food Crop Production

Although Ghana produces about 45 different types of cash and food crops, eleven of the most common are designated as "major crops" for priority government support to ensure food security (MOFA). These major food crops are maize, rice, millet, sorghum, cassava,

yam, cocoyam, plantain, groundnut, cowpea, and soya bean. Government also supports the promotion and production of other crops such as tomatoes, pepper, onions and ginger.

Other relevant crops include fruits (oranges, bananas, pineapples, mangoes, watermelon) and vegetables (cucumbers, carrots, cabbages, and lettuce). Improvements in the production and promotion of these crops are spearheaded by the private sector. Table 4.2 contains the list of crops cultivated in Ghana.

Table 4.2 List of all commercial crops in Ghana

tuber/root	legumes	cereal	fruits	cash crops	vegetables
yam	cowpea	rice	plantain	cocoa	tomato
cassava	soybean	maize	banana	coffee	onion
cocoyam	groundnut	millet	pawpaw	cotton	okro
sugar cane	melon seeds	sorghum	mangoes	oil palm	cucumber
potato		wheat	orange	rubber	carrots
tiger nuts		beans	watermelon	shea butter	garden eggs
			pine apple	cashew	lettuce
			guava	coconut	avocado pear
				tobacco	pepper
				kenaf	ginger
				kola nuts	

Source: MOFA, 2014

4.3.1 National characteristics of major food crop types

In terms of contribution to national and regional food security, some crops are more relevant than others. Relevance is indicated by four factors: production, popularity, coverage and yield. *Production* is measured by the total crop output in metric tonnes, *popularity* is measured by the number or percentage of districts that are producing the crop, *coverage* is measured by the total area that is planted with the crop (in km^2), and *yield* is measured by the amount of crop produced per hectare of area planted. Table 4.3 compares these factors for the eleven major crops based on MOFA data from 2012.

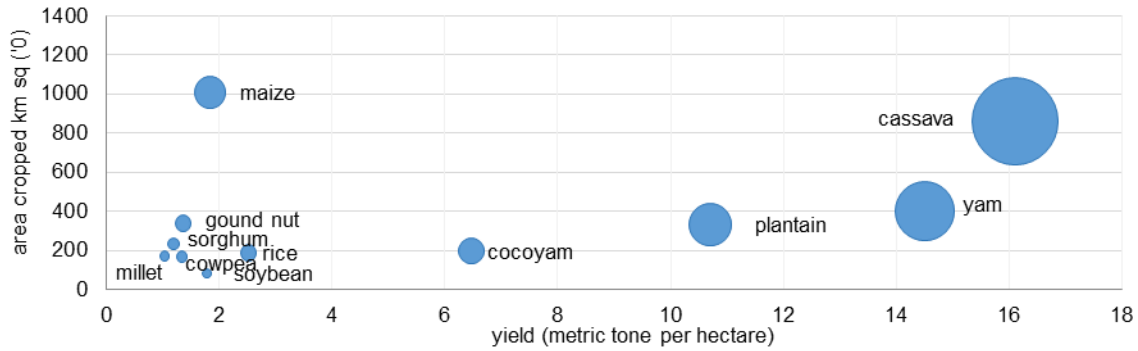
Table 4.3 Major food crops

	maize	cassava	yam	rice	plantain	cocoyam	cowpea	groundnut	sorghum	soybean	millet
popularity (# districts)	168	144	137	124	110	99	63	56	47	41	37
as % all dist	98	86		74	66	59	38	34	28	25	22
production ('000 mt)	1,876	14,547	6,639	481	3,557	1,270	226	475	280	152	180
coverage ('0 km^2)	1,008	859	399	188	332	195	167	339	233	85	172
yield (mt/ha)	1.87	16.1	14.5	2.53	10.7	6.47	1.34	1.37	1.2	1.78	1.04
						rank					
popularity	1	2	3	4	5	6	7	8	9	10	11
production	4	1	2	6	3	5	9	7	8	11	10
coverage	1	2	3	8	5	7	10	4	6	11	9
yield	6	1	2	5	3	4	9	8	10	7	11

Source: NSDF Study based on MOFA, 2012

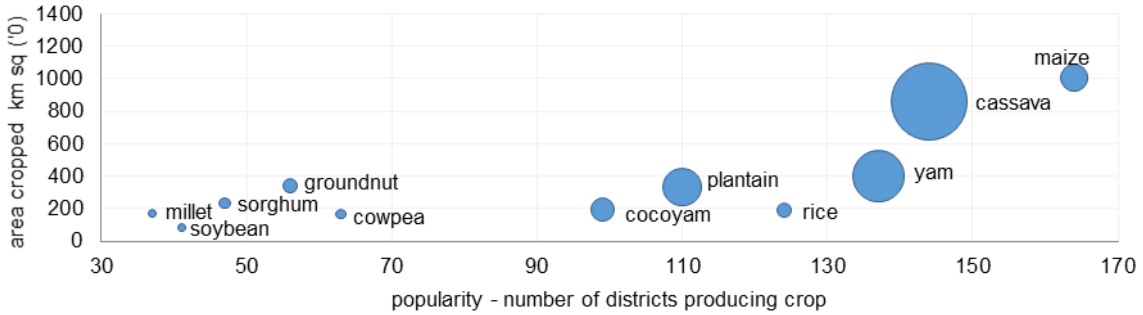
Figure 4.3 compares the major crops with respect to production, coverage and yield while Figure 4.4 compares these crops with respect to production, coverage and popularity. In both charts, the bubble size is proportional to quantities produced and the vertical axis gives the crop area coverage.

Figure 4.2 Crop production, coverage and yield



A number of patterns may be observed in the figures. For example, maize stands out as the most popular crop with the highest area coverage, but its yield is low and so therefore is its production. The three highest producers, cassava, yam, and plantain, have high yields and relatively high coverage and popularity; this seems rational as it makes sense to plant more of a high yield crop than one with low yield. Rice production is low due to low yields and low coverage, but it is the fourth most popular crop, and indication that there is a pent up demand to plant more should the conditions were more suitable. The remaining crops as groundnut, cowpea, sorghum, soybean, and millet, are form a cluster in which production, coverage and popularity are all low.

Figure 4.3 Crop production, coverage and yield



Source: NSDF Study based on MOFA data, 2012

Analysis of the major food crops with respect to the four factors of production, coverage, popularity and yields is summarised as follows:

- **Production:** Production levels varied from about 150,000 metric tons (MT) for soybean to over 14.5 million metric tons (MT) for cassava, which is almost half of the total production. Cassava is followed by yam and plantain with 6.6 and 3.5 MT respectively; these top three crops accounted for about 83 percent of the total production. As a group, cereals including maize, millet, rice and sorghum, accounted for less than ten percent of production.

- **Coverage:** Crop coverage varied from 850 km^2 for soybean to over 8,600 km^2 and 10,000 km^2 for cassava and maize, or 22 and 25 percent of the total respectively. As a group, cereals accounted for about 40 percent of the cropped area. Rice, one of the top five major crops, accounted for only 8 percent.

- **Popularity:** Crop popularity ranged from a low of 22 percent of districts that produce millet to a high of 99 percent that produce maize. Other popular crops,

produced in more than 50 percent of districts, are cassava, yam, rice, plantain and cocoyam. The popularity of crops is evidence that they can thrive in most agro-ecological zones and that they are valued as staples and perhaps as a means of supplementing incomes.

- **Yield:** The average yield from all eleven crops was about 7.5 mt/ha. Average yields for individual crops varied from just 1 mt/ha for millet to over 16 mt/ha for cassava. Yam and plantain had yields above the national average while yields for six crops, millet, sorghum, cowpea, groundnut, soybean, and, most importantly, maize, were less than 2 mt/ha.

4.3.2 Food production in regions

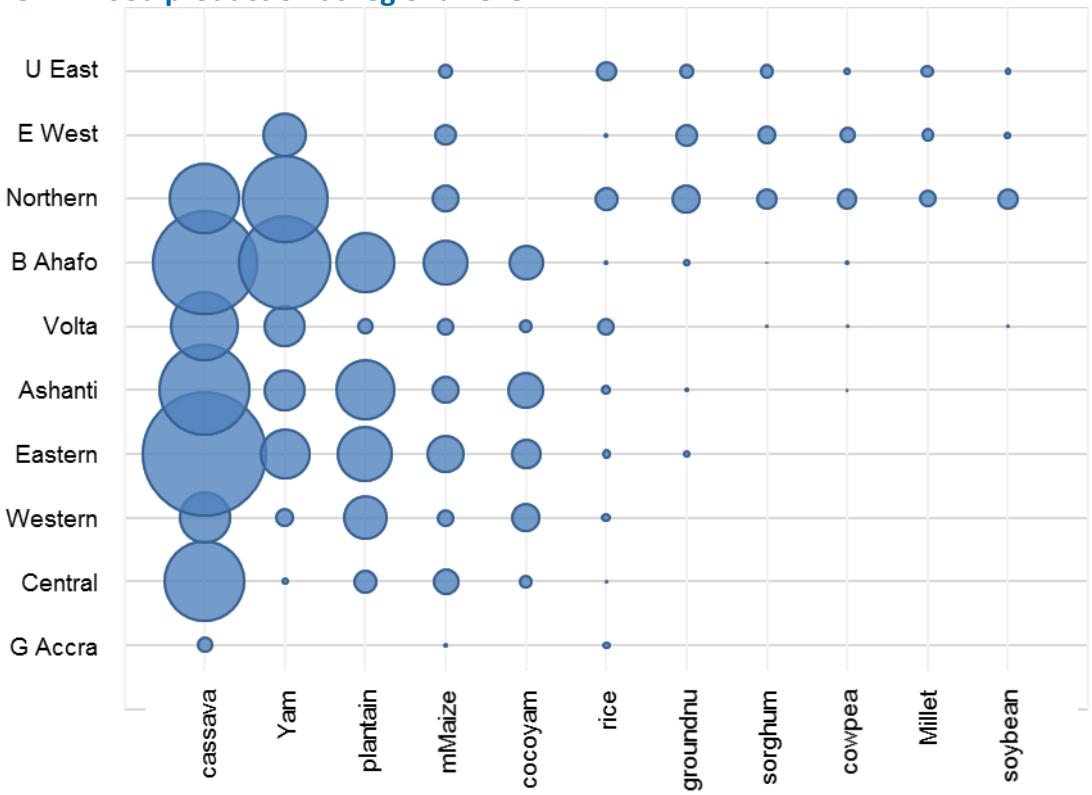
The distribution of food production quantities by region is shown in Figure 4.4. The most productive crops are ordered from the left column and the bubble diameter is proportional to the production quantity.

All regions display some degree of crop diversity, which is a key factor in food security, i.e. should one crop fail another may survive. All regions but Greater Accra produce at least seven of the eleven major crop types, while even Greater Accra grows three types. Brong-Ahafo and Northern regions are the most crop-diverse regions followed by Eastern, Volta, Ashanti and Upper West.

The 10 regions may be divided into two groups: (i) those that grow (mainly) the minor crops; rice, groundnut, sorghum, cowpea, millet and soybean; and those that grow the rest. The former comprise the three northern regions.

From a national perspective, combinations of crops in the regions seem to have different production advantages. For instance, cassava production is highest in Eastern, followed by Brong Ahafo, Ashanti and Central regions. Yam production is the strongest in Brong Ahafo followed by Northern Regions. Plantain production is about equal in Ashanti, Brong Ahafo and Eastern regions.

Figure 4.4 Food production at regional level



Source: NSDF Study 2013 based on MOFA, 2012

Major Crop Production

Major crops are largely concentrated in the southern regions, and some crops are more concentrated than others. For example, maize and rice are grown in all regions while eight regions grow yam. In general, the most productive crops are gown in the rain forest and semi-deciduous forest areas in the southern parts of the country. Apart from Greater Accra, all southern regions produce significant quantities of major crops. The Eastern, Brong Ahafo, Central and Ashanti regions have the highest production of the major food crops such as yam, cocoyam, maize and plantain. This is due to the fact that the rainfall pattern favours the southern parts making it possible for these areas to enjoy longer length of growing period.

Regions vary in the extent to which they contribute to national food production. Brong Ahafo's share alone accounts for 24 percent of national production, far more than its share of population and may be considered as the nations 'bread basket'. Other regions with large shares include Eastern, Northern and Ashanti regions, with 21, 15, and 14 percent respectively. The remaining regions, Central, Upper East, Volta, and Western, contribute less than 10 percent each. Greater Accra and Upper East regions contribute only percent each.

According to MOFA, current yields for cassava, yam, and plantain are about 16, 14 and 11 MT, respectively, these can be expected to increase significantly to about 45, 36 and 36 MT/ha, respectively, if the recommended MOFA policies are put in place.

Minor Food Crop Production

Figure 4.6 shows production of minor crops as well as the regions where they are produced. The five minor crops are cereals (millet and sorghum), cowpea, soybean

and groundnut. Minor crops are grown predominantly in the northern regions and in all cases production levels are relatively low. Nonetheless, due to favourable weather conditions and soil type, the three northern regions have a comparative advantage in producing these crops with Northern region the most productive. They also have large uncultivated areas that may support mechanized farming if the proper infrastructure is put in place.

4.3.3 Food production in districts

NSDF has analysed the spatial distribution of crop area coverage and average yields by district for the major eleven crops; Figure 4.5 for maize, cassava, rice; Figure 4.6 for millet, groundnut and cowpea; Figure 4.7 for plantain, yam and cocoyam; and Figure 4.8 for sorghum, soybean and the combination of soybean, sorghum, groundnut, cowpea and millet (SSGCM). In all Figures, *crop area coverage as a percentage of the district area* is given by the assigned colour to the district: light grey indicates lower coverage and dark grey represents higher coverage. Districts without production are shown in hatched lines. *Crop yields* are indicated by the size and colour of the circles. The two larger circles indicate above average yields while the two smaller circles indicate below average yields. Above and below average yields are further sub-divided into very-high and high for above average yields and low and very low for above average yields. The table below provides the legend.

Yield	designation	color	circle size
very high	VHY	red	4
High	HY	brown	3
Low	LY	yellow	2
very low	VLY	black	1

The larger red circles indicate very high yields (VHY); the brown indicate high yield (HY), the yellow circles indicate low yield (LY) and the black circles indicate very low yield (VLY).

Maize

Maize is certainly amongst Ghana's most important crops. It is the most popular and covers over 10,000 km^2, a quarter of all cropland. Yet maize yields are low; 1.87 mt/ha compared with the global average of 4 mt/ha, with a comparatively low rank equivalent to six. Given its high coverage, maize achieves a production rank of “four". Nonetheless, maize production is only about 13 percent of cassava, while consuming 17 percent more land. One may question whether it is rational to devote so much area to a crop that has such a low yield. Maize's high hectares-to-yield ratio suggests a strategy to focus on improving yield and replacing maize with a higher yielding crop. According to USAID's Feed the Future (FtF), 15 percent of maize demand is met through imports. While almost all districts produce maize, 61 have high-coverage but low-yields.

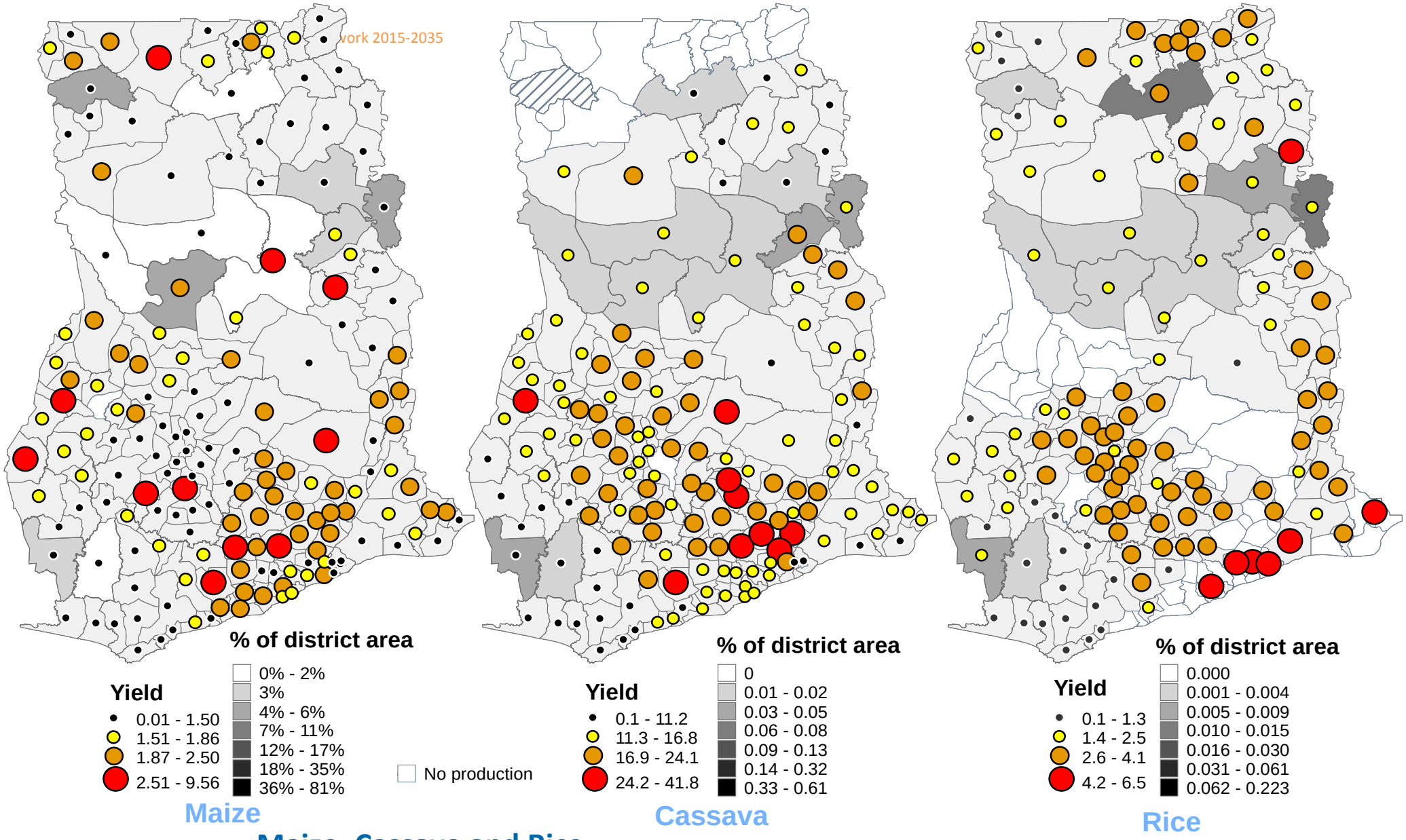


Figure 4.5 Maize, Cassava and Rice

Ghana National Spatia

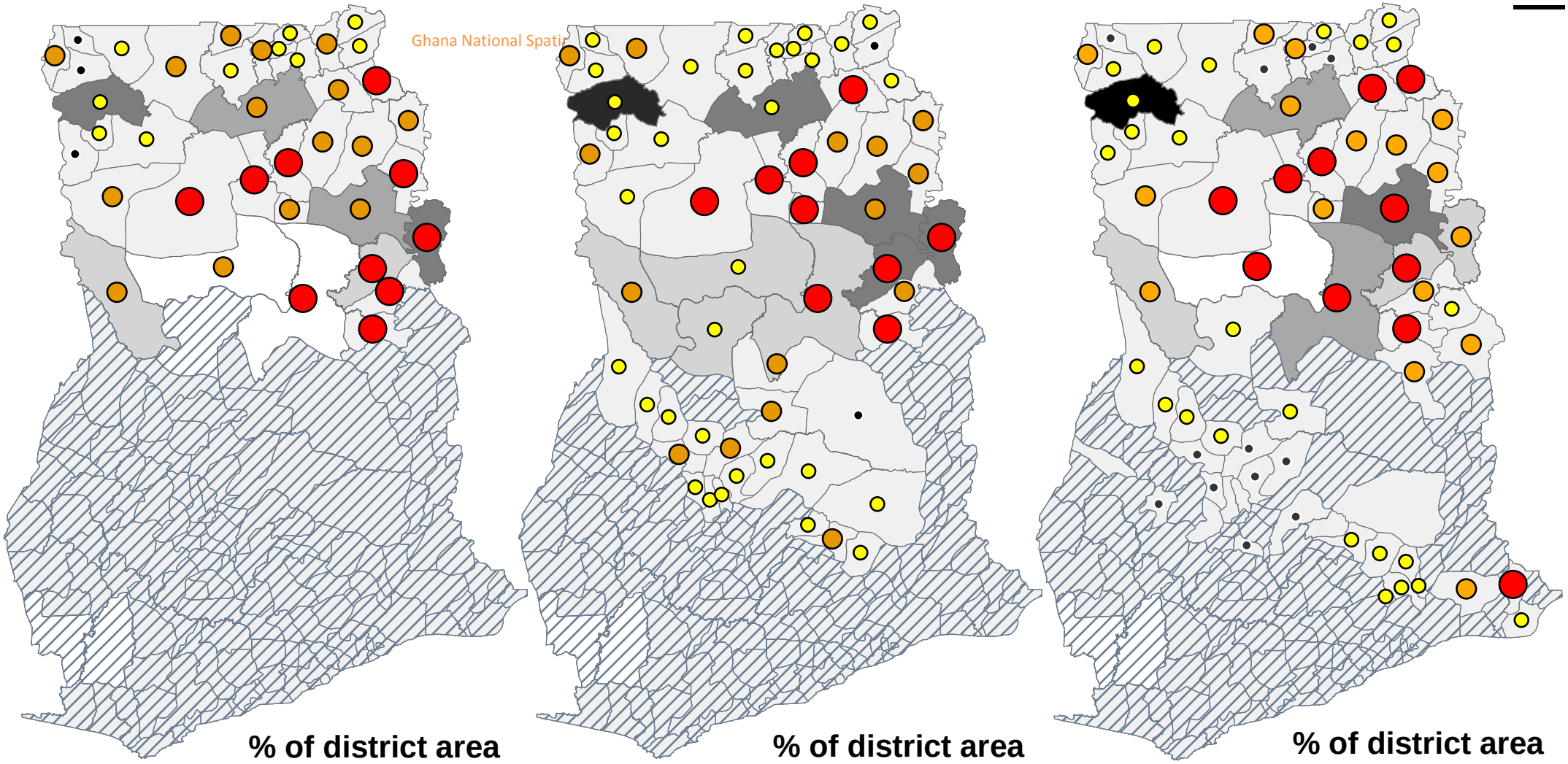


Figure 4.6 Millet, Groundnut and Cowpea

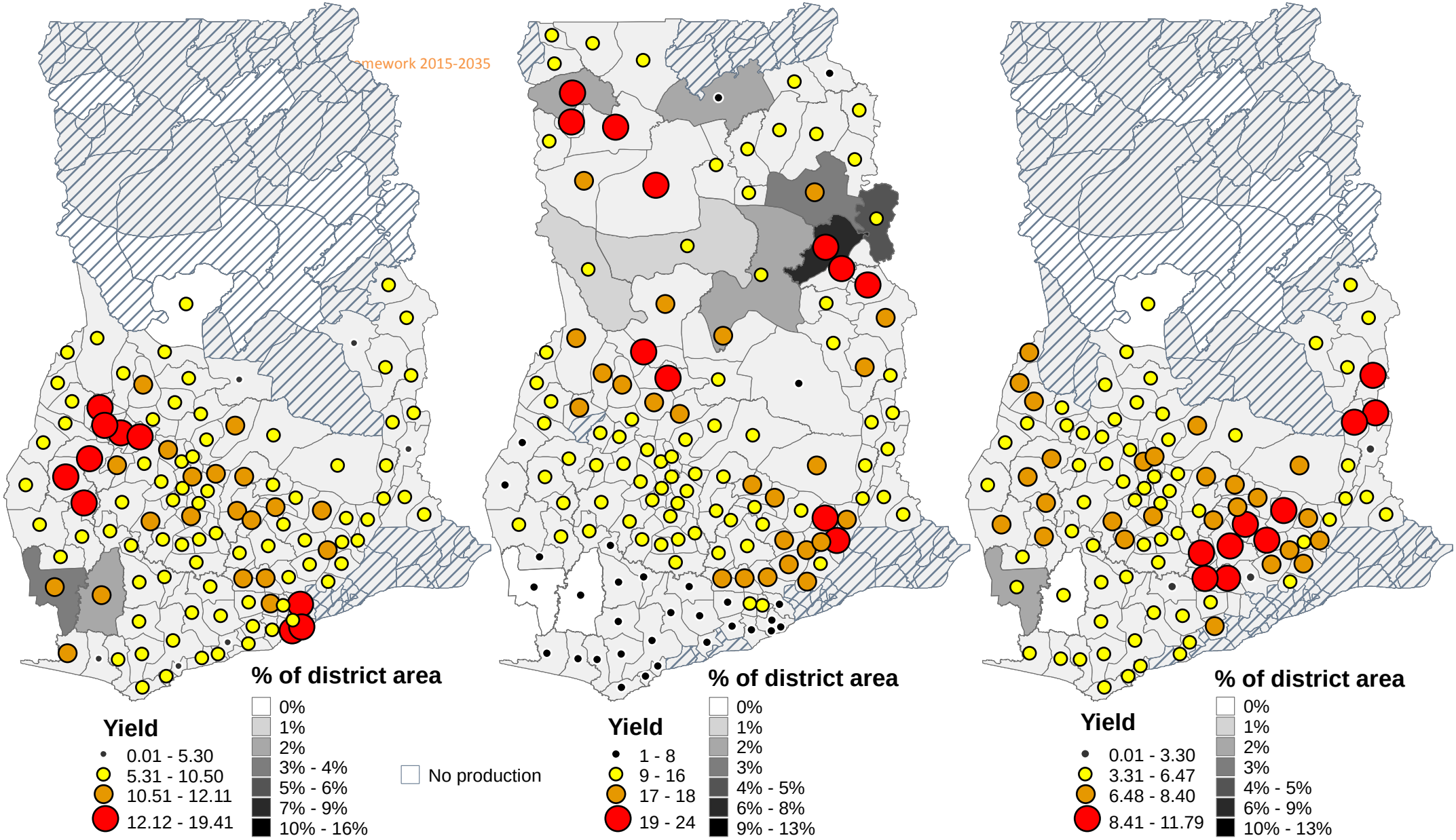


Figure 4.7 Plantain, Yam and Cocoyam

Ghana National Spati

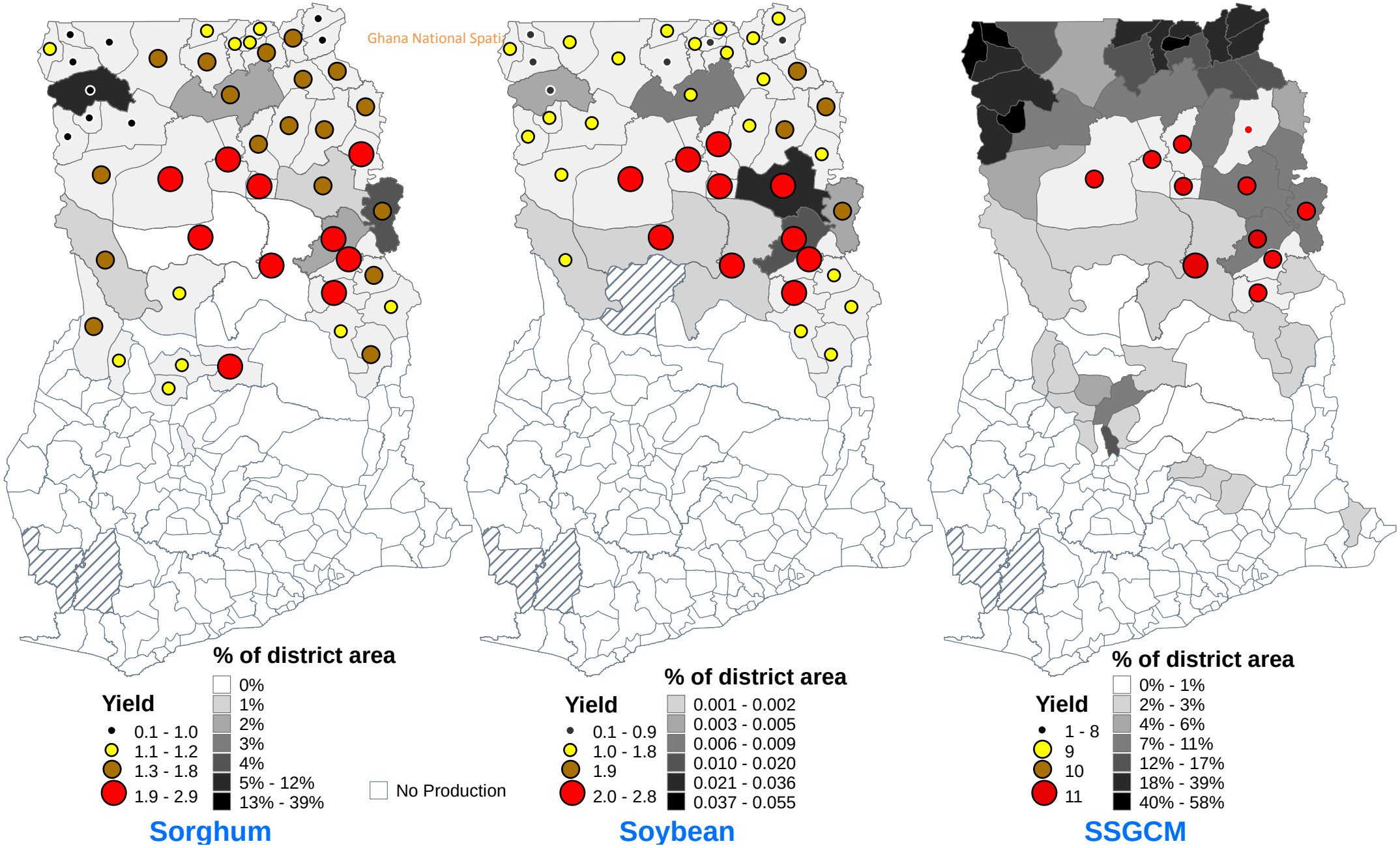


Figure 4.8 Sorghum, Soybean and SSGCM

Above average yield: Only 31 percent of producing districts have yields above the national average. Districts with above-average yields are found throughout the country. There are eleven VH yield districts in Eastern region and the rest of the VHs are scattered in the Brong Ahafo, Ashanti and two in Northern region. Sisala East, in the Upper East region, is among the districts with high yields. HY districts are also concentrated in Eastern region and some parts of Central and Volta regions.

Below average yield: Districts with below-average yield are spread across the country, particularly in the three northern regions and Western Region. All the intensively cropped districts in the three northern regions and most parts of Ashanti Region have VLY. For instance, the Tamale Metropolitan Assembly devoted about 50 percent of cropland to maize with returning yield of 1.5 MT per hectare.

Cassava

Cassava production dwarfs that of other crops, accounting for almost half (49%) of the total. This is due to its position as the highest-yielding crop (16.4 mt/ha) and second highest coverage. Produced in 85 percent of all districts, it comes close to achieving the popularity of maize. Cassava, in addition to maize and cowpea, is among the few crops that have two planting seasons in a year, which largely accounts for its high yield. Cassava's high yield and widespread popularity suggests that it deserves to be supported as a crop that ensures food security.

Above average yield: Out of the 144 districts, only 54, or 37 percent, are above average. Six of the VHY districts are in Eastern Region with one each in Brong Ahafo, Ashanti and Central Regions. HY districts are also concentrated in Eastern Region, while Northern Region has one.

Below average yield: All districts in Western Region, including all coastal districts are underperforming, although coverage is high. Western region has only two districts with LY while the rest have VLY. Like maize, cassava yields across the country are low. The greater quantities in output are dominated by a few districts in Eastern and Brong Ahafo districts. There is no cassava production in Upper East and Upper West regions.

Rice

Rice is produced in three-quarters of districts and hence fourth in popularity. Yet it ranks eighth in coverage. This may be explained by the special requirements of rice, mainly flat land and high water demand, which are less commonly found throughout the districts. Rice is not popularly grown among the leading food growing regions (Brong Ahafo and Eastern). Average rice yield (2.54 mt/ha) is also lower than four other crops and low compared with international standards of 5 mt/ha. Current rice production is not meeting domestic demand; according to USAID's Feed the Future (FtF) 75 percent of rice is imported.

Above average yield: Districts with above average yields are concentrated in five regions (Ashanti, Volta, Central, Greater Accra and Upper East Regions). Out of 124 districts, 74 have above average yield. It is important to note that the seven of the VHY districts have averages exceeding the global average yield of 5.0 MT per hectare and five are in Greater Accra region. Most districts (7 out of 9) in Upper East region have above average yields, signifying a potential in rice production. Most of the HY districts are concentrated in Ashanti, Volta and Eastern regions. Overall, percentage of district land in rice production is low. Nevertheless, districts with relatively higher rice coverage tend to have above average yields.

Below average yield: All districts in Western region registered below average yield and most of them are VLY. The rest of the below average yields are scattered in Northern and Upper East regions. There is no production in many of the districts in Brong Ahafo, Eastern and Central regions.

Yam

Yam has the second highest production level, second highest yield (about 90 percent of cassava's) and is third in popularity and coverage. Nevertheless, its land coverage is less than half that of cassava. This may be due to the planting season which is once in a year whilst cassava can be planted twice a year. It is one of the staple foods that are eaten in all parts of the country throughout the year. There is no production in Upper East Region and little production in the coastal districts. Out of 35 districts with above average yield, only 15 have between 12 and 25 percent of district land in yam production indicating that land cropped under yam is low. The 399 km^2 of land for yam production is less than half of 859 km^2 for cassava production.

Above average yield: Some 137 districts are producing yam out of which 35 districts, or 26 percent, have above average yields and eleven are VHY districts. There are four clusters of VHY districts. These start from the northwest (UW and NR) and descend to the northeast (NR and VR) through to central west (BA and AR) and finally down to southeast (ER and CR), forming a zigzag pattern.

Below average yield: The south-western part of the country comprising of the whole Western region and a greater part of the Ashanti region have yields below average. Whilst Ashanti region has LY, the whole of Western region has VLY among the below average districts. The rest of the below average yield are scattered in Volta south, northeast of Northern region and north of Upper West region.

Plantain

Plantain has the third highest yield (75% of yam's) and production level (half of yam's). It is grown in only the southern part of the country, from Brong Ahafo through to the coastal regions, and it ranks fifth in popularity and coverage. Quantities are exported to North America and Europe, mostly to meet the diaspora demand. Consumed in all regions, plantain has become a popular food which is processed and sold in most grocery shops and on the streets.

Above average yield: Quite a few districts have above average yields in the production of plantain. Out of the 110 production districts, only 31 districts (28%) have above average yields. Six out of the nine VHY districts are in the BA region with the remaining three in Central region. The HY districts are scattered in Ashanti, Central and the Eastern regions.

Below average yield: There are many producing districts with below average yield. These are in most parts of Western and Central regions with a few scattered districts in Brong Ahafo and Ashanti regions. All the districts in Volta region have LY with two being VLY. There is no production in the three northern regions and southern Volta.

Cocoyam

Cocoyam is another comparative advantage crop and is not as popular as plantain. It ranks sixth in terms of popularity making it the least among crops predominantly grown in the rain forest zone. Land assigned for production is ranked seventh reinforcing its unpopularity. Though average yield is relatively high (6.5 mt/ha), rice and maize, which have lower average yield, are more popular. Cocoyam may not

rank high as a staple food across the country. Cocoyam, in addition to plantain, is another example of comparative advantage crop grown in the rainforest zones, though not popular like plantain in terms of land cropped and coverage.

Above average yield: Some 27 districts out of 99 have yields above the national average. Districts with above average yields are located mainly in Eastern region. Fewer districts in Volta, Brong Ahafo and Central regions have above average yields in these two crops. Seven of the VHY districts are concentrated in Eastern region and the remaining mainly in Volta region. Eastern region alone has more than half of the (17) districts with above average yields.

Below average yield: Most low yield districts are in Western and Brong Ahafo regions with a few scattered in Ashanti and Volta regions. Percentages of land cropped for cocoyam are low with about 85 percent of districts cropping below five percent of district land.

Groundnut

Only 34 percent of districts produce groundnuts. However, it is the highest in production and coverage among the classified minor crops grown mainly in Northern region. It is considered as both food crop and as an industrial crop for oil production. Out of the minor crops, groundnuts have the highest production (475,000 MT), with a coverage of 3,390 km^2, popularity (56 districts) and has a national average yield of 1.37 MT/Ha.

Above average yield: Only 26 out of 56 districts have above average yields and more than 61 percent of these are concentrated in Northern region, which is a major producer. All nine VY districts are in Northern Region. HY districts are scattered in Upper West Eastern, Ashanti and Brong Ahafo regions.

Below average yield: Northern region has four districts with below average yields. All the districts in Upper East region have below average yields although a large number of districts have high percentage of district land cropped. Bongo district has the highest percentage of district land cropped. The only two VLY districts are in Upper East (Gaur Timpani) and Brong Ahafo regions (Sene). Upper West region has many districts with high percentage of land cropped yet average yield is low for most of these districts. The remaining of the VL districts are scattered in Ashanti, Brong Ahafo and Eastern regions.

Millet

Millet has the lowest rank in popularity. Only 37 districts plant millet and production and coverage are low, surpassing only soybean which ranked last in both categories. Only the three northern regions produce millet and its consumption in the rest of the country is low.

Above average yield: Northern region has the most districts with above average yield in Millet. All ten VHY districts are located in Northern Region. Out of the 26 above-average yield districts, only five are located in Upper East and Upper West regions, although these two regions have districts with high percentage of district land cropped.

Below average yield: Northern region has no districts with below average yield in millet. Upper West Region has the only three VLY districts but a high percentage of district land cropped. These districts are Lambussie, Jirapa and Wa West.

Cowpea

Cowpea is one of the most important grain and fodder legume crops in Ghana. Over 75 percent of annual national output is realized in 63 districts within the three northern regions. The other regions that also produce cowpea at minimum scale are Ashanti, Brong Ahafo, Eastern and Volta regions. Ranked 10, cowpea uses the least land cropped next to soybean and has a national average yield of 1.34 MT/Ha.

Above average yield: Some 28 out of the 63 districts have above average yield and all but six are in Northern region. Apart from the Akatsi district in Volta region, all the VHY districts are in Northern region.

Below average yield: Northern region has only one LY district. The rest are concentrated in Upper West, Upper East, Brong Ahafo and Ashanti regions. Upper West region, with many VLY districts, has the highest number of districts with high percentage land cropped whilst Upper East region has only one. Land cropped for cowpea is comparatively low.

Sorghum

Sorghum has the second lowest average yield after millet. Only 47 districts (28%) grow sorghum; these comprise all districts in the three northern regions plus six in Brong Ahafo and two in Volta region. According to FAO, sorghum is the world's fifth most important cereal following maize, wheat, rice and barley and accounts for 50 percent of the total cereal crop land area in most West African countries.

Above average yield: All ten VHY districts are in Northern region except Atebubu District in Brong Ahafo. The 18 HY districts are scattered across all the producing regions. Sorghum is the only crop in which all the districts of a region (Northern region) have above average yields. This indicates that Northern region has the highest potential in the production of sorghum. Upper West region has only one above-average yield district (Sisalla East), even though the percentage of district land cropped is high across the region.

Below average yield: LY districts are to the north and south of the producing area, while VLY districts are all to the north in Upper East and Upper West regions. It is a matter of concern that these low yield areas also have high crop area coverage.

Soybean

Although soybean has high nutritional value, its level of production and land coverage is the lowest in the country. It is grown in only 25 percent of districts and thus has the second lowest popularity.

Above average yield: All of the 14 districts with above-average yield are in Northern Region, and all of the VHY districts are contiguous, which indicates that this area has the most suitable conditions.

Below average yield: Districts with below average yields are in the remaining of the producing regions, with the VLY districts all in Upper East and Upper West regions.

Core High Yield Districts for Combination of Crops

It is important to identify districts that have high yields in a combination of different crops. The identification of such HYD will enable the identification of prime areas for immediate production investments to ensure food security. The core HYD are categorised into two classes based on comparative regional advantage in production. Map 3 on Figure 4.8 shows the core HYD for soybean, sorghum, groundnut, cowpea and millet, or SSGCM. Comparatively, these crops have high

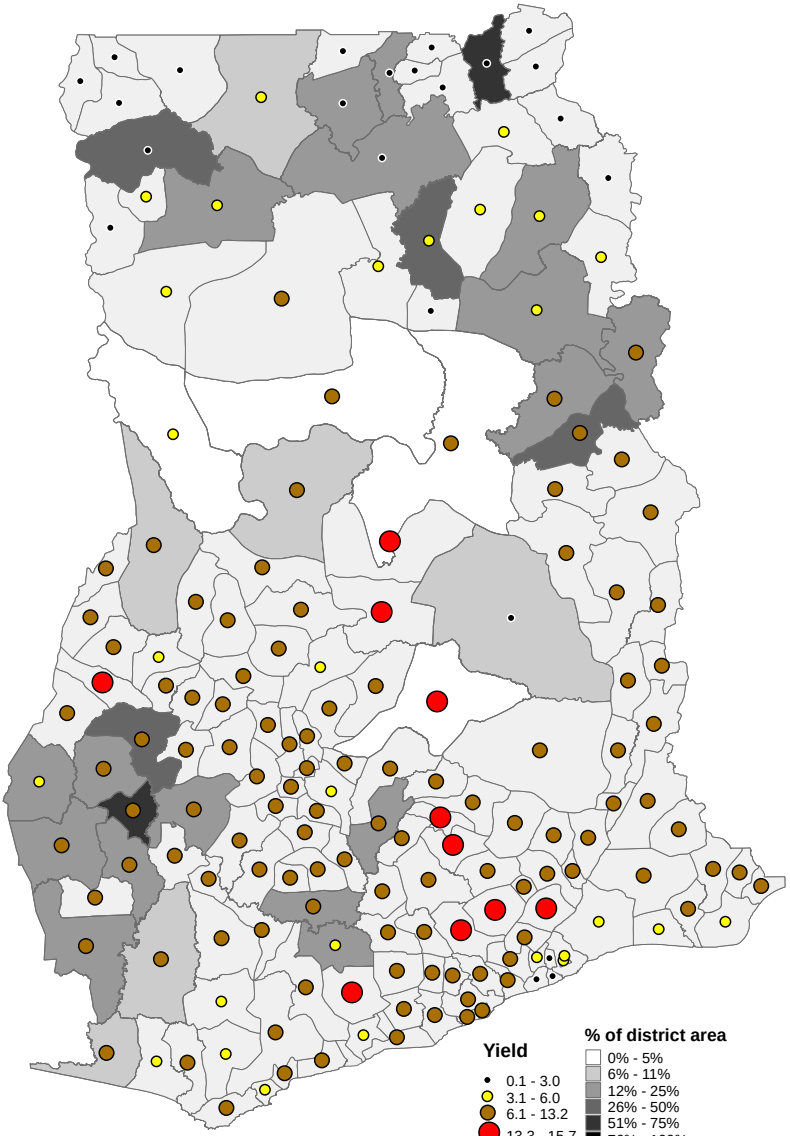
yields in the three northern regions. Within the three northern regions, average yield for a combination of the five comparative advantage crops are high only in nine districts and are concentrated in Northern region. The percentage of district land cropped are relatively high in districts within Upper East and Upper West regions, though, combination yields are very low. These combinations will determine districts that need be targeted and considered for immediate investments in the government policy to offset the deficit in the supply of crops like millet and sorghum for domestic consumption and also promote food security in general.

4.3.4 National perspective on production, yield and coverage

The combined average yield for the major food crops in each district, as well the total cropland intensity, are shown in Figure 4.9. Core high yield districts are those with above average combined yields. In general, with the exception of a few districts, above average yield districts are in the south and below average yield districts are in the north. The main exceptions are in Greater Accra and the southern part of Western region. Districts with high coverage of above 50 percent are mainly in Eastern and Brong Ahafo regions and in and around the regional capitals in the three northern regions.

Although the cropland intensity in districts in the three northern regions is high, the combined average yield of all but six is below the national average. Significantly, there are no districts in Upper East and Upper West regions with combined, above-average yields. Regions with well-performing districts comprise Eastern, Brong Ahafo, Ashanti, Volta, Central and (parts of) Western. However, one should not lose sight of the fact that some of the districts in Upper East and Upper West regions are performing well in the single major crops such as rice, maize and yam. All the districts in Upper East region were VLY reflecting FAO's assessment that five of the ten districts in Ghana with severe food insecurity at household level are located in Upper East Region. Figure 4.9 also shows the challenges for food production in the three northern regions.

Figure 4.9 Combined yield and coverage of all crops

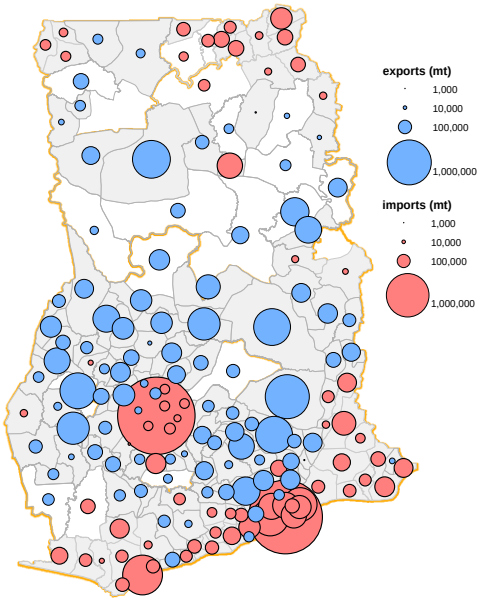


Source: NSDF Study based on MOFA, 2012

Food supplies (export/surplus) and demand (import/deficit)

In addition to other definitions, regional and district food security may be defined as the extent to which a region or district can feed its population from the food that it produces within its own boundaries. NSDF has prepared a rough analysis of regional and district food security by comparing the per capita national production with the per capita regional and district production. It then calculates the total quantity of food that must be imported or exported between regions and districts in order to provide each person with the per capita quantity.

Figure 4.10 District food crop production and food crop demand



Source: NSDF Study based on MOFA 2012 and GSS Population Census 2010

Figure 4.10 shows the districts producing more food than consuming and vice versa. With the exception of Upper East Region, which shows extensive deficits region-wide, all districts with food production deficits are mainly those with larger urban centres. This emphasizes that food production is predominantly a rural activity acting as suppliers to meet the excess demand in the urban centres. Districts producing the most food crops will certainly have to be accorded priority in the provision of agricultural infrastructure.

4.3.5 Horticulture

The production of horticultural crops has become an important agricultural activity across the country. Horticultural crops in Ghana comprise fruits and vegetables. Fruits include pineapple, mangoes, oranges, watermelon, bananas and papaya; vegetables include chillies, okra, eggplant, guar beans, tinda, gourds, marrows and yard long beans. There are very few large-scale growers and most fruits are cultivated and grown by small growers.

Central region dominates overall production and has specialised in pineapple, mangoes, oranges and watermelon. Volta and the three northern regions specialise in mangoes. Export vegetables, including chillies, okra, eggplant, guar beans, tinda, gourds, marrows and yard long beans, are cultivated in the southeast, particularly in Eastern and Greater Accra regions.

Horticulture production is marketed in one of these three ways; one part is sold unprocessed to the local market and these include all the citrus, distributed as fresh fruits, one part which is the canned and bottled fruit drinks processed for the domestic market, and one part is processed for export to the international market. Exports, which have grown significantly in the last two decades, comprise mostly pineapples, citrus fruits, bananas and papayas. More than 70,000 tonnes of fruits are exported. Pineapples, bananas and papaya are exported to Europe, while citrus finds its way to neighbouring Togo.

Exporters use both air and sea routes. Sea freight is the most common, but some papayas and pineapples are also exported by air. The government has taken proactive steps to help horticultural exporters by linking them to the Sea-Freight

Pineapple Exporters of Ghana (SPEG). One of the largest exporters of pineapples in the country is Farmapine, which is a co-operative of small growers.

The horticulture export sector is underperforming primarily due insufficient support to growers. The major challenge is educating the growers about quality issues, and as most are small-scale growers, the task remains a great challenge. Many growers and exporters have tried to conform to EU rules and regulations, but only few have so far succeeded. Vegetable export faces problems with repackaging, for example, vegetables are repackaged in open air at the airport, which often lowers their quality and decreases their shelf life.

4.3.6 Food production land area

In 2012, about 16 percent of the nation's land area was used for food crop production, or 0.15 hectare per capita (see Table 4.4). Put another way, each hectare of cropland feeds just over six persons. Crop area as a percentage of regional area ranges from 37 percent in Upper East to 9 percent in Greater Accra. Regions with above-average percentages may be classified as more food secure.

Regions, however, also differ in terms of their average yields, which range from 160 percent of the national average to only 18 percent. If the objective is to increase production, what matters more than land area or yield alone, is their combination in a concept that NSDF terms *yield-area*.

From a national food security perspective, it is more economical to increase cropped area in the region(s) with the highest yield(s), such as Eastern, Brong Ahafo, and Volta. However, from a regional view, it is more economical to increase the cropped area.

Table 4.4 Regional Land Area under crops

	regional area (km2)		food production area			average yield		yield-area	
	area (km2)	% of nation	area (km2)	% of nation	% region	avg. yield	as % national	yield-area	as % of nation
Eastern	18,857	8	5,253	14	28	1.23	162	6,461	21
B Ahafo	40,197	17	6,176	17	15	1.17	154	7,226	24
Volta	20,408	9	2,043	5	10	1.02	134	2,084	7
Ashanti	24,075	10	4,815	13	20	0.9	118	4,334	14
Central	9,588	4	2,523	7	26	0.87	114	2,195	7
Northern	69,896	29	6,281	17	9	0.71	93	4,460	15
Western	24,319	10	2,628	7	11	0.67	88	1,761	6
G Accra	3,782	2	337	1	9	0.66	87	222	1
U West	18,644	8	4,008	11	21	0.29	38	1,162	4
U East	8,736	4	3,247	9	37	0.14	18	455	1
TOTAL	238,502	100	37,311	100	16	0.76	100	30,359	100

Source: NSDF Study based on MOFA, 2013

By regional land area, the eastern part is a high food producing area that can benefit from land availability as a means of increasing production. There is the need for lands within the country that can be used to increase crop land in all regions.

4.4 Cash Crops

The three main cash crops in Ghana are cocoa, rubber, oil palm, these are discussed in this section. Other cash crops such as cotton, cashew nuts, shea butter, coconut and coffee are also grown. Most of these are produced by small-scale farmers.

4.4.1 Cocoa

Cocoa is the top agricultural export product. In 2011, cocoa accounted for over 22 percent of the total foreign earnings and 63 percent of the foreign export earnings from the agricultural sector (ISSER, 2011). Cocoa production also has backward and forward links to other enterprise such as chemical companies, input distributors and cocoa buying companies.

Cocoa is produced on some 350,000 small-sized farms that provide jobs to over 800,000 smallholder farm families (COCOBOD). Farm sizes range from 0.4 to 4.0 hectares and total about 1.6 million hectares (COCOBOD, 2011). Earnings from cocoa account for between 70 and 100 percent of household income.

Historically, cocoa production began in Eastern Region and gradually expanded to Ashanti, Brong-Ahafo and then to other regions. While today it is produced in six regions, Western, Ashanti, Central, Eastern, Brong-Ahafo and Volta, the bulk of cocoa is produced in Western region, which accounts for about 52 percent of the national output (COCOBOD 2012).

4.4.2 Rubber

Rubber production in Ghana is expanding; it nearly doubled between 2000 and 2010 from 11,000 to 20,000 metric tons. The industry is largely dominated by the Ghana Rubber Estates Ltd (GREL), owned by the Michelin Tyre Company that is engaged in planting, processing and exporting. There are also a few small-scale producers who sell their rubber to GREL.

While Western region presently has the largest plantation area (about 8,500 hectares), there is limited scope for this increasing. Instead, plantation increases are planned in Central and Brong Ahafo regions.

Rubber is presently processed at GREL's factory. A tyre factory near Tarkwa which had been operational since the 1960s ceased production. Tyres are now produced in two major plants in Nigeria and South Africa. Even though there is scope for another plant, it is more likely to be sited in Côte D'Ivoire or another country with larger rubber estates. However, there may be scope for other uses of rubber, such as Tema's foam production plant, particularly in conjunction with petrochemical industry.

Rubber production raises environmental concerns. It is more intensively planted than oil palm and hence more destructive and soil-depleting. For example, rubber-growing areas cannot be used for other crops for as long as twenty years.

Rubber also tends to crowd-out production of food crops, increasing food insecurity. In recognition of this fact, GREL now gives 25 percent of land area in new out-grower schemes for subsistence crops.

4.4.3 Oil Palm

Oil palm is a popular crop across the rainforest zone. There are seven major oil palm producers and a large number of small-farmers, many of them are out-growers whose products are bought by large companies. More than 80 percent of oil palm is

produced by private small-scale farmers. Most oil palm products are processed in very large scale plants such as in the Unilever Factory at Tema. The oil is extracted locally and on a large scale at the Benso Oil Palm Plantation (BOPP) in Western Region, today owned by the world's largest palm oil trader, based in Malaysia.

Ghana has over 350,000 hectares of oil palm that produce about 240,000 metric tons. Productivity, however, varies widely from about 3 tons/ha to up to about 20 tons/ha in some valley bottom plantations. Being a traditional forest tree crop, outgrowing is more likely to be combined with food crops. The different intensities of cultivation have different impacts on food security and biodiversity.

The oil palm industry has potential for expansion. There is a large unmet demand of 35,000 mt in Ghana and 850,000 mt in the ECOWAS region. I**t is estimated that some** one million hectares (10,000 km^2) are **suitable for oil palm plantations in five regions:** Western, Central, Ashanti, Volta and Brong Ahafo.

As a result, palm oil production has the support of government and several donors. For example, Agence Francaise de Developpement (AFD) is funding a master plan for the oil palm sector and supporting a 3000 ha out grower project in Upper and Lower Denkyira Districts in Central Region. The World Bank sponsored Agriculture Services Sub-Sector Investment Programme (AgSSIP) is expanding seednuts production capacity of Oil Palm Research Institute (OPRI) from 2 million to 5 million seednuts per year. The President's Special Initiative (PSI) on oil palm is supporting 20,000 ha of small-scale farms.

4.4.4 Other Cash Crops

Additional crops to those mentioned above include cotton, sugar cane and cashew nuts.

Cotton production (cultivated and semi-processed) is gradually gaining ground in parts of Northern and Upper West regions, despite the low level of support from the government. Large tracks of land has been acquired in the Sisala East, Tolon and Gonja districts by private companies to promote cotton production. These companies also offer support services to out-growers in form of making available seedlings, credits and ready markets.

Sugar cane is a major grass crop that once received government support. Mechanized farms were established in Asutware in Eastern Region and Komenda in Komenda Edina Eguafo Ashiem (KEEA) district. In addition to these mechanized farms, there are many small scale farmers in most parts of country, particularly in Western, Central and Eastern regions. Outputs were used as raw materials to support the sugar factories in Asutware in Eastern region and Saltpond in Central region. While these factories have closed down and most large farms no longer plant sugar cane, small scale farmers are still in production and their outputs are used to process molasses and other local gin.

Cashew is produced by small scale farmers across the country and particularly in the three northern regions. Outputs are processed into roasted cashew nuts by an industry located in the Tema free zone industrial enclave. However, production of cashew is low, prompting the processing industry to supplement with importation from Ivory Coast.

4.5 Livestock and Poultry Development

The government's food policy includes ensuring an adequate supply of quality animal products for healthy diets and adequate nutrition. The most spatially relevant strategies to achieve the policy objective are:

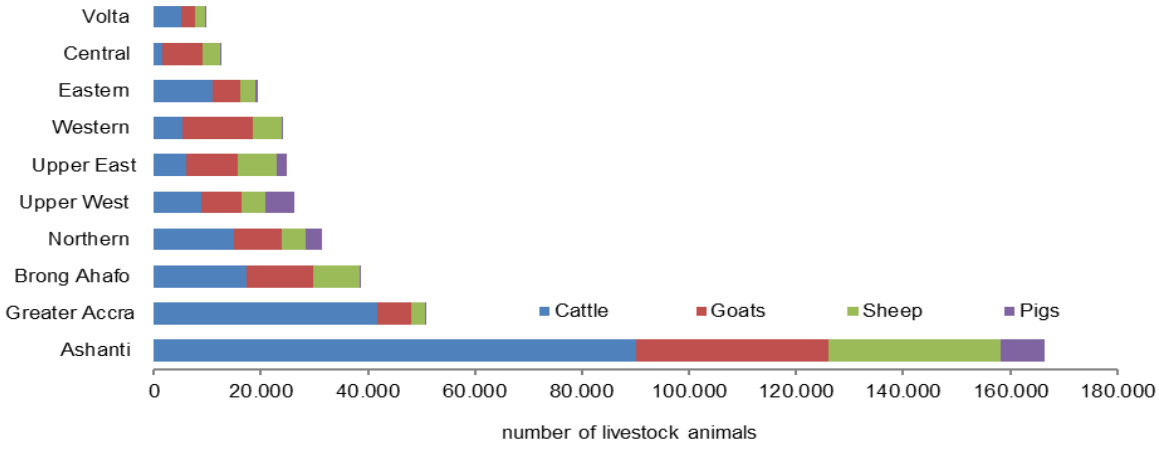
- support to large-scale cultivation of maize and soybeans for animal feed;
- research into large-scale breeding and production of guinea fowls, cattle, sheep and goats, especially in the northern regions;
- improving the dispensation of animal health services as well as instituting mass vaccination against pests in small ruminants and Newcastle disease in poultry;
- improving access of operators to technology and appropriate financial instruments to enhance their competitiveness;
- designing appropriate interventions to address processing and marketing of livestock;
- increasing awareness on food safety and public health and strengthening the enforcement of quarantine regulations on livestock movement.

MOFA's Animal Production Directorate operates seven livestock breeding and technology transfer stations as part its policy to promote livestock breeding. These are located at Kintampo in Brong Ahafo; Ejura in Ashanti; Babile in Upper East; Tamale in Northern; Aveyime in Volta; Nungua and Amrahia in Greater Accra. The stations have various specialities, for example, the Ashanti station breeds sheep, Upper East breeds pigs, and Kintampo breeds goats.

The five main types of livestock are cattle, sheep, goats, pigs and poultry. Regional distribution of livestock sub-sector is available only in terms of the place of slaughter and not at the place of production, which is likely to be different[95]. Nevertheless, the place of slaughter may be assumed to be close to the place of consumption. Thus the ratio of population to livestock may be an indicator of demand for meat products, and comparing this ratio across regions shows where the demand is highest. Places with higher demand for meat products are where policies could ensure sufficient area for livestock raising.

Figure 4.11 shows the region of slaughter of livestock in 2012. There is no consistent pattern in regional variations in the number of animals slaughtered in relation to regional human population except that Ashanti region with the highest regional population invariably dominates the slaughter of the types of livestock.

Figure 4.11 Region of slaughter of livestock



Source: NSDF Study based on Veterinary Services Directorate, MOFA, 2011

[95] ISSER's "State of the Ghanaian Economy in 2011"

4.6 Fisheries

The fisheries sector plays an important role. It contributes significantly to national economic development objectives related to employment, livelihood support, poverty reduction, food security, foreign exchange earnings and resource sustainability.

Fish are a preferred source of animal protein in Ghana and account for about 60 percent of animal protein intake and the main source of animal protein for some 50 percent of Ghanaians. Per capita consumption is estimated to be about 25 kg per annum. About 75 percent of the total annual domestic production (440,000 metric tons) is consumed locally, while another 410,000 metric tons is exported.

Fish are the country's most important non-traditional export commodity. The industry accounts for about five percent of the agricultural Gross Domestic Product (GDP) and three percent of total GDP. Export earnings from fish and fishery products on average account for about US$ 60 million annually.

Fish production may be split into three components: marine; inland freshwater fisheries that include lakes, rivers, ponds, lagoons and other water bodies; and aquaculture. Marine fishery is the mainstay of the sub-sector and has been a significant non-traditional export since the introduction of the Economic Recovery Programme in 1984. The area of operation for this is the Eastern Central Atlantic Fishing Area which spans most countries in the West Africa sub-region. The Ghanaian coastline is 528 kms long with an exclusive economic zone (EEZ) of over 218,000 km^2 and continental shelf of 23,700 km^2, with most of the country's major rivers pouring into the sea. The Volta Lake, reservoirs, fishponds and coastal lagoons are the main sources of freshwater fish.

There are about 200 fishing communities with an estimated two million fishermen, processors and traders who participate in this sector. These include not only fishermen but the upstream and downstream occupations such as processors, traders, exporters, boat builders and middlemen. These workers and their dependants comprise ten percent of the population.

Fish imports and export

Ghana's fish exports comprise of frozen fish, tuna, dried or smoked fish and cuttlefish. The largest exported species include anchovy, chub mackerel and round as well flat sardinella, which as a group account for almost 70 percent of the total marine catch. Lake Volta is a stable and consistent contributor to freshwater catch, accounting for almost 16 percent of the national output.

Promotion of fisheries development

The fisheries sub-sector is confronted with a number of issues. These include; insufficient monitoring and control to ensure compliance with laws and regulations on fisheries; weak collaboration with coastal fishing communities; lack of alternative livelihood opportunities and inadequate fishing infrastructure, including the use of over aged fishing crafts and other obsolete fishing methods. All of this leads to over-fishing and a continual decline in output.

The government is addressing some of these issues, for instance; it has offered additional support to the Department of Fisheries and Aquatic Science, Biological College, KNUST, to train extension officers and technicians for marine and inland fisheries. It is also planning to promote "Fish Farmers Associations" and train them as service providers. Finally, it is encouraging private sector investment in

aquaculture including in the breeding and production of fingerlings and enhanced management of different fish species.

4.7 Recommendations and proposals

Recommendations and proposals are divided into food crops and cash crops. Most importantly, recommendations cover food crop production across the country for both urban and rural areas but with variations in the type of crop and intensity.

There is enormous potential for certain crops in certain parts of the country. Efficient production of these crops in relation to the areas where they will thrive will be highlighted throughout these recommendations. Essentially, recommendations will dwell on maximum efficiency of land both in rural and urban areas and also on the crop types (both cash and food) and where maximum yields could be realized. Crops with comparative advantage will be highlighted with an examination of the possibility of whether they can thrive in other areas.

4.7.3 Recommendations for food crops

The recommendations in this section include the following: **learn from better performing districts and crop types; promote crops with comparative advantage in selected areas; intercrop cereals and legumes;** promote and support modern farming **methods;** improve yields of maize and rice; and **promote urban agriculture.**

Learn from better performing districts and crop types

NSDF has clarified and mapped the differences between districts in terms of yield and coverage for eight different crops. For each crop type, the maps show the best and worst performing district and how much of the district land is devoted to producing it. Based on these maps, all stakeholders in increasing food production and food security will have to:

- undertake research to understand the precise factors that determine high and low yields;
- link farmers in low yield districts who are interested in improving their yields to farmers in high yield districts with the interest and capacity to impart their knowledge and skills to others;
- prioritise high-coverage, low-yield districts for extension support to improve yield or to switch to a crop type with higher yields;
- prioritise low-coverage, high-yield districts for extension support to expand coverage by encouraging farmers to plant more of the high yield crop types.

Promote crops with comparative advantage in select areas

Crops with comparative advantage may be defined as crops that can be grown in specific agro-ecological zones. Land must be set aside for the production of these crops and government should make the necessary effort to ensure these lands will continue to have the potential to produce these crops, particularly in the three northern regions which dominate in nutritious crops.

Several crops are particularly relevant to nutrition, health and food security. These are the cereals (millet, sorghum) and legumes (cowpea, groundnuts, and soybean). In addition, there are places that are suitable for a limited set of crop types, for example, the three northern regions. It is of utmost relevance that the three northern regions are supported to increase production.

The American Agricultural Economics Association has predicted through 2008 research on climate change that the most vulnerable regions of the world are

undoubtedly in the tropics, particularly the semi-arid regions where higher temperatures and reduction in rainfall and increases in rainfall variability could have substantially negative impacts, and in coastal areas that are likely to be flooded due to sea level rise, all coupled with extreme weather conditions such as flash floods and desertification. These impacts are likely to be most severe in isolated regions where transportation costs are high, incomes are extremely low, and most rural households are highly dependent on subsistence agriculture for sustaining their livelihoods and for their food. These adverse impacts are predicted to be most severe in parts of sub-Saharan Africa. The three northern regions directly fit into this description and should be accorded attention to avert any negative impact on lands in these areas.

Likewise, the production of tuber and root crops like cassava and cocoyam as well as plantain should be maintained in the southern part of the country (rainforest agro-zone) where production and yields are high.

Intercrop cereals and legumes

Studies conducted by the University of Copenhagen in 2009 reported grain legume–cereal intercropping performance indicates some principal advantage worth considering while directing present agricultural practices in more sustainable directions like yield advantages and greater yield stability over years compared to grain legume sole cropping. Again, the lack of rain, which produces significant decreases in grain yield or even total yield losses, is one of the main problems in semi-arid regions like the northern regions in Ghana. To diminish the risk of total loss of yield, farmers should be encouraged to adopt intercropping, i.e. the growing of two or more crops simultaneously on the same area of ground.

Promote and support modern farming methods

NSDF analyses revealed the presence of a dramatic agricultural “yield gap”, difference between potential and actual crop yield, in specific districts in the country, particularly in the northern regions. The promotion and support to farmers to use modern production technologies, including agricultural mechanization, use of high yield varieties of seeds, fertilizers and the introduction of pesticides and weedicides, would help close this gap.

Improve yields of maize and rice

Maize and rice are popular (grown in 98 and 74 percent of districts, respectively), but average yields are less than half of the global average. With respect to water, rice is the crop that creates the most demand for irrigation worldwide; districts with irrigation facilities have high average yields. Promotion of rice and maize production to offset deficit in local demand will necessitate critical consideration, particularly in the provision of irrigation facilities and post-harvest processing.

Promote urban agriculture

Urban agriculture is practiced within and around thousands of cities and towns around the world. It is practiced on private land, public land (parks, conservation areas, along roads, streams and railways), and semi-public land (schoolyards, grounds of schools and hospitals), and even on roofs.

Urban agriculture is the growing of plants and the raising of animals within and around cities[96]. It is an activity that is integrated into the urban economic and ecological system and for climate change mitigation. For example, urban agriculture

[96] Resource Centres for Urban Agriculture and Food Security Foundation (RAUF)

uses urban residents as labourers, municipal organic waste as compost, and wastewater for irrigation. It has strong links with urban consumers, direct impacts on urban ecology, both positive and negative. It is a growing part of the urban food system, and competes for land with other urban functions. It is also influenced by urban policies and plans and to mitigate flooding under flash floods.

Urban agriculture is already popular in Ghana, particularly in the larger cities. For example, there are up to 1,000 vegetable farmers in Accra, Ashaiman and Tema that are growing exotic vegetable like lettuce, cabbage, spring onions and cauliflower as well as traditional ones like tomatoes, okra, ayoyo, aubergine and hot pepper[97].

The benefits of urban food production include increase availability of fresh food to improve diets in areas of high demand; reduce costs and energy used for food transport and loss of food during transport; engage the community and create cleaner environments and increase property values; making their cities more appealing, healthy, and sustainable. Government can promote urban agriculture in the following ways.

- include urban agriculture as a component of land-use and food policy and planning;
- create, enable, and fund community garden programs and urban agriculture organizations;
- create zoning and permitting processes that are friendly to urban agriculture.

Urban authorities should appoint an urban food production manager and establish a public-private-civil organisation to coordinate programs related to urban agriculture. A first step could be for cities to identify and create an inventory of available vacant land for urban agriculture and make this map and database publically accessible.

Urban agriculture programs should be established to reduce barriers to urban agriculture including access to land, soil, and water, as well as funding for development and administrative infrastructure. Examples of programs include donating or leasing vacant land to land trusts for community gardens, free shipments of compost to gardens, and discounted rates on municipal water. Priority should be given to disadvantaged communities. New development projects should be encouraged to include urban agriculture land.

Urban agricultural zoning could help protect urban farms or community gardens from rapid development when land tenure is otherwise unsteady. The zoning could be based in urban agriculture categories, as suggested by the American Planning Association[98], which are based on two dimensions; the extent of agricultural practices and the intensity of urban agricultural activities (Figure 4.12). More extensive/more intensive activities includes rural and peri-urban farming; less extensive/more intensive describes urban farms and farmers' markets; more extensive/less intensive applies to backyard and community gardens; and less extensive and less intensive are where there is little urban agricultural activity.

[97] Studies conducted by University College of London, 2014

[98] Zoning for urban agriculture; American Planning Association, 2010; Nina Mukherji and Alfonso Morales

Figure 4.12 Categories of urban agriculture

	more intensive	less intensive
more extensive	rural or peri-urban farms and associated agricultural activities	backyard and community gardens, limited livestock, and farm stands
less extensive	urban farms, farmers markets, and composting operations	backyard and community gardens

American Planning Association, 2010

More extensive/more intensive agriculture zoning would allow many types and scales of cultivation, animal husbandry, agriculture-related structures, and some farm-related commercial activity. This zoning would mainly apply to edges of cities in areas that are designated for agriculture, although in fast expanding cities this designation may be considered temporary.

Less extensive/more intensive agriculture zoning would apply to large urban markets, nonindustrial food processing operations, such as small-scale commercial production of fruit preserves, and large urban farming initiatives; all activities that can have large-scale impacts. Cities may wish to encourage this type of urban agriculture because it can help to create jobs, provide large-scale job training, strengthen community development, fill gaps in food access, and provide green space.

Cities may also wish to promote more extensive/less intensive activities such as backyard vegetable gardens, community gardens, school and church gardens, street vendors and small markets, farm stands, and limited animal husbandry.

While intensive urban agriculture can be addressed with specific zoning district designations, it is impossible to address urban agriculture completely without looking at agricultural uses for areas not specifically zoned as agricultural. In many cases, this involves rethinking existing restrictions to gardening and urban agriculture.

The main challenges faced by those promoting urban agriculture are finding land, accessing water, obtaining fertiliser, and selecting suitable crop types.

Finding large tracts of land for urban agriculture will be a challenge, but smaller tracts will be easier to find and are more plentiful. Potential areas include undeveloped land owned by the state, private institutions and individuals. Water sources include the streams and rivers running through urban areas, rainwater harvested from building roofs and in some cases the water from the mains. Organic fertilizer could be produced from food waste from markets, restaurants, and even households. Urban farmers will most likely determine the best foods to produce given the context of their farms, resources and local markets. It is however likely that urban producers will focus on products with the highest value per land area.

MOFA, MLNR, TCPD and others will need to develop policies to promote urban agriculture in Ghana. Policies are also needed for type of materials (faecal material/waste water for irrigation) as well as permissible crops to be grown.

Promote Fisheries Industry

The government is already addressing some of the fish industry issues. For example, it has offered additional support to the Department of Fisheries and

Aquatic Science, Biological College, KNUST to train extension officers and technicians for marine and inland fisheries. It is planning to promote “Fish Farmers Associations” and train them as service providers. Finally, it is encouraging private sector investment in aquaculture including in the breeding and production of fingerlings and enhanced management of different fish species.

Landing sites in major fishing towns should be established as there are quite a few of them in the country, cold storage facilities should be provided for these fishing communities to store fish and further processing during bumper harvest seasons.

Promote Livestock Production through Government Initiative

The three northern regions are areas where livestock thrive and are brought to markets in the southern parts of the country into places like Kumasi, Takoradi and Accra where ready markets are available. The three northern regions have to be equipped to be constantly enabled to ensure these supplies. In addition, the Zualugu meat factory set up to process beef into canned products has to be revamped.

Horticultural Promotion

Ghana needs to focus on the most popular export crops, such as Asian vegetables, chillies, pineapples and papayas. This is possible only if the country improves its infrastructure and technical abilities. Furthermore, Ghana also needs to take a second look at its marketing strategy, which currently concentrates on a single product. It will have to seek to integrate multiple product lines.

As most horticultural growers are SMEs, the country needs to come with a framework for quality standards. However, this framework has to be set up by the stakeholders for it to be effective. Otherwise, no amount of assistance and programmes will help the growers overcome the issues they are facing in the market today.

4.7.4 Proposed urban food sheds

Urban populations are growing and expanding, often consuming farm land. This means that cities need to field more people on less land or land that is further away.

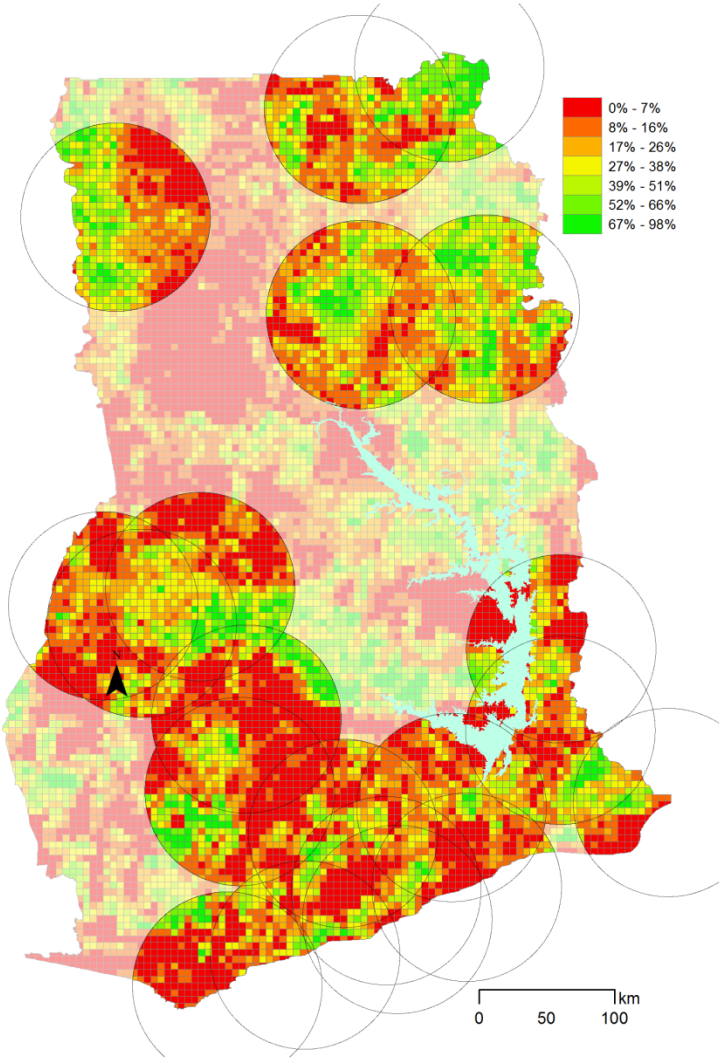
To address this trend, NSDF promotes the concept of "foodsheds". A food shed refers to the farms, processing facilities and distribution networks within a certain distance to a city that sustain the flow of fresh food to nearby populations. Figure 4.15 provides an example of food sheds in North America.

The benefits of food shed is that:

- food grown nearby reduces transportation costs, energy, and potential disruptions;
- locally produced food is more nutritious; fruits and vegetables lose 40 percent of their nutritional value within three days of being harvested;
- the greater access to fresh produce, the less likely people are to suffer from diet-related illnesses such as obesity and diabetes.

NSDF has identified the cities where food shed planning is a priority. Two size food sheds are considered using a 50 and 70 kms radius. A food shed with a 50 km radius covers an area of about 7,800 km^2 while one of 70 km radius covers 15,300 km^2 (Figure 4.13).

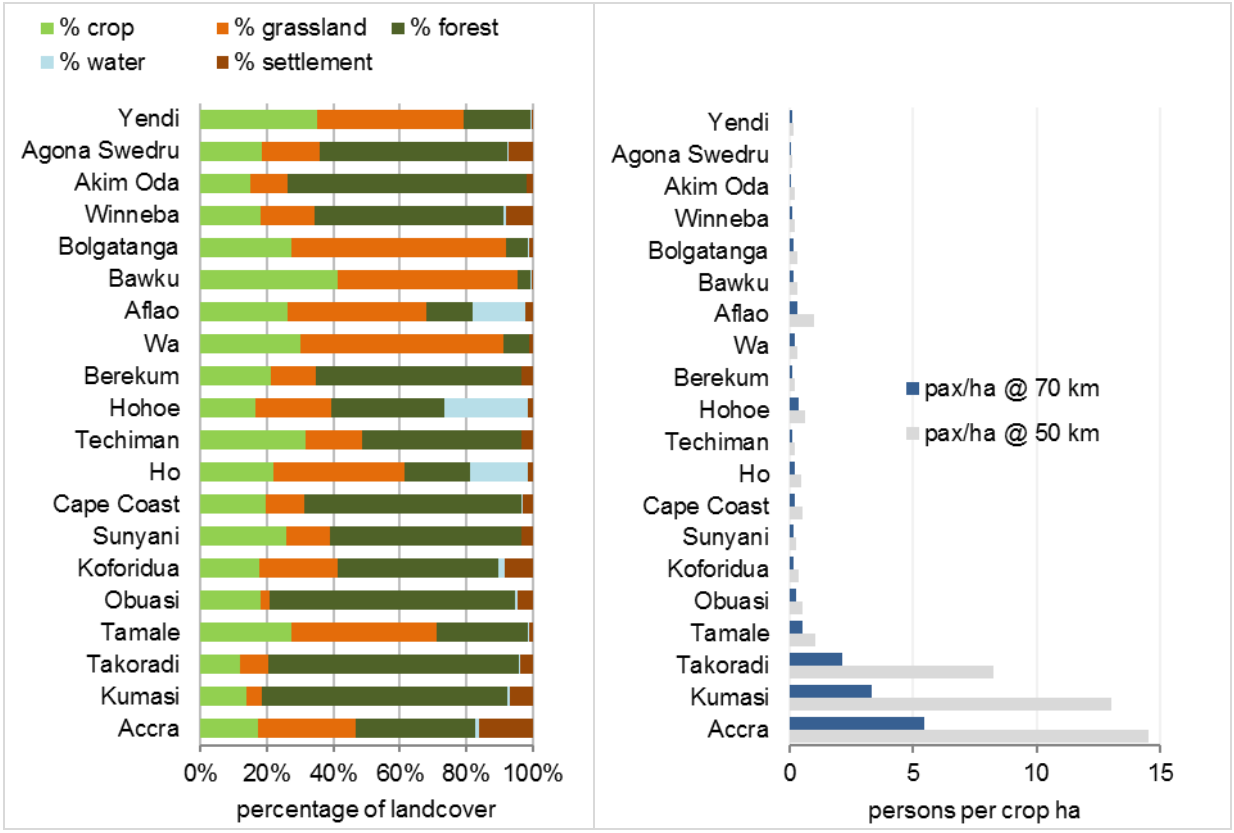
Figure 4.13 Foodsheds around major urban areas at 70 kms



The left hand chart in figure 4.14 shows the landcover type distribution within an area of 50 km from the city centre of the twenty largest cities, those over 50,000 inhabitants. Cities are shown bottom to top from the most to least populated. Larger cities tend to have a lower share of cropland than the smaller ones. The pattern is similar for cropland within 70 km of the city centre.

The right-hand chart shows that larger cities have more people per hectare of cropland, or less cropland per person. For example, with a food shed of 50 km radius, Accra and Kumasi have 15 and 13 persons per hectare of cropland, respectively, while Cape Coast and Tamale have only 2 and 1 respectively. When the food shed radius is increased to 70 km, Accra's ratio falls to 5 and Kumasi's to 3 persons per crop hectare.

Figure 4.14 Landcover type within 50 km of centre of urban area / persons per crop hectare at 50 and 70 km of centre



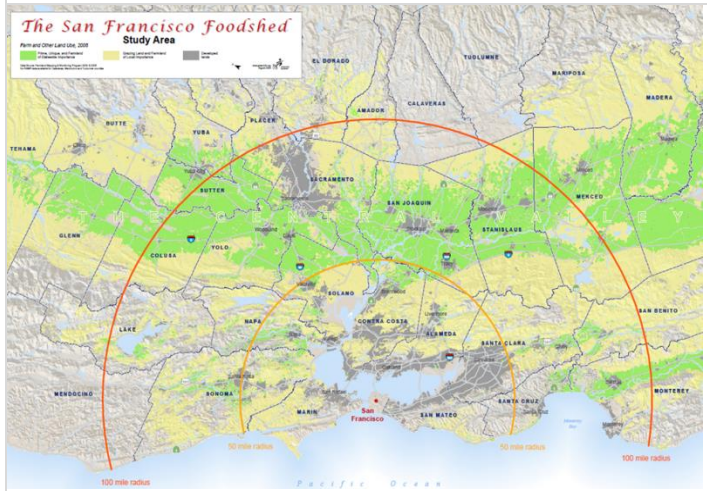
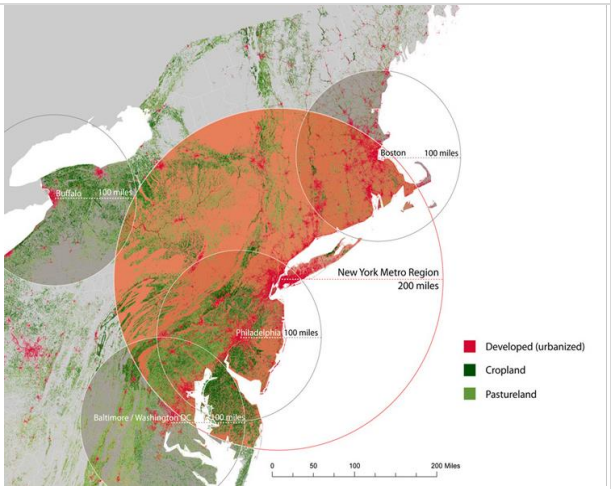
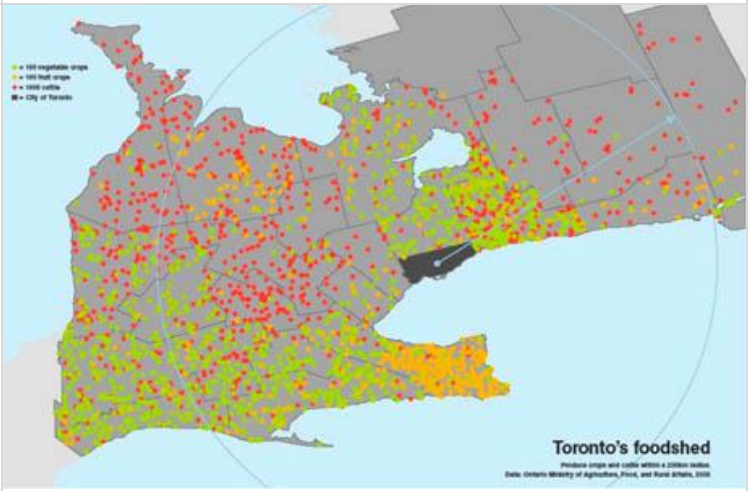
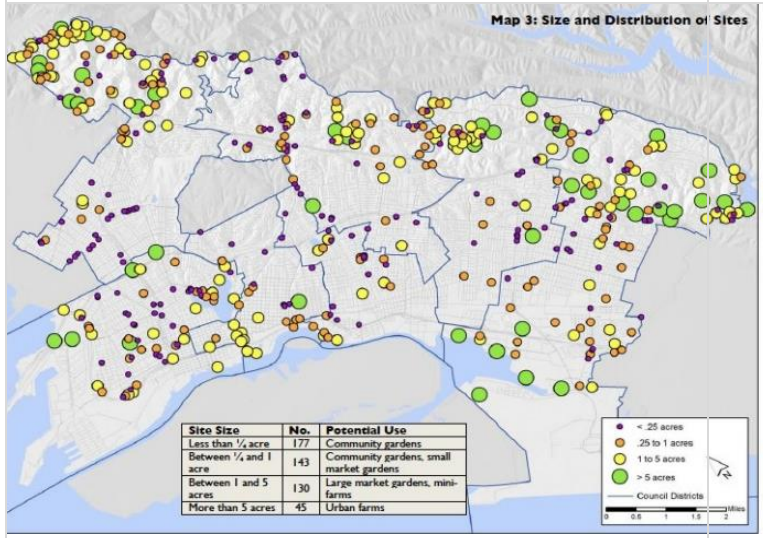
San Francisco Foodshed	New York City food shed	Toronto's foodshed
		
Oakland urban agriculture assessment	**Tennessee regional foodshed**	**Philadelphia foodshed**
		

Figure 4.15 Example of food sheds in North America

4.7.5 Proposed Agricultural Growth Corridor

The concept of Agricultural Growth Corridors (AGC) emerged from a recent World Economic Forum. The concept, aimed at regions with subsistence agriculture practices and with unrealised agricultural potential, it supports the conversion of land into commercial agriculture at an industrial scale. The theory is that investing in infrastructure (roads, railways, irrigation, storage, processing and ports) will attract Investment and facilitate the development of commercial agriculture.

Key requirements for an AGC include the following:

- availability of large areas of land for industrial agriculture;
- established infrastructure (roads, irrigation, warehouses, improved seedling);
- linkage to ports and other countries;
- strong private sector;
- accessibility and proximity to large urban markets;
- small-holder farmers.

Access to ports is vital for the export of agriculture produce and importing inputs such as fertilizers and agricultural machinery. Smallholder farmers are important to develop an out-grower component in the production system.

Several African countries have successful agricultural growth corridors (Figure 4.16). These include: Tanzania (Southern Agricultural Growth Corridor); Mozambique (Biera Agricultural Growth Corridor, Nacala Corridor, and Zambesi Corridors). In addition, Nigeria, with assistance from USAID, has designated the Lakaji growth corridor spanning from Lagos through Kaduna and ending in Kastina.

One of the major advantages of the corridor is embracing existing farmers as part of the corridor systems. Mostly, they are absorbed by larger mechanized agricultural institutions as out-growers equipped with new methods of farming. Incomes of farmers grow substantially when they are administered by industrial agricultural institutions usually private investors. Crops and agricultural activities which are promoted within the corridor include, cash crops, livestock/poultry, horticulture and food crops.

Ghana is to learn and capitalise from these successes and start the process of developing its own agricultural growth corridor. NSDF has taken the first two steps and has determined that Ghana has all the preconditions to establish an agricultural growth corridor and defined its possible boundaries, as follows.

Major Infrastructure including truck road, warehouses, and irrigation Ghana has a central major trunk road that links major markets, ports and international borders. The trunk road facilitates access to markets where farm produce can be sold to the general public, particularly, in the major urban centres such as Techiman, Kumasi Tamale, Accra and Tema. These market centres provide ready markets to enhance confidence in farmers to produce. Existing production levels of most districts around these areas are high. The busiest highway from Accra to Bolgatanga links all these major market centres.

The same highway links production areas to the port in Tema, from where it can be easily exported. Conversely, imported farm inputs like fertilizer and hybrid seedlings can be transported from the harbour via this trunk road to farming centres. The road links to international borders with Togo and Burkina Faso, facilitating exports to these places. Ghana already exports maize from Techiman to Burkina Faso and all

the way to Niger and Chad. Likewise, rice is exported to Lome and other border towns in Togo. Basically, the presence of this major trunk road is a massive boost for the establishment of an AGC.

Institutions with similar agricultural project: The definition of a GAGC area is influenced by the existence of private investments in agriculture within the area and other institutions with agricultural investments. These include investments by companies like GADCO, which has massive investments in rice plantations in Volta region and offers assistance to out-growers. In the three northern regions, AgDevCO, a British NGO, is supporting farmers to improve production of maize, rice and soy, and SADA and Feed the Future projects are working to increase yield and crop area.

Major markets linked to ports and international borders: Most of the major markets in the country that will offer convenient areas for demand and supply of agricultural goods are located in the AGC. The Kumasi central market is the biggest in the country. Others include markets in Accra and Tema, Tamale and the busiest in Techiman which links to international markets in Burkina Faso, Niger and Chad.

Major population concentration to guarantee demand: The AGC contains about 14 million people (57 percent of the national population) with 8.6 million residing in urban centres. This population presence spanning from Tamale, Techiman, Kumasi, Koforidua, Accra through to Tema is more than enough to provide the necessary demand for produce that may come out from within the corridor.

Availability of land and potential production sites: The major economic activity of all the regions in GAGC, apart from Greater Accra and Ashanti, is agriculture. The two biggest regions in Ghana (Northern and Brong Ahafo) cultivate only 10 and 16 percent of their respective lands into crop production. These factors will enhance the establishment of the agricultural growth corridor. Additionally, the most predominant activity in the whole of the three northern regions is farming.

Agricultural growth corridor - two options

NSDF has prepared two options for the Ghana Agricultural Growth Corridor (Figure 4.14). These are naturally not the only options; there are unlimited possibilities. Nevertheless, these options are to provide and initiate a dialog with all stakeholders.

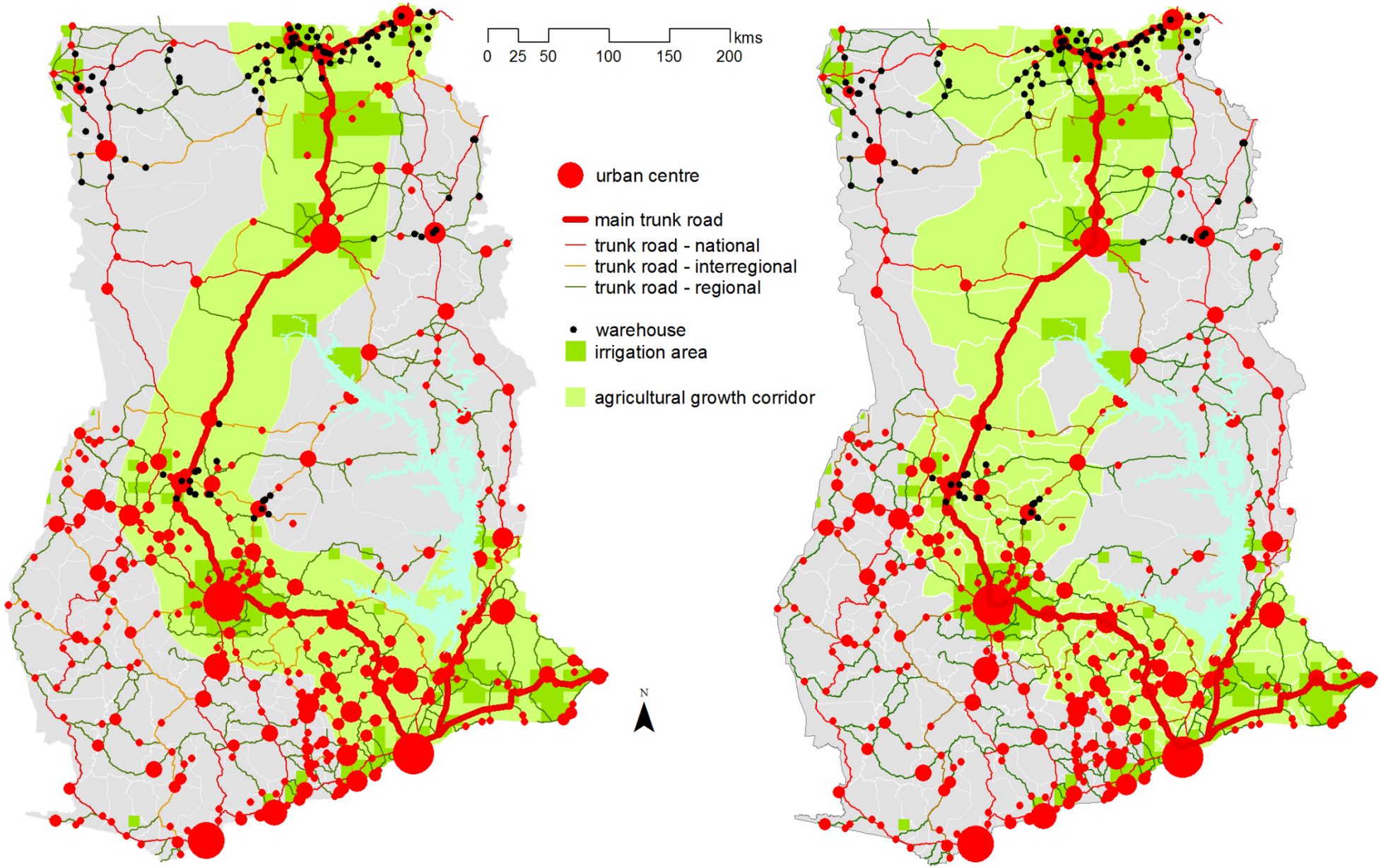
Both options are centred on the same main trunk road spine and both cover approximately the same area. Option 1 includes the area with a 50 kilometre buffer line centre around the trunk road, while option 2 includes the whole area of districts that are located adjacent to the main trunk road.

Figure 4.16 Examples of International agricultural growth corridors

Nigeria Lakaji growth corridor

Tanzania Southern Agricultural Growth Corridor

Mozambique Beira Corridor



Option 1: 50 kilometre buffer

Option 2: Districts adjacent to main trunk

Figure 4.17 **Agricultural Growth Corridor**

Implementation Strategies

The promotion of the GAGC concept should be spearheaded by MOFA with policies that will initiate its implementation. To make the GAGC concept operational, a level of public-private coordination with respect to agricultural development and investment is required which has eluded Ghana in the past. The corridor concept provides a tangible platform for this collaboration. Interested stakeholders can consider the formation of an Agricultural Growth Corridor Advisory Council to serve as a platform for collaboration between the public and private institutions investing in projects along the corridor. The Advisory Council could serve in an advocacy and coordination capacity, improving the investment environment along the corridor and attracting new investment (domestic and international).

Development of Infrastructure: Central to the development of the corridor concept are roads, irrigation, ports and railways since the lack of these and storage facilities is often cited as a major barrier to agricultural development and food security in Ghana. Nevertheless, it is important to ask what kind of infrastructure is required to benefit farmers in the country. Private capital is not interested in investing in infrastructure, although companies are happy to be paid to build it. In this regard, GoG should take the initiative in securing the means through which infrastructure can be provided in the growth corridor.

Small scale farmers as out growers and contract farmers: Promoters of all the corridor concept, along with the World Bank and FAO, constantly emphasise how they want to help smallholder farmers gain access to credit, farm inputs and protection for their land rights and speak of major benefits for them and for local communities. Ghanaian farmers within the corridor can reap the same benefits as being reaped by the rubber and oil palm out-growers in Western region. In the same way, existing farmers in the corridor will be grouped as out-growers and accorded the necessary benefit. This is also being in practice in Fervie in the Volta region for rice growers.

Public Private Partnership (PPP): The government should consider the PPP as the foundation for it agricultural policy. AgDeCo, the company that developed investment blueprint for SACGOT is in Upper East region and has initiated similar support for farmers in the region. The government has to look for such partnership to propel the implementation of the GAGC.

4.7.6 Recommendations for cash crops

The government has not actively promoted cash crop production, apart from cocoa, but private companies have promoted oil palm, cotton and rubber. MOFA has to consider the following recommendations in their striving to improve production of cash crops.

Collect data on and monitor cash crop production

MOFA does not collect data on the land area used for cash crop production. Consequently, it is not possible to determine cash crop yield per area, the value of cash crops per area, and to compare this with other land uses including other cash crops and food crops. It is understood that farmers in Western region have been switching from food crops to rubber plantations, with an impact on regional food security. It is recommended that the government would develop policies to regulate land for production of most cash crops to reduce the threat to food security.

Designate Western region as cash crop growth corridor

Western region, which leads in the production of all cash crops, has to be designated and supported as a cash crop growing region. Southern parts of the region have become cash crop growing corridors that links up to the Takoradi

harbour. These corridors are in areas like the Ahanta West district with massive production in rubber and oil palm and Tarkwa Nsuem district with rubber and oil palm as well. Rubber and oil palm plantations led by international private investors with semi processing plants are flourishing within growth corridors stretching from Tarkwa, Prestea through Ahanta West district and linking the Takoradi harbour. Cocoa and coconut farms are also doing quite well within the same corridors.

Additional land not required to increase cocoa production

In general the rejuvenation of cocoa in terms of increase in production should not necessarily require additional land for planting. The analysis showed that production is decreasing due to poor methods in production and the expansion of illegal mining activities. The use of land in the agro forest zone is elastic and can support different crops. The government would have to ensure that proper farming practices are employed on existing cocoa lands to ensure high yields and that lands are preserved solely for the purpose of cocoa production. Efforts are also to be made to curb the activities of illegal mining.

Designate land for cotton production

To diversify the economic base of agriculture from domination of food crop production, cotton production will have to be promoted in the three northern regions where efficiency in production exists but presently only practiced on a small scale. Lands in current producing districts have to be regulated to ensure sustainable use of land in the districts as it is believed that planting of cotton like rubber have devastating impact on the soil. If proper attention to cotton is neglected, the already poor unproductive soil may be completely degraded if uncontrolled cotton cultivation occurs.

4.7.7 Conclusion

While it is clear that agriculture plays an important role in the economy, contribution to GDP has been experiencing a downward trend from 2000 to 2010 where it fell from 36 percent to 30 percent compared with the services sector that grew from 39 percent to 51 percent. In spite of the downward trend it continues to be the lead employer at 44 percent compared with the other sectors at 19 percent for industry and 37 percent for services. Some of the issues that led to these negative impacts can be attributed to the lack of government commitment to the sector particularly to cash crops.

The private sector plays a key role in agriculture, particularly in the food crop production, which abounds with a lot of challenges related to administration, use of rudimentary methods and climatic conditions resulting in low yields across the country. Though large tracks of lands are cropped across the country, the three northern regions have the highest percentages of regional land cropped with very low yields suggesting a high level of inefficiency.

Fisheries and livestock production have varying challenges and government support continues to be inadequate. Fishery activities are mostly dominated by the coastal districts whilst aqua culture practice mostly by the inland regions in the southern part of the country is yet to be extensively developed. As pastoral lands have not been designated, impact of grazing has had negative impact on crops and cropland and the environment in general due to overgrazing.

All dominant cash crops (cocoa, rubber, oil palm) are produced in the rain forest zone, whilst the minor ones which are cotton, cashew and shea nut are produced in mostly the three northern regions. Cocoa is the only cash crop that attracts government support though production is completely dominated by the private sector. A greater part of the oil palm and rubber plantations are owned by foreign

investors and production levels have been increasing over the years, the effects of both on crop production have been devastating in districts within Western region. Invariably the proposed designation of Western region as a cash crop region is in line with such outcomes.

It is also important to note that urbanization exhibits a greater influence on land, and generally, in Ghana it is cropland that are easily affected. In sum, farmland values are higher near urban areas. Urban influence is associated with land values being "bid up" by competing land use activities, including residential and commercial development. This explains the reason why land cropped in the southern parts of the country which is more urbanized are low. It is relevant for the GOG to know the future urban influence on land in order to make a conscious effort to protect crop land and regulate urban agriculture.

Ghana has all the potential and motivation to become food self-sufficient again, while creating a more inclusive agricultural economy that provides employment opportunities for its growing population. However, government efforts towards promoting agriculture in the country have been less encouraging, particularly with cash crops. Inadequate data on cash crops makes it difficult to estimate any effort in that sector. For Ghana’s agriculture to have a positive influence on food security and contribute to export earnings, GOG will have to step up its current efforts.

Volume I

Chapter 5

Infrastructure

5 Infrastructure

5.1 Introduction

The National Spatial Development Framework has reviewed the infrastructure policies, plans and projects of the different sector ministries, in particular, the draft National Infrastructure Plan (December 2013), or NIP, which covers the period 2013-2020. Where NSDF concurs with the proposals in these plans, these proposals are incorporated in NSDF. Where NSDF has a different perspective on these proposals, it provides options for consideration by decision-makers. In addition, as NSDF's planning period extends 15 years beyond that of NIP's, NSDF builds on the proposals.

The urban population is expected to increase by about 6 million to about 18 million by 2035. This urban population will require a high level of inter-modal traffic and transport connectivity, efficient energy and water supply, improved environmental sanitation and the use of modern ITC technology. Only reliable and efficient transport links will ensure the distributed population access to education and health facilities, business and job opportunities as well as to other public and private services. Improved links are also important for agricultural development and access to markets, processing industries and export harbours. Improved transport is vital for development of the mining sector.

The NSDF suggests that the location of urban development centres must take place close to the transport corridors as the corridors help the development of cost efficient productive projects and efficient urbanisation. Investments close to the trunk road network and urban settlements will benefit more population than investment far from the trunk road network and urban settlements. The urbanisation policy ought to encourage the citizens in dispersed populated areas to move towards the trunk road network.

The official overall strategy is to maintain the existing and on-going routes for freight and passenger transport. These include roads, railways, inland water and air travel in-Ghana as well as the sub-region (ECOWAS). International passenger trips will be facilitated mainly by air travel through KIA. Import and export of goods will largely take place through the sea ports at Tema and Takoradi as well as the KIA and Tamale airports.

The main challenges in the transport sector include inefficient freight transfers at the sea and inland ports; lack of coordination of various stakeholders at sub-regional, national and local levels in both the public and private sectors of the economy; traffic congestion in Tema, Accra, Takoradi and Kumasi; and inter-sectoral and intermodal coordination.

There is an urgent need within ECOWAS to improve cooperation on how to reduce travel and cargo transport times within the West African countries. Coordination of transport laws and regulations is needed. At present, two important common transport projects are on the drawing board. Their relevance, as these projects are being developed, lies in the fact to develop in what is expected to be one of Africa’s most economically vibrant and dynamic zones. With, in short, the Lagos – Lome – Accra – Abidjan corridor development and the Tema – Paga – Ouagadougou Corridor development supported by World Bank, UEMOA, ECOWAS, and other development partners.

Infrastructure encompasses several types of services. Therefore this chapter covers amongst other transport.

5.2 Transport

The transport sector is managed by two ministries, Ministry of Roads and Highways and the Ministry of Transport, and is divided into four sub-sectors: aviation, maritime and in-land water, railway, and roads. Sectoral policies and plans are set out in several documents including the National Transport Policy (NTP) 2008, the Integrated Transport Plan (ITP) 2011-2015, the Transport Sector Infrastructure Plan (TSIP) 2013-2020 and the National Infrastructure Plan (NIP) 2013-2020. In addition to these documents, master plans have been prepared for various sub-sectors such as the Ghana Railway Master Plan.

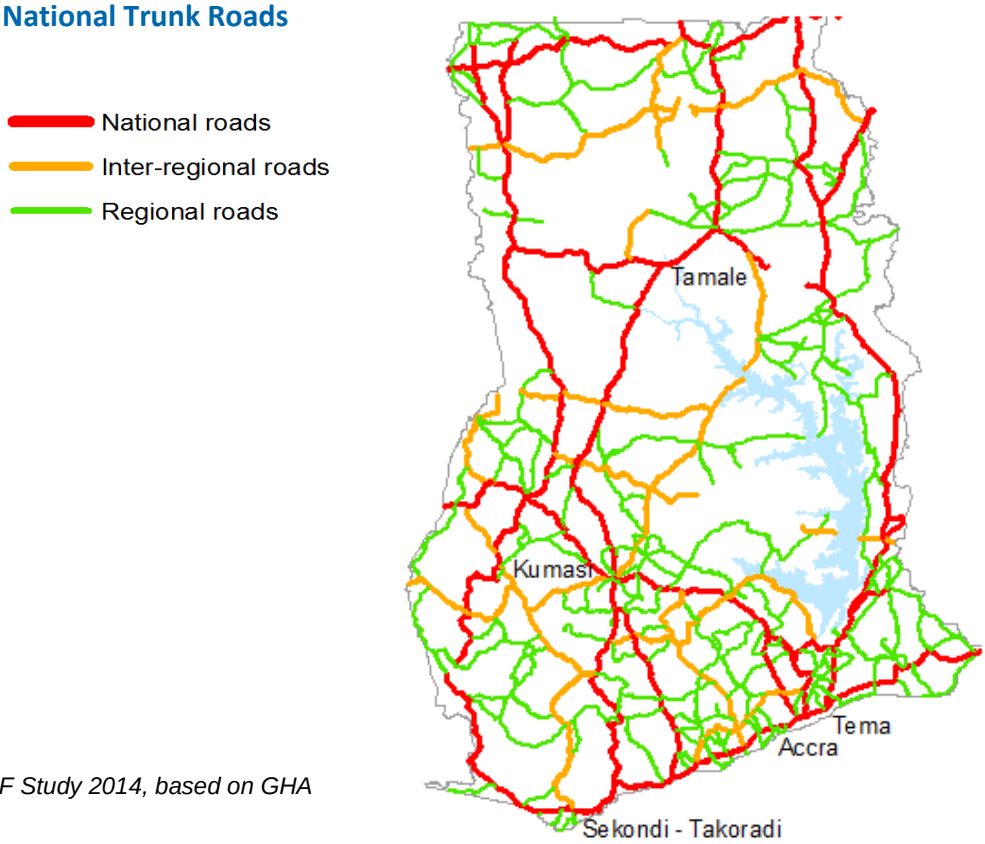
The overall objective is to establish Ghana as a transportation hub for the West African sub-region

5.2.3 Road network policies

The key functions of the Ministry of Roads and Highways are to create road networks and maintain and improve existing roads; create and sustain an efficient transport system that meets user needs; integrate land use, transport planning, development planning and service provision; and ensure sustainable development in the transport sector.

The road system includes three road types: trunk, feeder and urban roads. There are about 13,000 km of trunk roads, 12,000 km of urban roads, and 42,000 km of feeder roads[99]. Trunk roads, which are classified as national, inter-regional and regional, connect to neighbouring countries, regions and major urban centres. Urban roads service the main urban centres. Feeder roads connect to small towns and rural areas.

Figure 5.1 National Trunk Roads



Source: NSDF Study 2014, based on GHA 2012

[99] Ghana Highways Authority, 2013

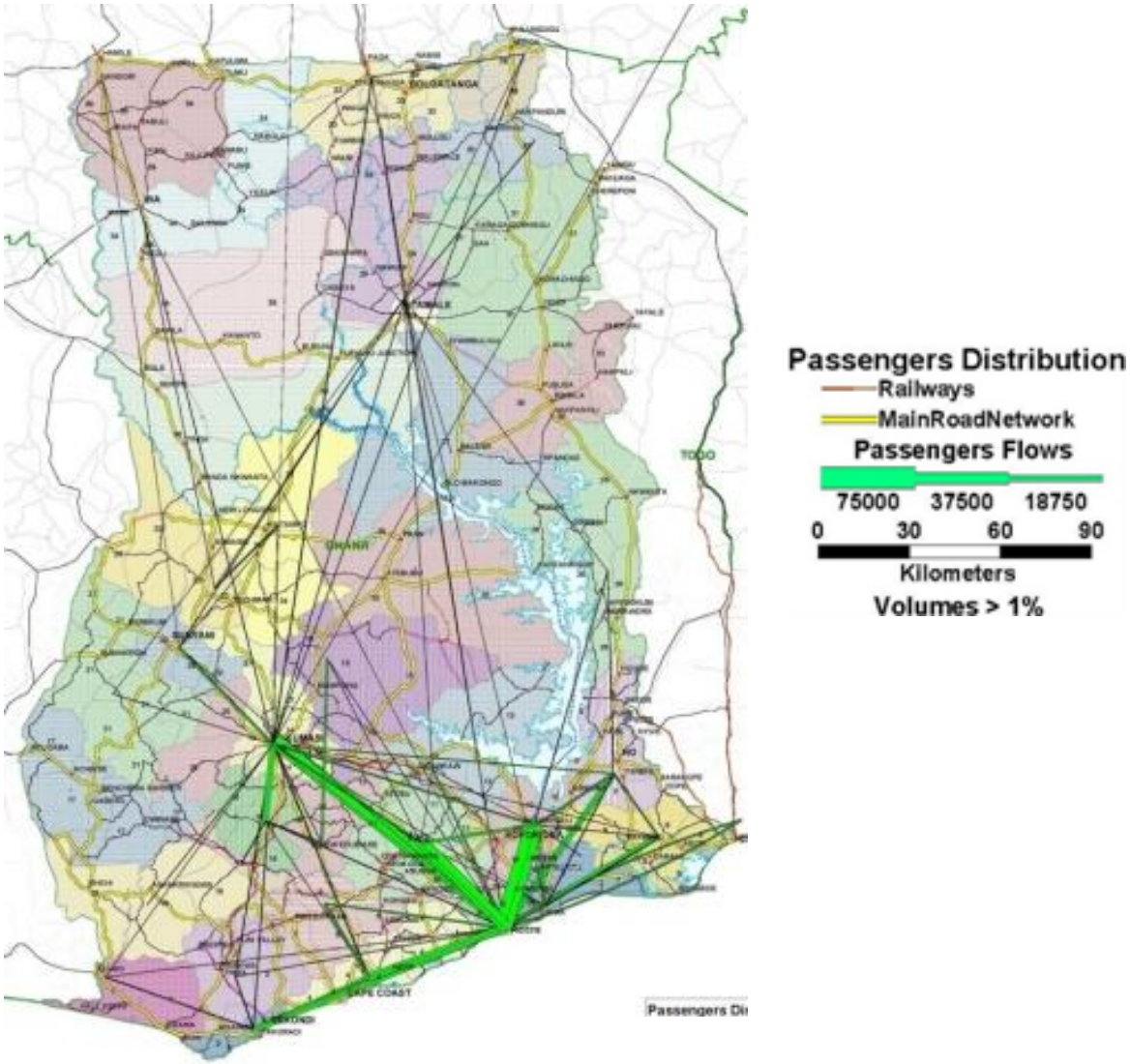
The World Bank rates Ghana's road system as approaching the standard of middle-income countries. But it points out that "**significant investments are required to maintain and expand the existing network to improve connectivity among towns and cities and other settlements**" (WBGUR/GoG/NDPC 2010).

The National Tourist Development Plan 2013-27, one of the few sectoral plans that underlines the role of roads, specifies where road improvements can increase the potential for tourism. These include (i) the eastern corridor, which would give tourists access to areas that are currently relatively inaccessible, and (ii) the coastal corridor, which needs a dual-carriageway from Accra to Cape Coast.

5.2.4 Existing and projected passenger and freight volumes

Existing passenger and freight movements were studied and quantified by the Ghana Railway Master Plan (GRMP) (Figure 5.2).

Figure 5.2 Estimated passenger flows on roads, 2013



Source: Ghana Railway Master Plan, 2013

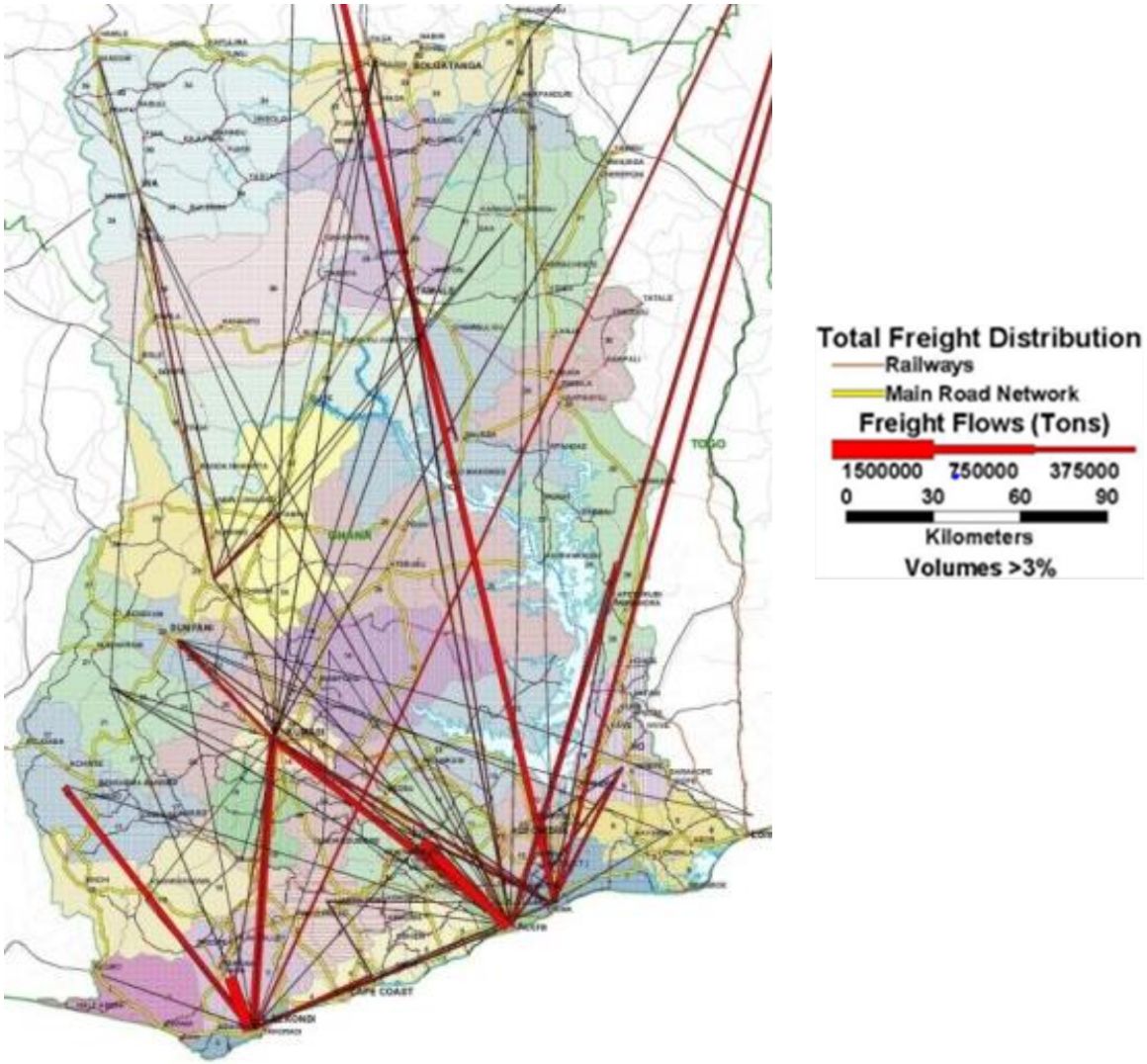
Existing passenger volumes

Figure 5.2 shows passenger flow volumes as indicated by the width of the green bands. Most of the passenger traffic is centred on Accra and occurs along four

corridors: Accra-Tema metropolitan area; coastal zone; between Koforidua, Akosombo, Ho and Volta Lake; and in Ashanti Region. Significant passenger traffic is found between Kofuridua and Tema, Koforidua and Kumasi, Kumasi and Obuasi and Kumasi and Sunyani.

There are three high-volume corridors. Passenger flows are highest between Accra and Koforidua, suggesting that this route should be accorded priority. Another high-flow corridor is between Accra and Kumasi via Oda/Kade, and a third one is along the coast between Accra and Takoradi and the coastal settlements inbetween. Moderate volume corridors are Accra-Akosombo-Ho and Kumasi-Obuasi.

Figure 5.3 Estimated freight flows on roads, 2013



Source: Ghana Railway Master Plan, 2013

Existing freight volumes

Figure 5.3 shows freight flows in tons as indicated by the width of the red bands. Freight flows total was about 34.3 million tons[100] in 2013. Most freight flows from or to Accra and the ports at Tema and Takoradi. The majority of freight comes from Tarkwa, Takoradi, Accra, Tema, Koforidua, Kumasi and Sunyani. The major destinations are Accra, Kumasi, Tema, Cape Coast and Kofuridua.

[100] Ghana Railway Master Plan 2013. Projection based on ITP

Freight flowing to Tema port originates in Accra, Volta Region and Kumasi while that flowing to Takoradi port comes from Tarkwa, Kumasi and within Western region. Tema port freight goes to Burkina and Mali' Takoradi Port freight to Kumasi and Mali.

The major freight routes are Accra-Kade, Accra-Kumasi, Tema-Burkina Faso-Niger, Takoradi-Tarkwa, Takoradi–Kumasi, Takoradi- Juabeso/Amoya/Adwufia. Others are Tema–Ho, Tema–Kumasi, Kumasi–Sunyani, Techiman–Wa and Techiman–Kintampo.

These flows appear to justify: (i) a central freight corridor from Accra to Paga and Bawku, passing through Kumasi and Tamale; (ii) an inter-modal freight corridor on the Volta Lake; (iii) a corridor between Takoradi-Tarkwa-Kumasi and (iv) a corridor in Western region to Takoradi.

General cargo accounts for 31 percent of all freight. It comprises imports and local products manufactured in Accra and Kumasi and then distributed to the most populated areas and exported mainly to Burkina Faso[101]. Agricultural products (23%) are imported via Tema and Takoradi ports and come from the processing plants in Accra and Kumasi. From these locations, they are distributed to the most populated areas, and exported overseas or to (mainly) Niger. Cocoa accounts for another 2 percent and originates in Western, Brong-Ahafo and Ashanti regions, and flows to the two ports for export overseas. Timber (32%) comes from Tarkwa, Brong-Ahafo and Ashanti regions and destined for export through the ports of Tema and Takoradi. Bauxite and manganese (6%) originates in Tarkwa and flows to Takoradi port. Cement (6%) originates in local production plants in Tema, Takoradi and Kumasi and is distributed to Greater Accra, Eastern and Ashanti regions.

Projected passenger and freight volumes

Passenger volumes may grow by 2.4 percent annually between 2015 and 2047 (GRMP) where the demand in 2035 is expected to be around 1.1 million passengers per day. Freight volumes may grow by 5.5 percent annually between 2015 and 2047 with 82 percent carried on national roads[102].

Traffic on trunk roads

Table 5.1 gives a summary of the average daily traffic (ADT) on the trunk roads in seven regions by vehicle type[103]. Nationally, ADT exceeds one million vehicles per day. Overall, light vehicles; cars, taxis, pick-ups and small buses, account for 79 percent and medium vehicles, such as large buses and light and medium trucks, about 14 percent. Heavy vehicles, such as semi-trucks, trailers and large truck, comprise only seven percent of the vehicle traffic.

In general, southern areas have more traffic than the northern areas. Traffic volume is highest in Western and lowest in Upper East region. While most regions have a similar traffic patterns breakdown, Northern region stands out with a high share of heavy (16 percent) and medium (25 percent) size vehicle traffic.

[101] GRMP; Final Railway Master Plan 2014 based distribution 2008, ITP

[102] Idem

Table 5.1 Average daily traffic (ADT) by vehicle type and region

	# of vehicles ('000)				percentage			
	adt total	light	medium	heavy	adt %	light	medium	heavy
Western	274	202	47	25	100	74	17	9
Central	229	193	27	12	100	84	12	5
Eastern	222	189	24	9	100	85	11	4
Greater Accra	196	154	25	17	100	78	13	9
Volta	121	96	14	10	100	80	12	9
Northern	38	22	9	6	100	59	25	16
Upper East	10	8	1	1	100	80	12	8
TOTAL	1,089	864	149	80	100	79	14	7

Source: NSDF 2014 based on GHA Road Condition Report, 2012

Table 5.2 provides insight into the nature of road use in different regions. It shows the difference between regional and national ADT by vehicle type. Greater Accra has about ten percent more cars and eleven percent less taxis. Central region, followed by Eastern, has higher taxi traffic (perhaps for the purpose of commuting to Accra). Upper East, followed by Northern, has more pick-ups/vans/4WD (perhaps due to the activities of NGOs) and less small buses than the national rate. Northern region has a higher share of extra-large trucks.

Table 5.2 Difference between regional and national ADT by vehicle type

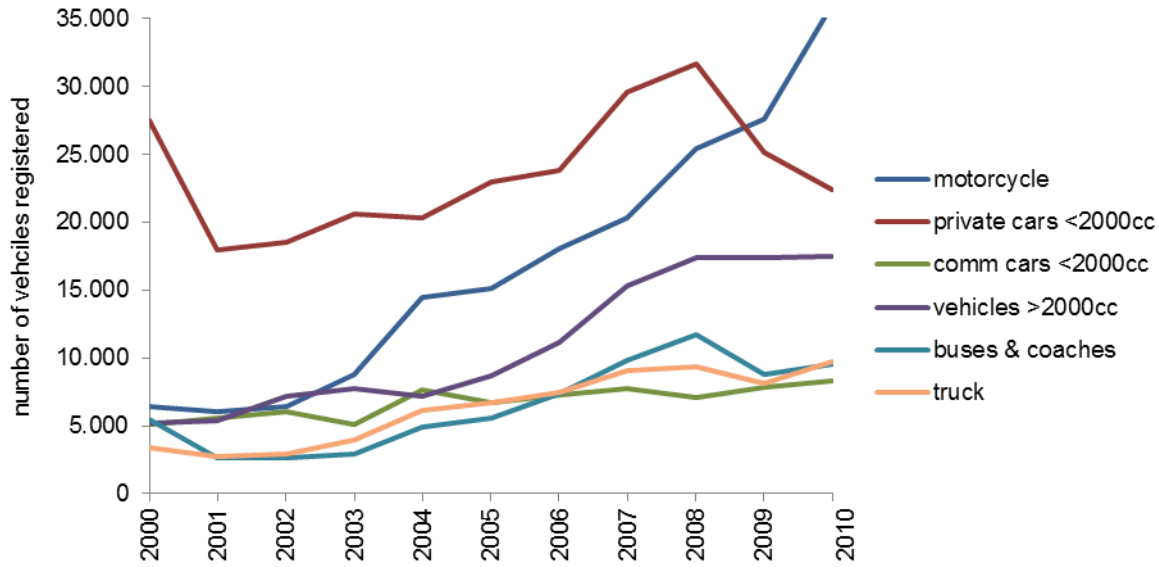
	cars	taxis	pick up/vans/4 wd	small bus	medium bus	large bus	light truck	medium truck	heavy truck	semitrailer-light	semitrailer-heavy	truck trailer	large trucks & others
Greater Accra	10	-11	-2	2	0	0	-1	0	1	1	0	0	0
Eastern	-2	5	-1	4	-2	-1	1	-1	-1	-1	-1	-1	0
Volta	-2	-3	-1	7	0	-1	0	-1	1	0	0	1	0
Upper East	0	-5	15	-9	-1	0	0	-1	1	0	0	0	-1
Western	-1	-1	0	-3	0	2	1	1	0	0	1	1	0
Northern	-8	-11	6	-7	4	2	2	3	3	0	0	0	5
Central	-3	10	2	-3	1	-1	-1	-1	-1	-1	0	-1	0

Source: NSDF Study based on Ghana Highways Department, 2012

Between 2000 and 2010, there has been a dramatic increase in the number of registered motor vehicles, with larger vehicles more popular than smaller private cars (Figure 5.4). Some 81 percent of the vehicles are registered in two regions; 64 percent in Greater Accra and 17 percent in Ashanti; no other regions had more than 4 percent of vehicle registrations (Table 5.3). The growing number of vehicles is a challenge in general but particularly in the more urbanised regions. As energy consumption and pollution are directly related to the size of vehicles, the figures

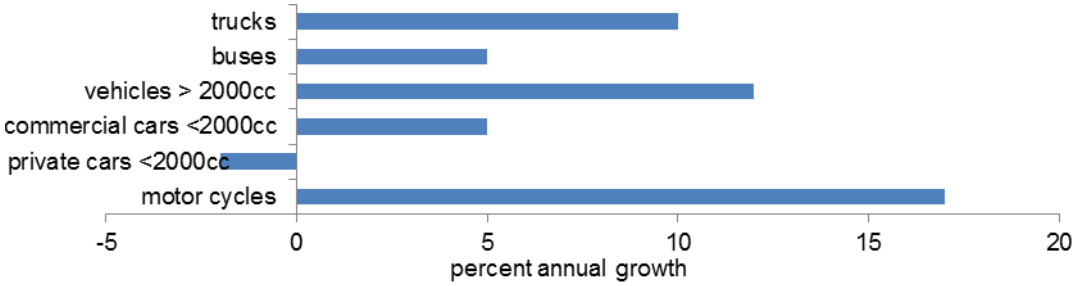
suggest that more attention should be given to the promotion of more convenient vehicle sizes according to function by diversified taxes on vehicles.

Figure 5.4 Vehicle registration from 2000 to 2010



Source: NSDF Study 2014 based on Driver Vehicle Licencing Authority, 2013

Figure 5.5 Vehicle registration 2000-2010, average yearly growth rate



Source: NSDF Study 2014 based on Driver Vehicle Licencing Authority, 2013

Table 5.3 Cumulative vehicles registered by region in 2007

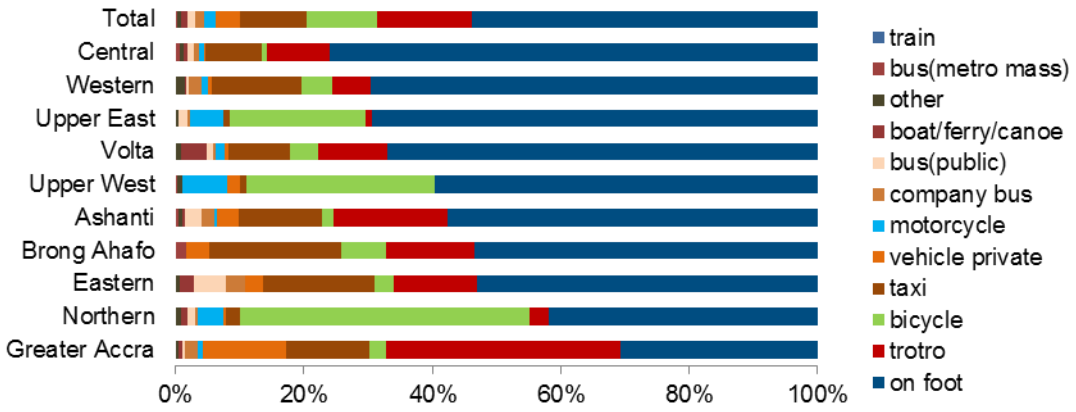
Region	total 1997-2007	total (%)
Greater Accra	409,686	64
Ashanti	109,819	17
Northern	23,336	4
Western	21,813	3
Brong Ahafo	17,946	3
Eastern	15,012	2
Central	10,517	2
Upper East	15,425	2
Upper West	11,202	2
Volta	6,287	1
Total	641,043	100

Source: NSDF Study 2014 based on Driver Vehicle Licensing Authority, 2007

Commuting to work

Mode of commuting. People commute to work by non-motorised transport, such as walking and bicycling; public transport including trotros, metro buses, company buses, taxis; and private motorised transport, including motorcycles and vehicles. Regions have varying commute patterns (Figure 5.6). Most people walk to work, followed by trotros, bicycles and buses. Nationally, some 64 percent of commuters use non-motorised transport with 54 percent walking and 10 percent using bicycles. Compared to the national average, a larger share of commuters walk to work in Central, Upper East, Western, Volta, and Upper West regions.

Figure 5.6 Commute mode by region



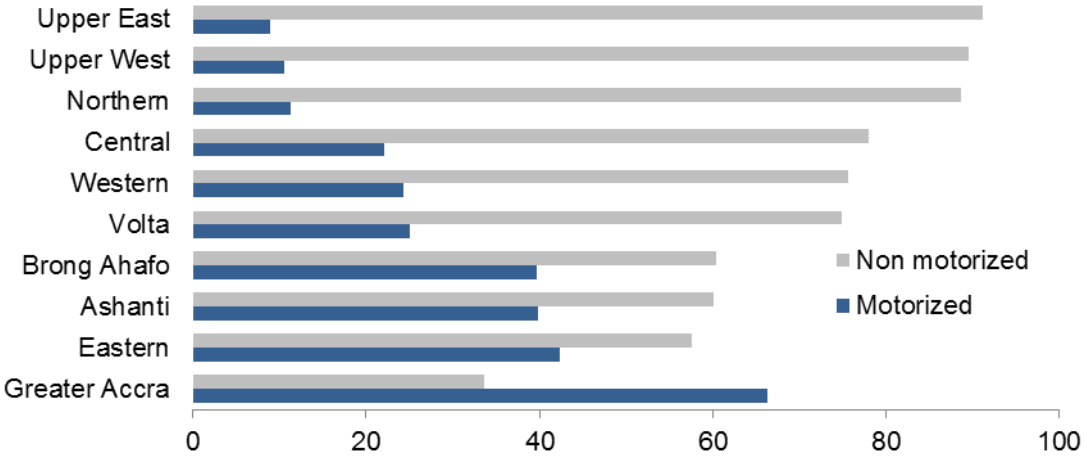
Source: NSDF Study 2014 based on GSS Transport Indicators Database Survey, 2007

Bicycle commuting is popular in the three northern regions, particularly in Northern where it accounts for about 50 percent of all commuters, but not in the others. In Greater Accra, where jobs are concentrated and roads are bicycle-unfriendly, 31 percent walk and 2 percent only bicycle to work. The above pattern is similar to the one in Mumbai, India where 44 percent of all commuters, and 63 percent of the poor walk to work[104].

Greater Accra is the only region where motorized exceeds non-motorized commuting, although it accounts for about 40 percent in Eastern, Ashanti and Brong Ahafo regions (Figure 5.7). Less than two percent of commuters use motorcycles, and motorcycles are mostly used in Northern region.

[104] Urban Poverty and Transport: The Case of Mumbai; World Bank Policy Research Working Paper 3693, September 2005.

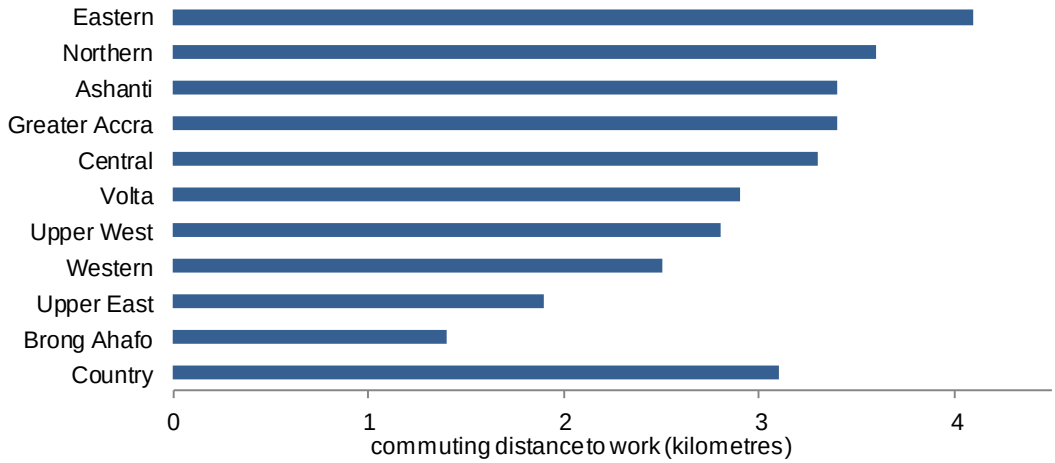
Figure 5.7 Commute modal split: motorised and non-motorised



Source: NSDF Study 2014 based on GSS Transport Indicators Database Survey, 2007

Commuting distance. Figure 5.8 shows the mean distance to work, which is 3 km nationally and ranges from about 1 to 4 kilometres in the regions. These low figures, which are compatible with the findings that most commuters walk to work, may be due to workers choice to live close to where the jobs are located, workers lack of means to commute to jobs at greater distances, or employers choice to locate near to large residential areas with labourers residing at commuting distances.

Figure 5.8 Average commute distance to work by region



Source: NSDF Study 2014 based on GSS Transport Indicators Database Survey, 2007

Commuting challenges: At national level, the main challenges concerning commuting to work are bad roads (34%) and long commuting distances (24%), followed by heavy traffic on the road (19%) (Table 5.4). However, each region has its own specific mix of challenges. For instance, over 60 percent of Greater Accra commuters point at 'heavy traffic' as the main challenge; 60 percent of those from Brong-Ahafo point at 'no access road'; and 72 percent of those from Upper East complain of 'long distances'.

Table 5.4 Main challenges to commuting, % by totals by region and travel mode

	Region											travel mode											
	Western	Central	G. Accra	Volta	Eastern	Ashanti	B Ahafo	Northern	U East	U West	Total	individual taxi	trotro	shared taxi	metro mass bus	public bus	company bus	private vehicle	motorcycle	Water transport	walking	bicycle	other
bad roads	55	34	11	31	30	23	30	60	18	52	34	25	22	39	0	32	43	12	62	8	36	67	11
distance too long	29	14	7	44	31	15	0	26	72	36	24	6	6	5	0	22	0	3	14	62	45	23	17
heavy traffic on road	3	2	61	1	2	22	0	0	0	0	19	38	41	23	0	5	43	83	5	0	1	0	17
difficulty to get vehicle	3	11	5	2	6	18	10	3	3	3	6	6	11	13	60	22	14	1	5	0	3	2	11
long waiting time	3	14	11	3	6	12	0	0	2	1	6	13	17	12	40	16	0	0	0	0	1	0	0
no access road	4	16	0	11	21	7	60	6	0	6	6	2	0	1	0	0	0	0	0	27	11	6	22
no money	3	5	1	3	3	1	0	3	2	0	2	2	1	6	0	3	0	1	0	0	1	0	11
other	1	5	3	4	1	1	0	1	3	3	2	8	1	1	0	0	0	1	14	4	2	1	11

Source: NSDF Study 2014 based on GSS Transport Indicators Database Survey, 2007

Challenges also vary by type of commuting mode. Non-motorised commuters (walkers and bicyclists) and motorcyclists are mainly challenged by bad roads. Private vehicle users overwhelmingly complain about heavy traffic. Out of the three types of bus commuters, metro passengers have trouble getting and waiting for a vehicle, as do public bus passengers who also complain about bad roads and long distances, while company bus passengers state bad roads and heavy traffic. Users of both types of taxis face similar challenges, primarily bad roads and heavy traffic. Finally, water transport users complain about long distances and no access road. These results may be partrly explained by the location of the commuter, this can though not be verified because there is no locational data in the survey.

Strategies to addresses these challenges include the following: improving the pedestrian environment, providing bicycle lanes or routes, improving management of the roads and public transport and investing in new public transport systems such as rapid bus transport, trams and light rails, and most ambitiously, fostering a development pattern that reduces distances between jobs and places of residence.

5.2.5 Public transport and private transport

The privately-owned and operated minibus, or ‘trotro’, is the main mode of public transport and is used by 15 percent of commuters. The trotro system emerged with the gradual decline in the State Omnibuses Service Authority (OSA), presently the troto owners have formed the Ghana Public Road Transport Union (GPRTU). The government has created the Metro Mass Transit (MMT) but has been unsuccessful in reviving the state-operated public bus system. Only 0.2 percent of commuters take a MMT to work. While commuters are generally satisfied with the trotro system, they complain about overloaded vehicles, uncomfortable seats and poor ventilation.

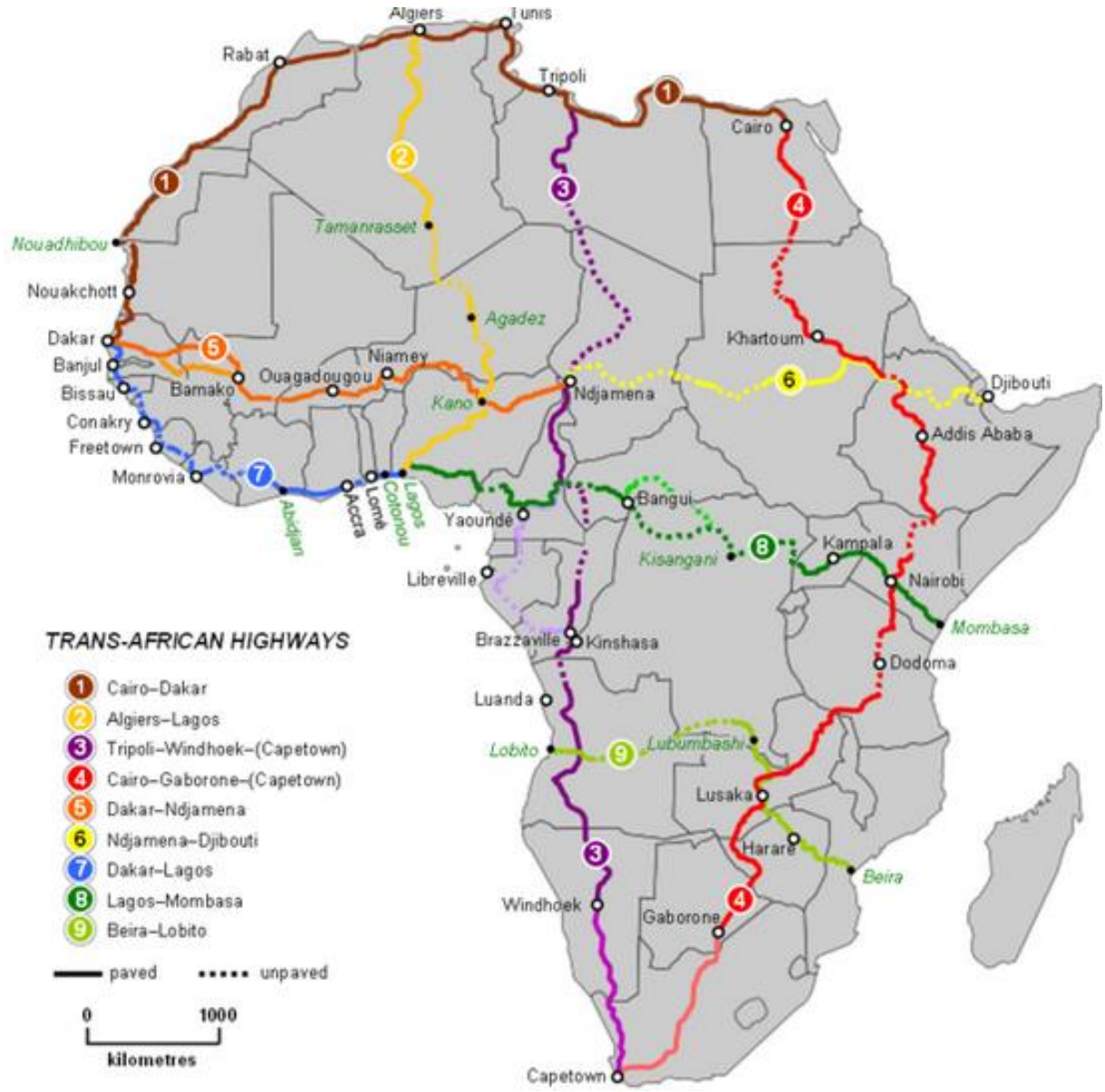
Other public transport modes include individual and shared public taxis, trains and water transport. Taxis are used by eight percent of commuters; trains by less than one percent. Some six percent of commuters in Eastern and Volta regions use water transport, mainly canoes and ferries, to commute across Lake Volta.

Nationally, the use of private vehicles is generally low; only 4 percent commute in private automobiles, but some 12.5 percent of commuters in Greater Accra region drive to work.

5.3 The Trans-African highway network

The Trans-African Highway (TAH) network comprises nine transcontinental road corridors that connect most countries on the African continent. The aim of the network is to promote trade and alleviate poverty in Africa. Network development is supported by the United Nations Economic Commission for Africa, African Development Bank, African Union and regional international unions, including ECOWAS, which supports the development of the Trans-African Highway Network in Western Africa.

Figure 5.9 Trans–African Highway System



Source: African Development Bank

In addition to the physical infrastructure, there are initiatives to reduce delays caused by highway checkpoints, border controls and disparate national regulations and practices. The total TAH network is 57,000 kilometres in length.

Two east-west corridors are relevant for Ghana: the Dakar-Trans-African Highway Ndjamena Highway and the Dakar-Lagos Highway, numbered 5 and 7 in the Figure above.

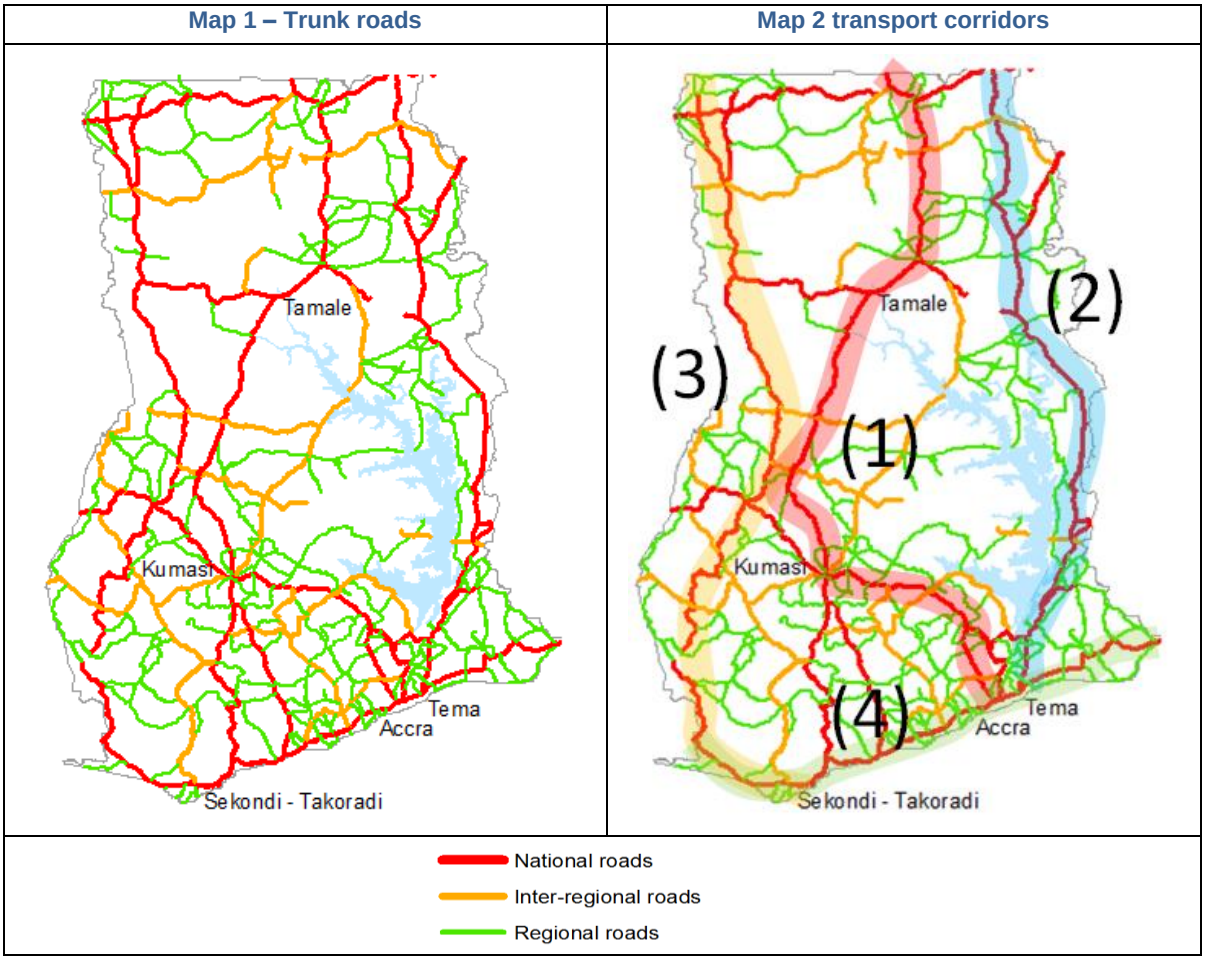
The 4,500 km Dakar-Ndjamena Highway or Trans-Sahelian Highway, with about 80 percent completed, runs through Ouagadougou and links West African countries to the Sahel. The 4,000 km Dakar-Lagos Highway, or Trans–West African Coastal Road, with also 80 percent completed, runs close to Takoradi, Cape Coast, Accra and Tema. In Dakar, the two highways join the Cairo-Dakar highway, which runs around the western extremity of the continent.

Highways 5 and 7 are linked in the east by the Algiers-Lagos highway (number 2), which runs from Lagos through Kano. Because of the large distance between Dakar and Kano, about 3,500 km, NSDF proposes an additional north-south corridor running from Accra and STMA through Ouagadougou, which is roughly at the midpoint. This would connect several land-locked countries to the Ghana ports.

5.4 Trunk roads

The trunk road network is divided into national, inter-regional and regional roads. There are about 4,500 km of national, 2,600 km of inter-regional, and 7,900 km of regional trunk roads. Figure 5.10 shows the trunk road network, which connects major cities and regional capitals and are typically referred to as road corridors: central (1), eastern (2), western (3) and coastal (4).

Figure 5.10 Ghana trunk roads



Source: NSDF Study 2014 based on GHA 2012

The central corridor links Accra/Tema, Kumasi, Tamale, Bolgatanga and the border crossing at Paga and connects also to Sekondi-Takoradi. The coastal corridor links the urban settlements along the coast including Tema, Accra, Cape Coast and Sekondi-Takoradi. The coastal corridor, the old N1 highway, also links to the border crossings at Elubo and Akanu and links up to Ivory Coast and Togo. Accra, Kumasi, Sunyani and Dormaa are additionally bound together with the old N6 highway. The eastern corridor links the urban centres in Volta Region with Greater Accra and Northern Region. The western corridor connects Kumasi, Sunyani, Sawla, Wa and Tamale, although its southern part has weak links in the south west and south east directions.

5.4.4 Trunk road network components

The trunk road network links all major towns, districts and regions. Table 5.5 disaggregates the trunk road system by region and class of road and is sorted out by total road length[105]. Trunk roads are classified as “N” for national, “I” for interregional (between district capitals), and “R” for regional (within the same region), based on the nature of access and service level provided. Northern region has 20 percent of all trunk roads, followed by Brong Ahafo with 14 percent.

[105] The total trunk road network includes several sections, totalling 487 km that are under construction. Thus the existing trunk road coverage is 14,873 km.

Table 5.5 Existing trunk road network, 2012

	total kilometres				total kilometres (%)			
	national	inter-reg.	regional	Total	national	inter-reg.	regional	total
Northern	1,004	460	1,550	3,014	22	19	20	20
B. Ahafo	561	544	979	2,084	12	22	12	14
Ashanti	443	336	936	1,714	10	14	12	12
Western	443	305	921	1,669	10	13	12	11
Eastern	342	370	840	1,551	8	15	11	10
Volta	418	34	994	1,446	9	1	13	10
Central	327	200	672	1,199	7	8	8	8
Upper West	420	121	535	1,077	9	5	7	7
Upper East	288	61	271	620	6	3	3	4
G Accra	280		220	501	6		3	3
total	4,524	2,431	7,919	14,873	100	100	100	100

Source: NSDF Study based on GHA Road Condition Report, 2012

Table 5.6 shows the distribution of trunk roads by region, including data on their respective regional share, road-length density, and population per road length. The table is sorted by road-length density. Northern region, being the largest, has the largest share of the network, but has the lowest road-length-to-area density, while Central and Greater Accra have the highest. Greater Accra and Ashanti have the highest ratio of persons per kilometre of road length; around five times the national average, while Northern and Upper West regions have the lowest ratios.

Figure 5.10 shows that the regional share of all trunk roads correlates strongly to the regional share of national land area, which suggests that the road network is geographically equitable.

Table 5.6 Trunk road distribution by region, 2012

	area km^2	pop '000	pop density	road length (km)	% road share	road-length density	pop/ road km
G Accra	4	4,010	1,060	501	3	132	8,012
Central	10	2,202	230	1,200	8	125	1,836
Eastern	19	2,633	140	1,602	10	85	1,644
Ashanti	24	4,780	199	1,896	12	79	2,521
Upper East	9	1,047	120	620	4	71	1,687
Volta	20	2,118	104	1,446	9	71	1,465
Western	24	2,376	98	1,679	11	69	1,416
Upper West	19	702	38	1,077	7	58	652
Brong Ahafo	40	2,311	57	2,142	14	53	1,079
Northern	70	2,479	35	3,199	21	46	775
total	239	24,659	103	15,360	100	64	1,605

Source: NSDF Study 2014 based on GHA Road Condition Report, 2012

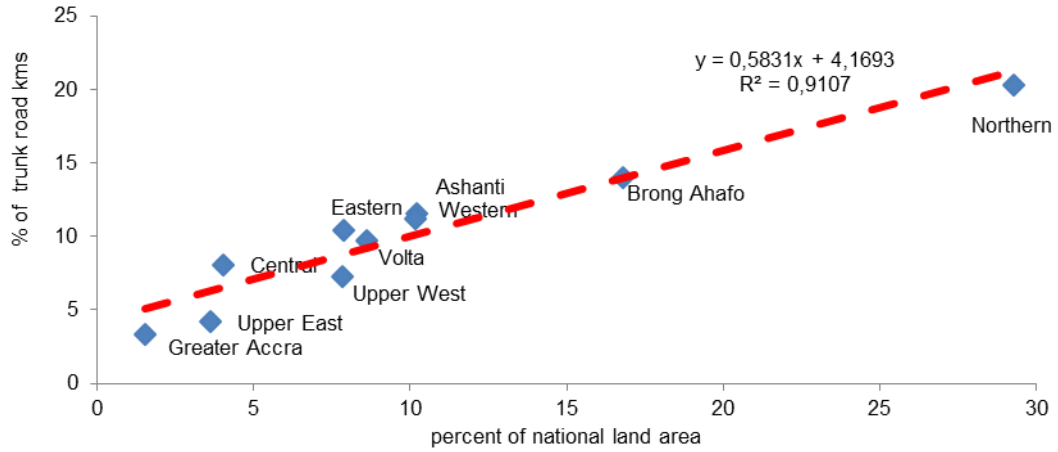
5.4.5 Road densities and road access

Road density (RD) is the ratio of the length of an area's (nation, region, district) total road network to the respective area's land area. Road density is an indicator of the service level. In general, the higher the density, the shorter the travel distance (or access) to the nearest road and the travel distance between two given points.

Map 1 on Figure 5.10 shows a correlation between the road length density and the population density. For example, the districts with higher RDs are shown in yellow and red, are near the coast, in the "triangle", i.e. Accra, Kumasi and Takoradi, and

around the regional capitals; the districts which RDs are shown in blue, are in Northern, Eastern and Brong Ahafo regions.

Figure 5.11 Regional trunk road length by regional area

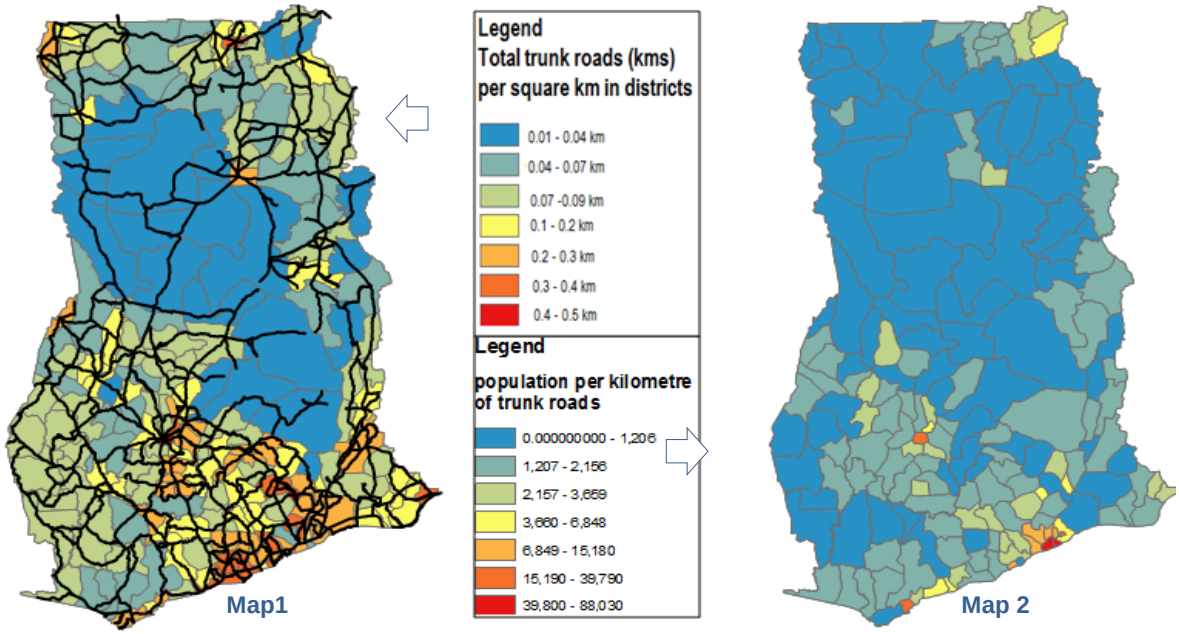


Source: NSDF 2014 based on GHA Road Condition Report, 2012

Population per road length

Map 2 on figure 5.12 shows the ratio of population per kilometre of road, which is an indicator of the intensity of use as well as the potential of cost recovery from the roads' users. The indicator is higher around the major cities and the more densely populated southern part of the country.

Figure 5.12 Road density and population per road kilometre



Source: NSDF Study 2014 based on GHA Road Condition Report, 2012

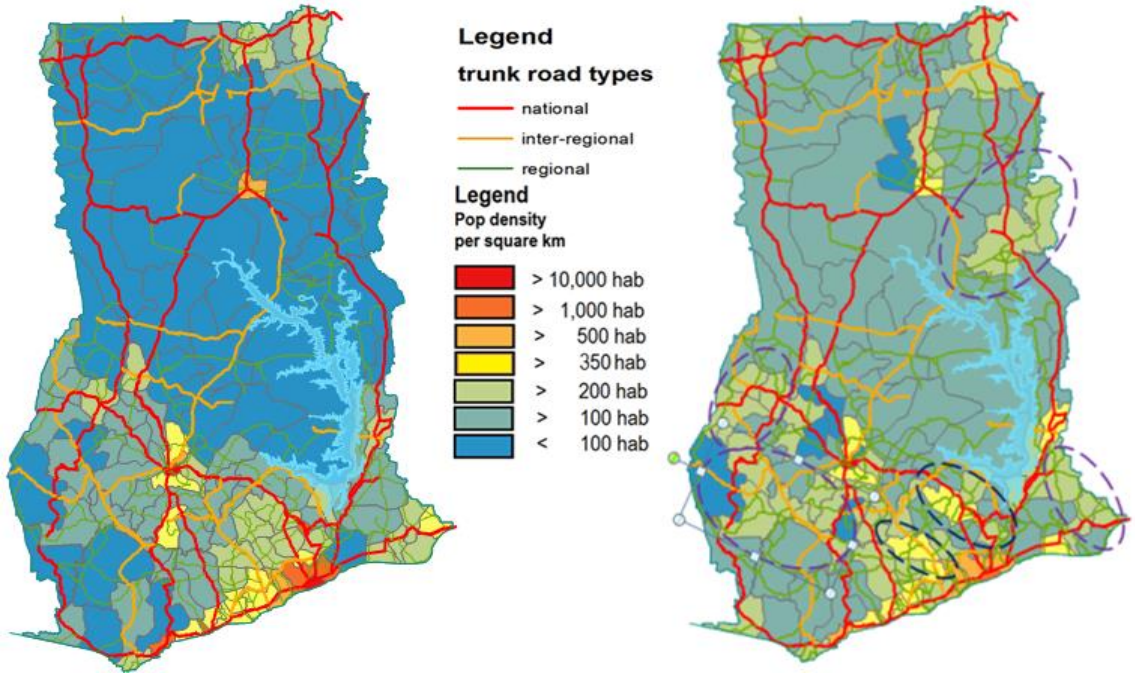
Although the trunk road network is unevenly distributed, map 1 on Figure 5.12 shows that there are more trunk roads in districts with more inhabitants. This

relationship justifies policies that require road users to cover the costs of infrastructure and maintenance.

Figure 5.13 shows the trunk road network in relation to the population density. The blue colour shows low and green, yellow and orange progressively higher density. The map identifies areas where attention should be given to improve the road system such as in the south eastern parts of Northern and Volta Regions, the northern part of Western Region and the eastern part of Brong Ahafo since population in these areas is increasing, they remain the less well served areas with trunk road networks.

Figure 5.13 Trunk road network and population density

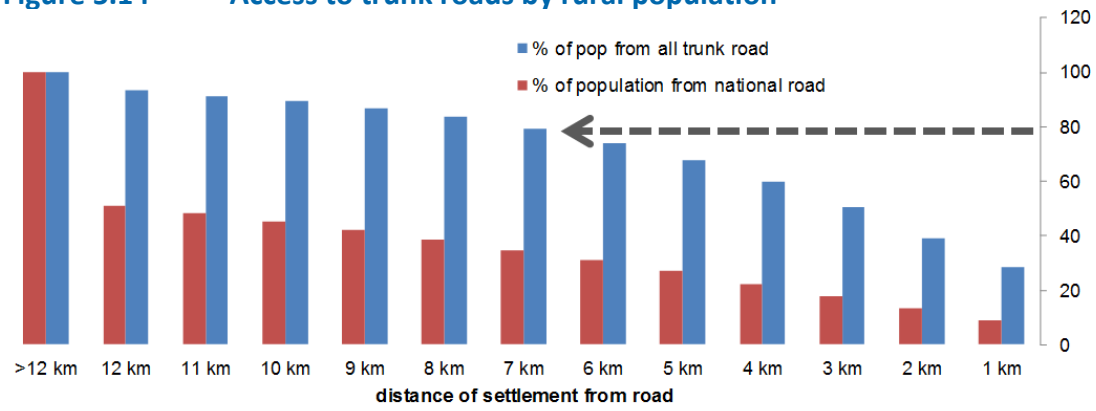
Map 1 Trunk roads and population density **Map 2 Trunk roads and population**



Source: NSDF Study 2012, GHA 2012 and GSS 2010

Rural settlement populations vary significantly in terms of distance from trunk roads. An estimated ten percent of the rural population is located further than 12 km from the nearest of any type of trunk road, while 50 percent is located further than 12 km from the nearest national-level trunk road. Yet a significant share of rural population is close to a trunk road, i.e. 70 percent is located within 5 km (Figure 5.14).

Figure 5.14 Access to trunk roads by rural population



Source: NSDF Study 2014, GIS analysis based on data from GSS 2010

5.4.6 Road surface quality and surface condition

Road surface quality

Road surface quality including asphalt and concrete roads are of higher quality than surface treated and rigid roads, which in turn are better than gravel roads and the quality varies by region (Table 5.7). Overall, only about 36 percent of the network is paved; 10 percent in asphalt or concrete and 26 percent is surface-treated. Greater Accra has the best quality of roads; about 32 percent of the system is surfaced with asphalt or concrete while another 31 percent is surface treated or rigid. Other regions with relatively good road surfaces are Ashanti and Central regions. The roads in the three northern regions have relatively poor surfaces with over 50 percent gravel roads.

Table 5.7 Trunk road surface types by region (percentage)

	asphalt or concrete	surface treated and rigid	gravel	under construction	missing	all
Greater Accra	32	31	5	1	0	100
Ashanti	21	24	16	9	7	100
Central	14	32	13	9	0	100
Brong Ahafo	12	30	20	6	2	100
Upper East	9	19	49	5	0	100
Western	8	23	40	6	0	100
Northern	7	11	64	2	5	100
Eastern	5	39	11	2	2	100
Volta	5	33	11	17	0	100
Upper West	0	15	60	10	0	100
Total	10	26	30	7	2	100

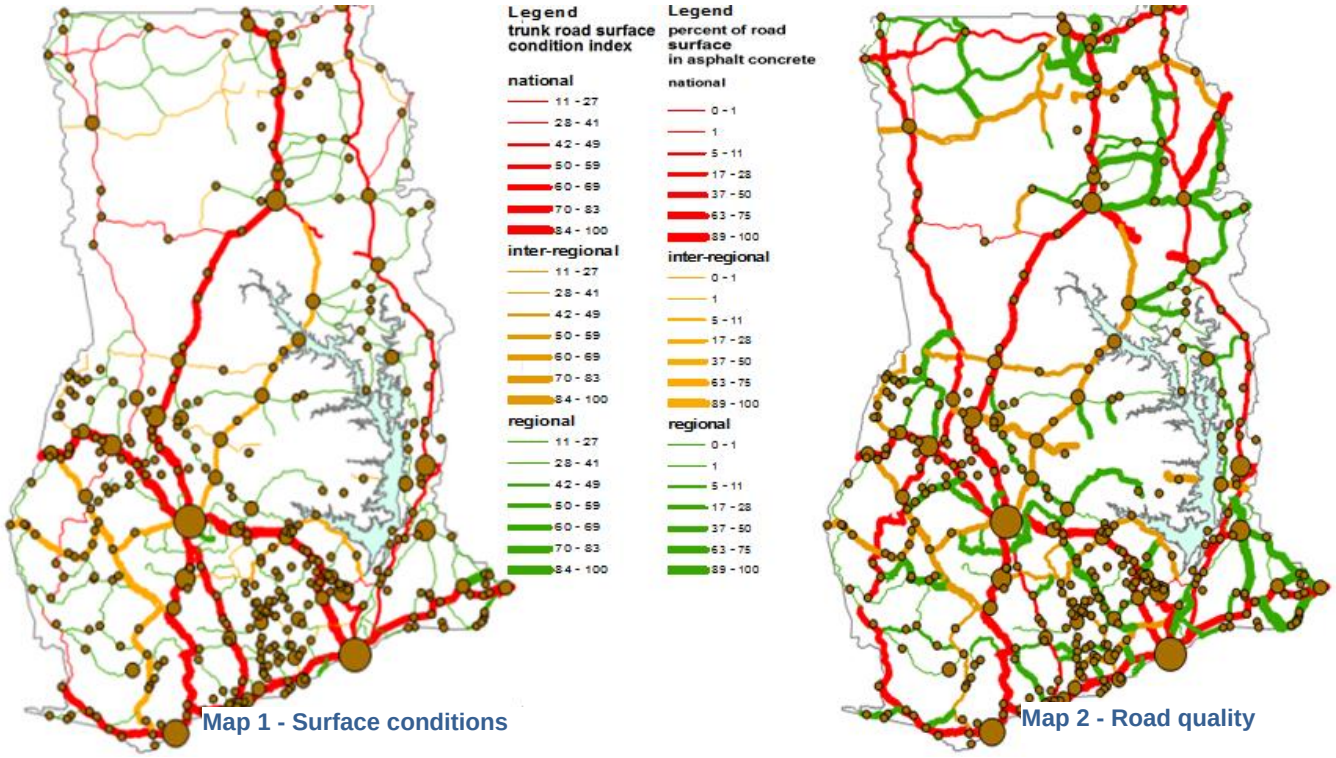
Source: NSDF Study 2014 GHA Road Condition Report, 2012

Map 2 in Figure 5.15 shows the surface quality of all three trunk road types: national, inter-regional, and regional. Surface quality is indicated by the percentage of individual trunk road corridors that were surfaced in asphalt/bituminous or concrete in 2012. In general, road quality is linked to road type: national roads are better than inter-regional, and inter-regional are better than regional roads. Major cities and the principal international border crossings are better served by high quality roads. It is understood that the roads authority has recently upgraded the quality of many more roads, including the sections of Hamale-Wa-Techiman; Sawla-Fufulsu; Tamale-Yendi; Ahamasu-Nkwanta and Nkwanta-Bimbila.

Road surface conditions

Map 1 in Figure 5.15 shows the surface condition of trunk roads. Inadequate road maintenance has been and is still a serious challenge for an adequate functionality of the road system. Poor surface conditions are a major obstacle for transportation of passengers and cargo between settlements, ports, local markets and neighbouring countries. Poor surface conditions are challenging in both urban and rural areas. Poor quality roads harm connectivity and interaction, prolong travel times, reduce road safety and provoke considerable additional repair costs of the vehicles.

Figure 5.15 Trunk road surface conditions / road quality 2012



Map 1 - Surface conditions

Map 2 - Road quality

Source: NSDF Study 2014 based in Road and Highway Authority data, 2012

Proper maintenance of road systems requires considerable and dedicated resources. The World Bank estimates indicate that African countries need to spend about 27 percent of their budget on their infrastructure maintenance, of which the largest share is to be dedicated to road maintenance[106]. Ghana Road Authorities plan to use 26 percent of the road infrastructure budget between 2013 and 2020 for road maintenance.

Ghana is gradually improving the surface condition of its roads. For example, in 2012, *good*, *fair* and *poor* roads accounted for 49, 25 and 16 percent of the total, respectively. This is a significant improvement from 2008 when these figures were 38, 30 and 32 percent[107] (Table 5.8).

Road surface conditions were related to road type; national roads were in better condition than inter-regional roads, and these were in better condition than regional

[106] World Bank, Africa's Infrastructure, A time for transformation, 2010

[107] Some 9 percent of the network was not surveyed because the roads were not accessible.

roads. Some regions maintained their roads better than others. For example, regions with above average shares (16%) of poor roads were Western, Eastern, Central and Greater Accra. Regions with below average (49 %) shares of good roads were Volta, Central, Eastern and Western.

Table 5.8 Trunk road surface conditions 2012 (percentage)

	condition	total	Western	Eastern	Central	G Accra	Northern	Ashanti	U West	B Ahafo	U East	Volta
national	uc	8	0	8	16	0	3	14	12	2	14	19
	good	62	38	35	53	89	65	81	58	74	51	63
	fair	23	38	54	22	11	25	5	27	15	26	11
	poor	7	23	3	9	0	7	0	4	9	9	7
	all	100	100	100	100	100	100	100	100	100	100	100
Inter-region	uc	7	15	0	3		0	13	0	12	0	0
	good	55	35	37	38		67	70	0	69	75	75
	fair	22	35	27	52		17	3	80	7	0	0
	poor	17	15	37	7		17	13	20	12	25	25
	all	100	100	100	100		100	100	100	100	100	100
regional	uc	12	9	6	11	3	0	14	9	21	0	37
	good	40	25	28	34	33	51	40	52	45	90	38
	fair	28	25	41	23	27	31	31	26	28	5	19
	poor	20	42	25	31	37	18	15	13	6	5	6
	all	100	100	100	100	100	100	100	100	100	100	100
all	uc	10	8	5	11	2	1	14	9	13	8	29
	good	49	30	31	40	60	59	58	50	59	67	48
	fair	25	30	41	29	19	26	18	31	19	17	16
	poor	16	33	22	21	19	14	11	9	8	8	7
	all	100	100	100	100	100	100	100	100	100	100	100

Source: NSDF based on GHA Road Condition Report, 2012; Note: uc = under construction

Regional and interregional road surfaces are in worse condition in Western region where transport of the cocoa and mineral ore for export is taking place. Also, the road network within the Triangle, from where agricultural products might be transported to the important markets in Kumasi, Accra and Takoradi, have poorly maintained roads. The Volta Lake area is another part of the country with poor road surface conditions.

5.4.7 Road connectivity assessment

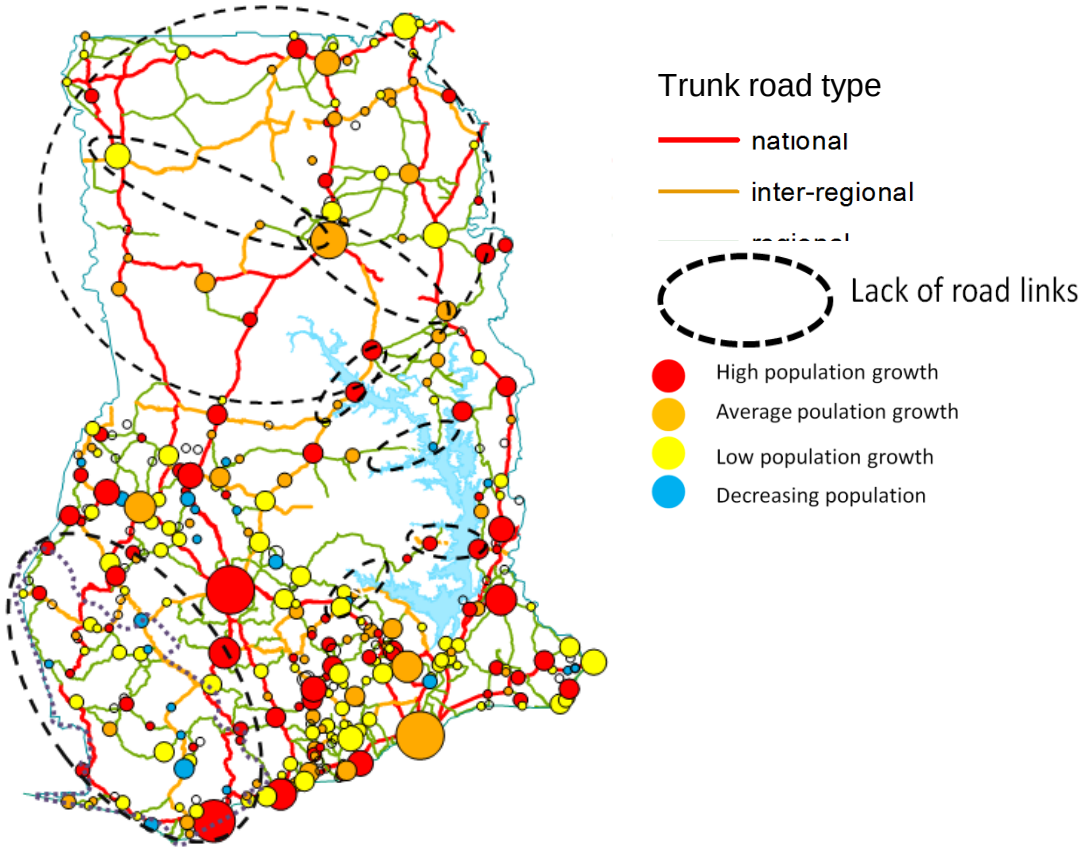
Good road connectivity is key since it supports urban as well as rural development. A good road network promotes private and public service provision as well as service sharing and access to markets, retail, repair services, education, health and other administrative and socio-economic activities. NSDF has assessed trunk road network connectivity and has identified a number of weak areas, particularly in the central part of the county, Western Region and the northern regions (Figure 5.16).

Lake Volta's barrier: The most important connectivity issue is the separation of central and eastern parts of Ghana by the Volta Lake. The four existing ferry crossings are said to be unreliable and have low capacity. The separation affects movement between Volta and Ashanti Regions but also between Ashanti and Togo, as well as development on both sides of the lake and its surroundings. Recognising this separation, the railroad master plan proposes a rail link from Kumasi to Kwadwokurom at the eastern shore of the lake. Measures to improve connectivity could include construction of trunk and feeder roads and modernisation of the ferry services around the lake.

Western region requirements for improved links: Western Region has weak connections to the regional capital Secondi-Takoradi; between Kumasi and the border crossing at Elubo; towards the "triangle" area and Accra; and in border areas from Enchi up to Nsawkaw and Bui. Improved roads in this corridor might stimulate agricultural development and trade in an area renown for fertile soil and high agricultural production potential.

Need for improved inter-regional links: In the northern regions, there are no direct links between the regional capitals Tamale and other capitals, (although the rehabilitation of the Wa-Sawla–Tamale road in 2014 has improved the situation); between Wa and Bolgatanga; and between Bimbila and Tamale there are still deficiencies. Development in the north depends on good connections between urban settlements and growth centres, these need to be well connected by roads to promote interaction as well as access to markets and services. In the south east, the link is weak between Ho and the border crossing at Akano.

Figure 5.16 Lack of road links



Source: NSDF 2014 based on data from Road and Highway Authority 2012 and GSS 2010

5.5 Feeder roads

The Department of Feeder Roads (DFR) plans, develops and maintains 42,000 km of feeder roads. Their overall goal is to extend the feeder road network to within 2 km of 80 percent of rural settlements.

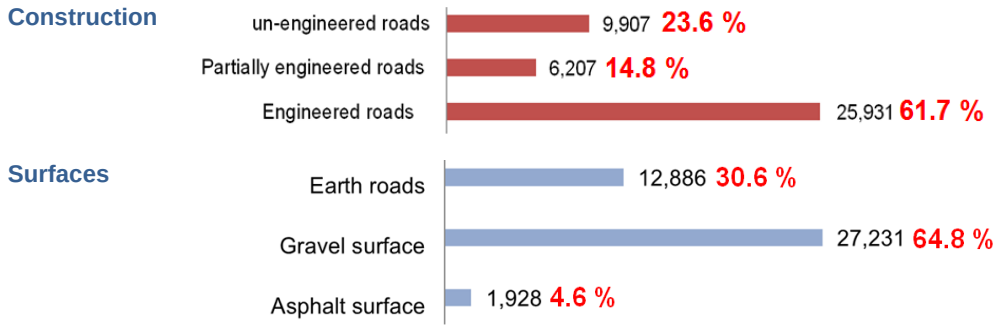
There are three levels of feeder roads: inter-district, connector and access. Inter-district feeders serve most of the inter-district and inter-regional trips and cater for most of the traffic. Connectors link to other district roads and link towns and villages to the trunk road network; they may at times cater for as much traffic as inter-district

roads. Access feeders lead to communities and villages, they are usually shorter, and have less traffic[108].

The inter-district and connector roads are considered to be more important and are given higher priority. Figure 5.17 shows that 62 percent of the feeder roads are engineered and 15 percent are partially-engineered. Engineered roads are gravelled, cambered, and have drainage structures (culverts) and side drains. Partially-engineered roads have some drainage structures and may be shaped. The remaining 24 percent are un-engineered roads.

Only 5 percent of feeders have asphalt/bituminous surface while 64 percent have gravel surface. The remaining 31 percent have earth surfaces that are vulnerable during the rainy seasons.

Figure 5.17 Feeder road construction and surface quality



Source: NSDF Study based on Feeder Road Department, 2014

Feeder road densities

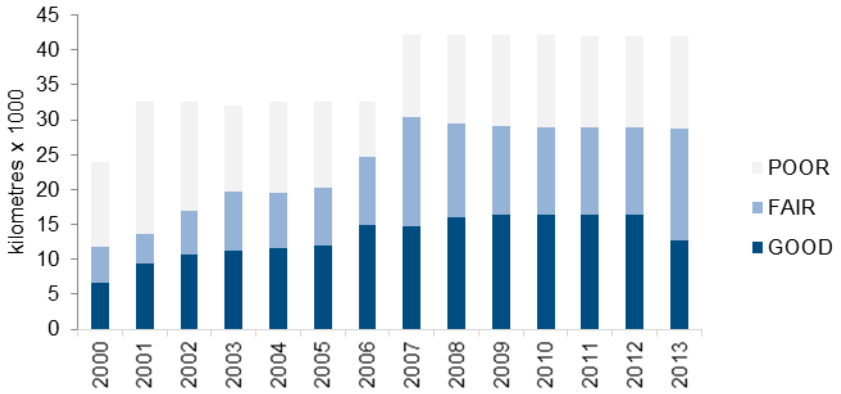
Feeder road densities are an indicator of rural-urban connectivity. A former study found that only 25 percent of rural dwellers have access to an all-weather road within a two kilometres distance, far below the 60 percent average in Africa's middle-income countries (AICD 2010). Another study found that residents in some areas in the north are more than ten kilometres from the nearest road and that it takes farmers an average of two hours to reach the nearest town with a population of over 100,000 (WBGUR). Feeder roads are important for the transportation of agricultural products to trunk road and hence to markets. Poor rural-urban connectivity harms and restrains agricultural productivity by poor access to agricultural inputs and markets and genders higher post-harvest losses. It also results in higher food prices in urban areas. The end result is rural stagnation and higher migration rates to urban areas (ISSER 2009, 2010).

Feeder road system extension and improvement

The Department of Feeder Roads constructed about 18,000 km of feeder roads between 2000 and 2007 but it has not extended the network since. Since this period, between 2007 and 2013, the surface quality of feeder roads declined; the share of poor quality roads (32 percent) increased slightly and the share of good feeder roads has dropped between 2012 and 2013 (Figure 5.18).

[108] Feeder Roads Department, October 2014

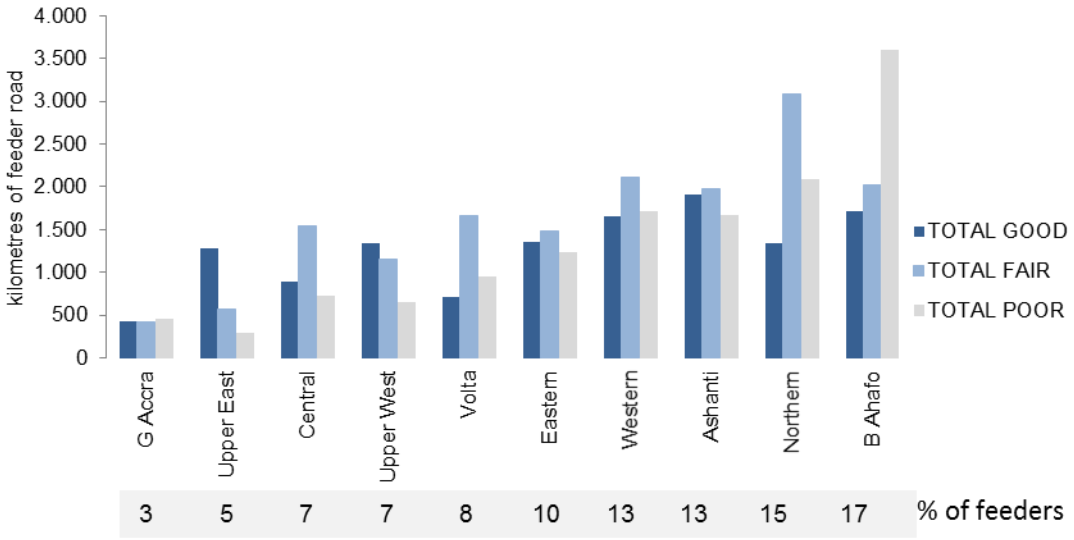
Figure 5.18 Feeder road surface conditions, 2000-2013



Source: NSDF Study 2014 based on Feeder Road Department, 2014

Figure 5.19 shows the distribution of feeder roads by condition and by region (sorted out by total feeder road length). The regional share of feeder roads ranges from 3 percent in Greater Accra to 17 percent in Brong Ahafo. The regions with a high share of poor feeders include Brong Ahafo and Greater Accra. Brong Ahafo's poor feeder roads are a matter of national concern given that the region is the bread basket of Ghana.

Figure 5.19 Feeder road conditions by region, 2013



Source: NSDF Study based on Feeder Road Department data, 2014

5.6 Urban roads and mobility

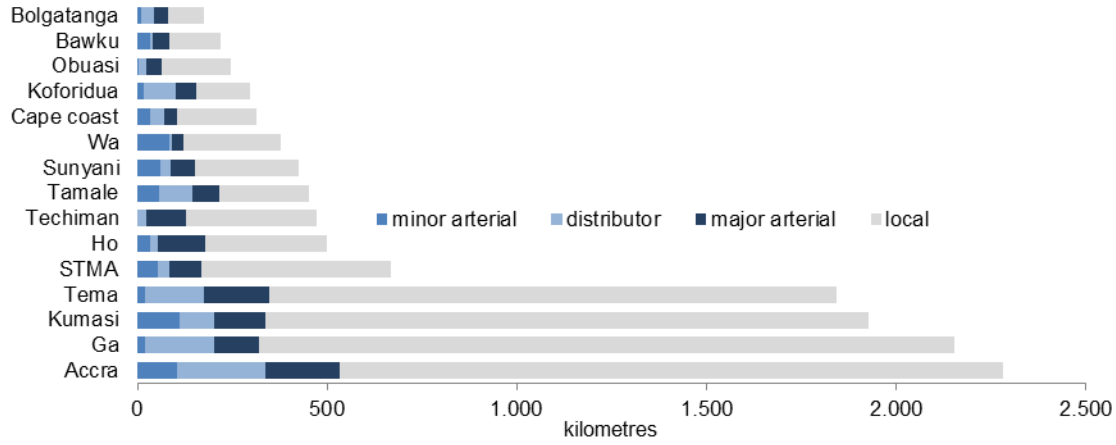
Urban road management has been decentralized to the district assemblies under the supervision of the regional offices of Urban Roads Department. The designation of urban roads is determined by all departments concerned including Highways, Feeder roads and Urban roads.

Urban road network in urban centres

Only 15 urban centres have urban roads: the ten regional capitals plus Ga, Tema, Techiman, Obuasi and Bawku. The urban roads network's 12,000 km roads are categorised into expressways, major arteries, minor arteries, collector or distributor

roads, and local roads. Three-quarters of urban roads are local, 11 and 5 percent are respectively major and minor arterials, and 8 percent are distributors/collectors.

Figure 5.20 Length of urban roads in major cities and towns



Source: NSDF Study 2014 based on Department of Urban Roads, Annual report 2008 excluding expressways

Urban road length and share of roads vary by category among the urban centres (Figure 5.20). The city-region of Accra, Ga and Tema has over 6,200 km, accounting for almost half of the network's length. Kumasi has about 16 percent while all other centres have no more than five percent each.

Urban road system challenges

Although road densities are higher in and around urban centres, urban road systems are suffering considerable challenges due to more intense road use, urban expansion and sprawl. More than 70 percent of the arterial roads in the major cities are congested, resulting in economic loss and increased air pollution[109]. The situation is expected to worsen; as the use of private vehicle is projected to increase five-fold, while urban population is projected to double by 2035.

Congestion problems in urban centres have been experienced in many other countries since the private car became an affordable common family commodity and useful experiences are available to draw upon in order to improve the situation. To address the urban road problem, there is a long term need for improved integration of land use and transport planning. In the short term, there is a need to improve the management of the existing road system. This may be accompanied by constructing additional lanes, upgrading road surfaces, and improving signage[110].

Another common problem that obstructs traffic circulation and creates congestion on urban roads is the use of all urban road categories as direct access and exit roads. To rationalise the flow in the traffic on the urban roads, these must be used according to the road hierarchy, reserving major and minor arteries for through-passing and connecting traffic only, limiting direct access to distributor and collector roads as much as possible and providing access to plots and parcels only from the local roads.

In existing urban areas, this may be difficult to ensure. But all new urban developments the road and urban plan departments in the district assemblies must

[109] Draft NIP 2013

[110] Draft NIP 2013

ensure a strict discipline regarding the design and use of the road hierarchy. In new schemes, access to plots should be from local roads.

Nevertheless, improvement of the urban road capacity is not likely to reduce congestions. In many cases, road improvements generate more traffic, adding to the congestion problems. Parallel with physical and functional improvements of the urban road system, urban roads need to be adjusted and prepared for complementary efficient public transport services with larger buses and/or tramways.

A major issue is the funding of road improvement and maintenance because the National Road Fund is limited and district assemblies do not have their own road funds. Priority is given to the urban roads that are highest in the urban road hierarchy. This is determined by the number of vehicles in use in the area, the road network situation and the population served[111].

5.6.4 Urban public transportation

The major challenges facing urban public transportation include the following[112]:

- more than 70 percent of the arterial roads in the major cities are congested
- public transport is of low coverage and low quality and waiting times are long
- informal sector provides 70 percent of public transport

Trotros and other buses, which occupy only 32 percent of the road space, carry more than 68 percent of the passengers[113]. Public transport services are provided mainly by the private informal sector, and more recently, by the public sector, and even more recently by the private formal sector. The private informal sector provides the bulk of transport services and trotro owners have formed the Ghana Private Roads Transport Union (GPRTU). GPRTU members provide unscheduled and unregulated intra- and inter-city trotro services.

The Metro Mass Transport (MMT) service, established in 2002, covers ten regions and 15 of the major towns and cities. The service includes long distance, inter-city, and intra-city components. In 2008, only half of its buses were in operation (GSS 2008).

Recently, a few formal private transport companies have started to provide large-bus services along routes with high demand including Accra–Kumasi, Accra–Tamale, Accra–Cape Coast–Takoradi, and others[114]. Nevertheless, it is generally agreed that public transport will need further improvements in order to provide adequate services and address traffic congestion.

Urban Transport Policy and Strategy

The Government's urban transport policy is to: invest in and improve public transport systems so as to cover 80 percent of all passenger trips; provide sufficient urban public transport infrastructure and regulations; develop and implement a decentralised institutional and regulatory framework for public urban transport; and integrate urban public transport into a strategic urban development framework[115].

[111] Urban Roads Department, October 2014.

[112] Draft NIP 2013

[113] Department of Urban Roads, Ministry of Roads and Transport 2004-05 with the international Consultants DHV, BCEOM in collaboration with Municipal Development Collaborative and Associated Consultants.

[114] WB Ghana Urban Roads

[115] Ghana Ministry of Transport, 2007

Ghana Urban Transport Project, UTP

The Ghana Urban Transport Project (UTP)[116] aims at improving mobility in the Greater Accra and Kumasi Metropolitan Areas. Key components include: (i) support to traffic engineering, management and safety; (ii) integration of urban development and transport planning for better environmental management; and (iii) strengthening the capacity of ministries and agencies concerned with urban transport. Component (i) involves investments in infrastructure and equipment including traffic signal control, segregated bus-ways, interchange facilities, terminals and pedestrian-ways.

The project has designed a pilot project of large-bus system for Accra, based on B-Bus technology, to begin operations in 2015. B-Buses are more economical than the bus rapid transit[117], or BRT, because they use the same lanes as other vehicles where possible, instead of segregated bus-ways. If successful, the B-Bus system will be rolled out in Kumasi.

Box 8 Ghana Railway Master Plan addressing urban public transport

The Ghana Railway Master Plan (GRMP) of 2013 stresses the importance of a viable, rapid urban public transport system that links to the railway network and includes buses, light trains and railways. The plan recommends large-bus systems and BRTs on segregated bus-ways. GRMP proposes public transport strategies for Accra, Kumasi, Sekondi-Takoradi and Tamale. It also states that the public transport strategy requires that the population densities of these cities are increased, particularly in the inner parts but also along commuter corridors.

Public transport in Accra and Kumasi: GRMP projects that by 2035 Accra and Kumasi Metropolitan Areas will need a public transport system that can accommodate about 10.6 million and 7.6 passenger trips-per-day respectively. GRMP recommends for Accra and Kumasi metropolitan areas the following way forward:

- define public transport policies which identify the public transport organisations that can plan, manage and install high capacity mass transport systems, coordinating and integrating the different traffic modes of bus, BRT and railway;
- prepare metropolitan transport plans considering the possibilities among the numerous routes in the territory for the establishment of a high capacity system starting with busses, BRT systems and tram-buses including also the LRT;
- study the possibilities of the rehabilitation and/or new construction of suburban railway lines for commuters;
- study where to locate interchange points between the various means of traffic, establish park and ride facilities to facilitate use of busses, trams of trains and make the service more appealing;
- strengthen the policy for electric power supply in metropolitan areas to ensure future power supply to the establishment of heavy metro and LRT systems.

Public transport in Sekondi-Takoradi and Tamale: GRMP projects that by 2035 Sekondi-Takoradi and Tamale will need a public transport system that can accommodate about 900,000 and 500,000 passenger trips-per-day respectively. To handle this load, GRMP recommends the following:

- identify one public institution to plan and manage the local public transport;
- plan a local transport with sufficient lines to cover the territory, based on the adoption of high capacity systems starting with buses (single and 2 coaches), BRT system and/or tram buses

[116] Funded by the World Bank and the French Development Assistance, the project started in 2007 and will run until 2020.

[117] The BRT system combines the capacity and speed of light rail, tramway or metro with the flexibility, lower cost and simplicity of a bus system. The BRT transport system (BRT) has been developed since the 1970s and has specialised design, services and infrastructure to improve the system quality and remove the typical causes of delay. The BRT operates for a significant part of their journey within a fully dedicated right of way (bus way) to avoid traffic congestion. The BRT provides “rail-like” service using specialized vehicles, designated stations, frequent scheduled service, segregated bus-ways, interchange facilities, terminals and facilities for pedestrians and non-motorized transport; as well as improved passenger comfort and amenities; The first BRT system was established in Curitiba, Brazil, and entered in service in 1974. This inspired many similar systems around Brazil and the world, such as the one in Bogotá, Colombia, which opened in 2000. A BRT vehicle can transport between 1500 and 4000 passengers per hour[117]. The BRT is recommended by transport consultants for the Ghanaian cities and is being considered for testing in Accra and Kumasi.

in order to achieve a high capacity mass transport system;
- integrate the various means of transport with interchange points, making the bus service more appealing with (park and ride) where private car users conveniently can change from car to bus or BRT service.

Accra suburban railway: The Ghana railways were established in the early 1900. The southern part of the old Eastern Railway Line links Accra, Achimota, Tema and Kotoko. Today the part of the railway line running from Tema to Accra is 24 km and has been renovated between 2007 and 2010. The railway line carries around 1,400 passengers per day.

GRMP have confirmed, based on a 2004 study[118] that the economic feasibility of a commuter-based suburban railway network by 2035 would serve an area of about 8 million inhabitants in the Accra built-up area. It considers that the feasibility exists for suburban railway lines along six identified important existing commuter routes. The six railway lines identified are four radial and two circular lines as shown in Figure 5.19 below.

Figure 5.21 GRMP-proposed concept for a suburban rail network

Source: Ghana Railway Master Plan 2013

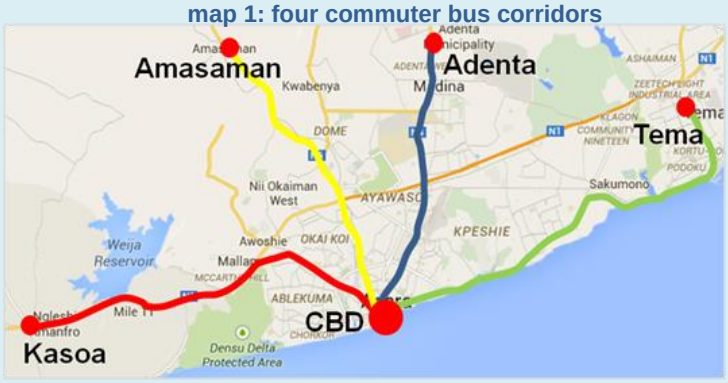
NSDF notes that the proposed corridor (IV) does not link to the planned ECOWAS Abidjan-Lagos railway.

[118] DHV, Traffic Study in GAMA1, 2004.

Box 9 Accra's Bus System

The MMDAs in Greater Accra Metropolitan Area (GAMA) and the Awutu Senya East Municipality in Central Region [119] are collaborating to promote an Accra Bus System to resolve the serious mobility problems that resulted from the rapid population growth, urban sprawl and the use of private vehicles. Map 1 below shows the location of the four commuter corridors that will be served by the system while map 2 beside shows the alignment of the pilot route.

map 1: four commuter bus corridors



map 2: pilot bus

Source: NSDF Study 2013 based on Accra Bus System Plan

Box 10 Greater Kumasi Urban Development Plan 2013

Greater Kumasi Urban Development Plan (GKUDP) 2013 proposes a series of interventions to improve mobility in the Greater Kumasi Sub-Region. The recommended strategies also include development of urban road and public transport systems as well as rehabilitated rail lines.

The key urban road system interventions comprise a new road hierarchy, a new ring-road system and strategic road improvements. The proposed three-part road hierarchy consists of (i) arterial roads comprised of major roads and (ii) regional roads and collectors (or distributor) roads.

The ring road system comprises the existing inner-ring road at about three kilometres from the city centre, a middle-ring road at about six kilometres, and an outer ring-road around 22 kilometres from the centre. The ring roads improve the network by reducing flows through the main city centre dispersing incoming traffic to the sub-centres. Strategic road improvements include widening critical roads for traffic, construction of missing links to provide more direct routes where needed and where possible, and grade separation at critical junctions to reduce snarled traffic and improve traffic flow.

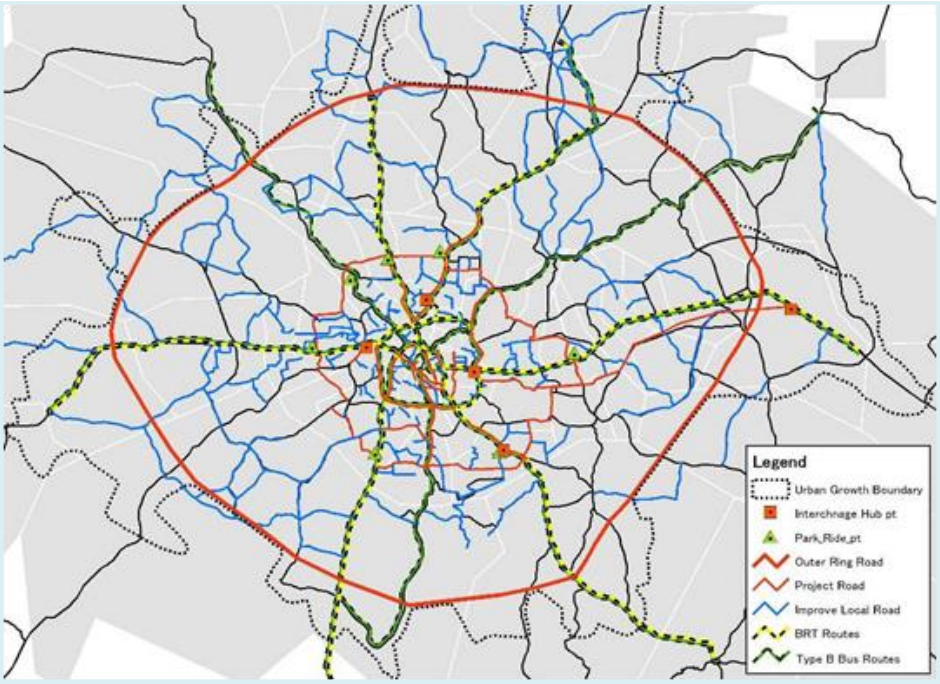
The proposed key public transport improvements are a BRT and Bus-B service system[120] that operate on nine radial roads and on the inner ring-road. BRT systems are proposed to run on six of the radials and the Bus-B service on three. The system will have transfer hubs at Tafo, Anloga, Kwadaso, Abinkyi and Ejisu.

The system will also develop and integrate the existing trotro system which will operate on the collector roads to serve as feeders to the new BRT and Bus-B services.

The GKUDP included rehabilitation of the existing railway lines between Kumasi and Bekwai on the western railway line and between Kumasi and Ejisu connecting to the inland port at Boankra and the toll free development zone. A heavy suburban railway is considered not to be justified within the GKUDP planning period.

[119] comprising the Assemblies of Accra Metropolitan area, Ledzokuku-Krowor Municipality, Tema Metropolitan Ares, Ga West, Ga East, Ga South, Ga Central, Ashaiman Municipality, Adentan Municipality, La Nkwantanang Madina Municipality, La Dade Kotopon Municipality and Awutu Senya East Municipality in Central Region

[120] BRT buses run on segregated bus-ways and type Bus-B routes run on segregated bus-ways only in areas with obstacles for the bus' speed.



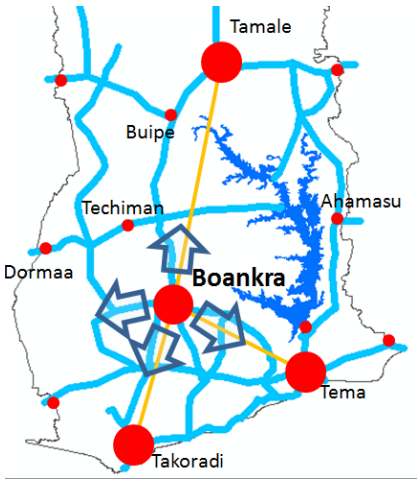
Source: GKUDP, 2013

5.7 Transport Centres and Hubs

Transport centres improve connectivity, handling of cargo and coordination of the different transport modes. Transport centres also complement the ports with storage capacity and pull transport vehicles and transport handling away from the urban centres.

5.7.1 Boankra inland port project

The Boankra Inland Port, located near Kumasi, a major generator of imports and exports, is one of Ghana's most important transport projects.

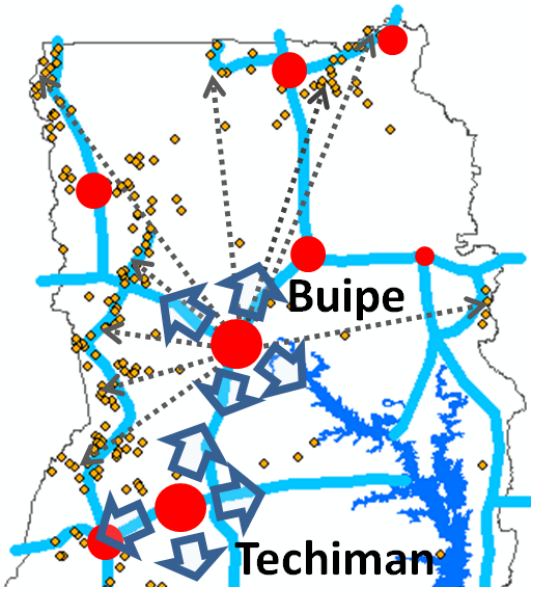


Located on a 160 ha site in Ejisu, about 28 km east of Kumasi, the port is expected to reduce congestion at the Takoradi and Tema ports and lower transport cost for importers and exporters in the middle and northern parts of Ghana as well as in the landlocked countries. Its site is also near residential and commercial development areas, near to the toll free zone planned for agro-produce processing industries, and near to the Kumasi Outer Ring Road, which will be the connection point for passenger traffic between Kumasi and Accra as well as between Kumasi and Tamale.

The area will also be an ideal location for a major passenger transport centre for all destinations in Ghana. The development of the Boankra Inland Port is expected to boost economic development in the triangle cities. The development of the national railway network is substantial for the development of the inland port and the NSDF proposes that the future railway lines and the future express ways meet in this location.

5.7.2 Other traffic centres

Several minor transport centres will be needed at border crossings to facilitate, service, and provide maintenance and parking facilities for transport vehicles. The maintenance facilities for the rolling stock on the railway will have to be coordinated with these transport centres. The development of a transport centre will generate considerable business and employment opportunities for the urban population. Other traffic centres may be needed to service the expressway and trunk road systems such as Buipe and Techiman.



Buipe and Techiman

Buipe, the nodal point where the proposed expressway, rail and Lake Volta transport will meet, is a strategic location for a transport centre. Techiman is also a strategic transport centre, as it is a major trading post for agricultural produce from the land locked countries and northern Ghana, it connects to Cote d'Ivoire via Sunyani, Berekum and Dormaa-Ahenkro to the west and to Togo via Ejura and Mampong.

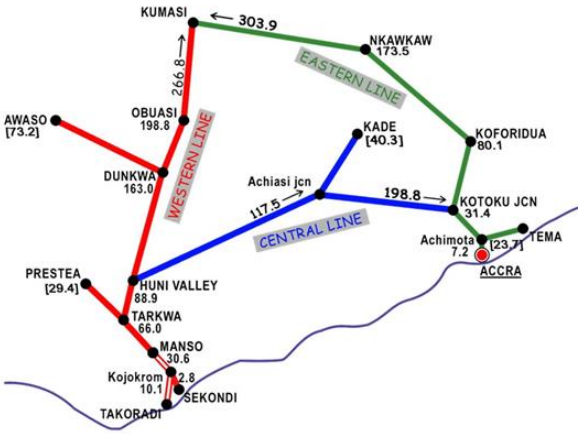
5.8 Railway

The existing railway network is located in the southern part of the country. Historically, minerals, cocoa and timber constituted the bulk of goods traffic on the railway network. The total railway network is 947 km long and consists of three main stretches: (i) Western Line (red), from Takoradi to Kumasi with branches from Tarkwa to Prestea and from Dunkwa to Awaso; (ii) Eastern Line (green), from Accra to Kumasi with a branch to Tema and (iii) Central Line (blue), from Huni Valley to Kotoku with a branch to Kade (Figure 5.23). The system is mostly single-track, except for the 30 km stretch from Takoradi to Manso, which still carries Manganese to Takoradi port.

The main issues faced by the railway system include obsolete network and trains, encroachment on railway lands, and a dwindling customer base, due to inability to provide reliable services.

Most of the network is originally from the early 1900's. Only around 10% has been rehabilitated or re-built to support passenger transport and the new oil and gas industry to ease pressure and congestion on the roads and highways. The operational sections are in the Western Line between Takoradi and Tarkwa and the Eastern Line between Tema and Accra. Two lines are presently being rehabilitated: Accra-Achimota–Asaprochonaa and Sekondi-Kojokrom-Takoradi.

Figure 5.22 Existing railway network in kilometres



Source: Railway Master Plan Inception Report, 2013

Investment into the rail sub-sector is required to move cargo from the ports of Tema and Takoradi to inland destinations. Cocoa, petroleum, cement, bauxite, manganese and other bulk cargo are more efficiently and safely moved by rail. Investment in rail will reduce the pressure on roads and their maintenance. There is also the need for efficient suburban rail services for Accra, Tema, Kumasi and Takoradi. This will contribute to a more fluid urban mobility and help reduce the effects of congestion on roads.

5.8.4 Existing railway policies and plans

Medium-Term National Development Policy Framework

The GSGDA and GSGDA II (2014-17) set out the government's policies regarding the development and operation of the national railway system. The government intends to upgrade, modernize and extend the railway network to ease the pressure, and reduce the rapid deterioration of roads and highways. The main policies aim to:

- establish Ghana as a transportation hub for the West African Sub-Region;
- create and sustain an efficient transport system that meets user needs;
- integrate land use, transport planning, development planning and service provision;
- Create a vibrant investment and performance-based management environment that maximize benefits for public and private sector investors in the railroad sector;
- Implement a comprehensive and integrated transport policy, governance and institutional frameworks;

The strategies to implement the policies that are most relevant to NSDF are to:

- strengthen the planning of the railway development;
- maximize access to the sub-regional markets in West Africa and transport networks in line with international standards;
- improve accessibility to key centres of population, production and tourism;
- ensure integration of the intermodal facility into the planning and transport development strategy;
- modernise the railway system for efficient transportation of minerals, ores, cocoa, timber and oil products;

- rehabilitate and modernise the rail-based mass transport system in Accra-Tema, Kumasi-Ejisu, Accra-Nsawam and Takoradi-Kojokrom.

ECOWAS West African connection

Several countries in West Africa have developed railroad networks that largely serve their national territories and in some cases connect to adjacent countries. In 2009, as part of the strategy to promote regional integration, the Economic Community of West African States (ECOWAS) prepared a plan to improve railway connectivity between West African countries. The plan starts with the existing national rail lines (in blue) and extends these with new lines (in red) to the major international capitals See Figure 5.21). Concerning Ghana the plan only considers an east - west railway connection linking Abidjan to Lagos via Accra, Lome and Cotonou.

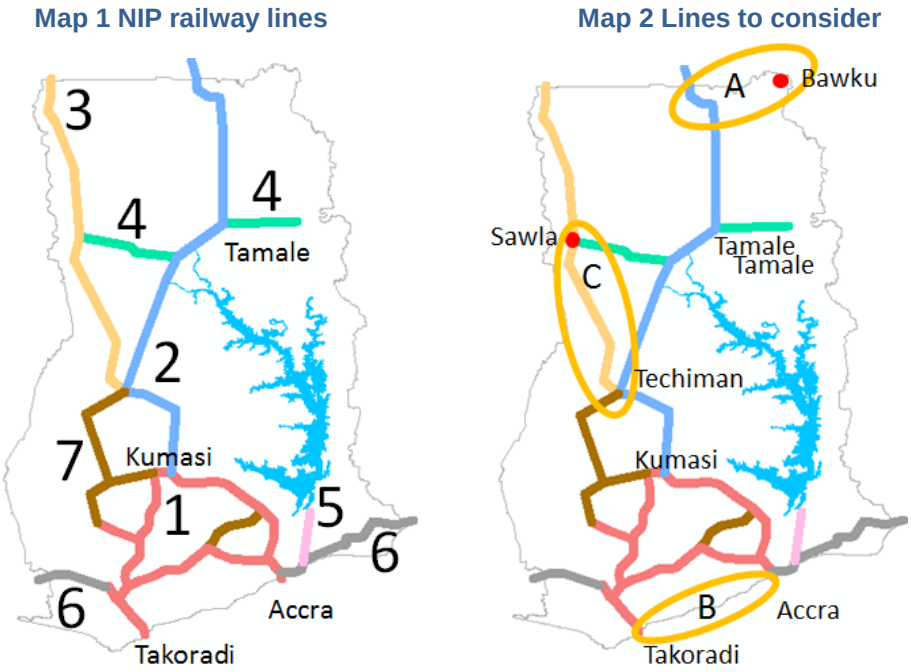
National Infrastructure Plan (NIP) on railways

NIP considers the following factors as justification for investment in the development of the national railway system:

- the increase in transit trade and intermodal linkages with neighbouring countries;
- the growing population and congestion in major urban areas (Accra, Kumasi, Tema and Takoradi) increase the demand for mass transit;
- the need to transport heavy manganese and bauxite ore in Western region;
- the growth of the oil and gas industry and its increased demand for railway services.

NIP proposes improvements to the existing railway system and major investments in network expansion (Figure 5.24). The total network length will be 2,560 km. The plan proposes rehabilitation of the Western and Eastern Lines and eight new lines in a concurrent number of phases.

Figure 5.23 NIP Proposed rail network phasing



1. Existing Western, eastern and central Railway Link
2. Kumasi–Techiman, Techiman–Tamale–Bolgatanga–Paga
3. Techiman–Sawla–Wa–Hamale
4. Sawla–Fufulso and Tamale–Yendi
5. Tema-Akosombo.
6. Ecowas railway Akanu–Accra and Prestea–Elubo
7. Achiasi–Osino and Kumasi–Nyinakin–Bibiani–Sunyani–Techiman

Source: NSDF Study based on draft NIP 2013

Links 2, 3 and 4 in the north, connect regional capitals and major urban settlements. Links 2 and 3 will also improve conectivity to Mali, Burkina Faso and Niger. All links connect to areas with mining potential.

Links 2, 4 and 5 will connect to the inland water transport system on the Lake Volta. Link 4 will connect to two potential mining areas: Sawla (maganese) and Sheini (iron ore) and could also extend to iron ore deposits in Togo and the Togo railway system. Link 5 will connect the port of Tema with Lake Volta and link 2 connects to Lake Volta in Buipe and Yapei.

NIP railway does not consider a connection towards the east at Bawku connecting with ECOWAS, namely, the Lome - Ouagadougou link (A), nor does it consider a link between Accra and Takoradi, although this area may be a major development area during the next 20 years (B). Finally, NIP railway plan considers an extension of the Western railway link from Techiman to Sawla almost parallel with the Techiman Fufulsu (C).

Ghana Railway Master Plan, 2013

Ghana railway Master Plan 2013 spans over the period from 2015 to 2047. It proposes the rehabilitation of around 950 km of existing lines; the construction of

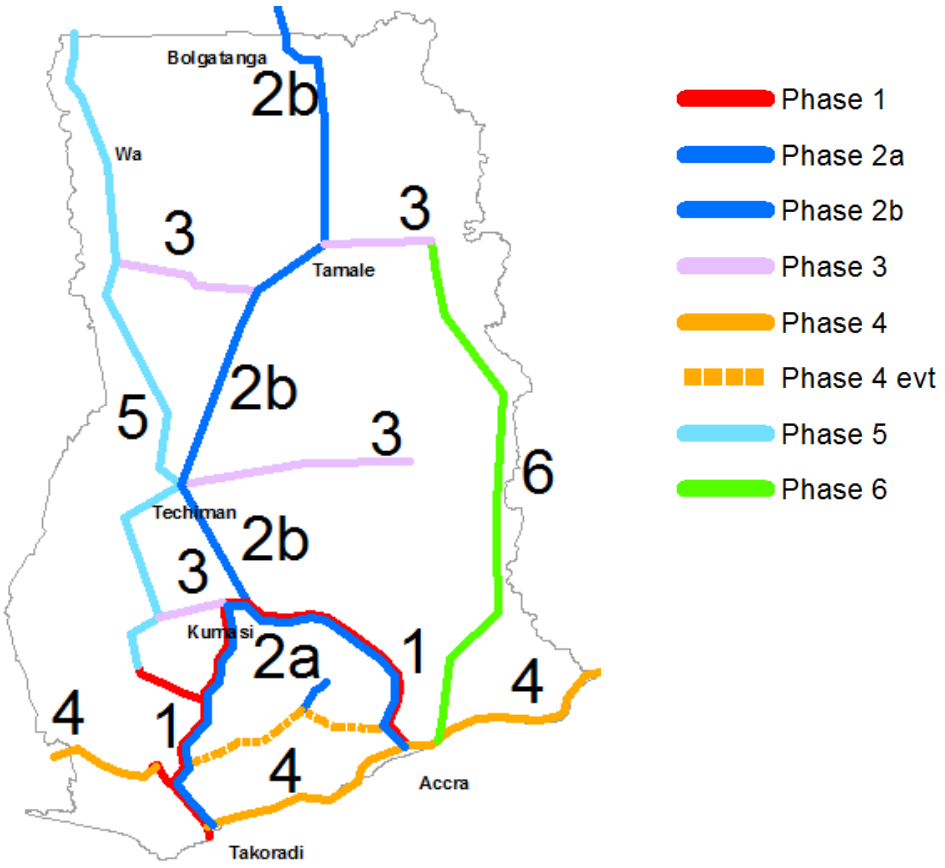
2400 km of new lines; and the purchase of new trains, or rolling stock. The estimated costs of these investments are over US$ 23 billion[121].

GRMP proposes six implementation phases (table 5.9 and Figure 5.25)

Table 5.9 GRMP railway network investment phases

#	period	Description
1	2015-2019	modernisation of existing rail lines with exception of the Central Line.
2	2019-2020	modernisation of the existing system and extension from Kumasi to Paga.
3	2029-2035	four transversal railroad links from main trunk to Sawla, Yendi, Dwokurom and Nyinahin.
4	2035-2039	ECOWAS rail road along the coast and eventual renewal of old Central Line.
5	2037-2044	extension of Western line from Awaso Sunyani, Sawla, Wa to Tamale and Burkina Faso.
6	2041-2049	construction of an eastern corridor rail line from Tema to Yendi.

Figure 5.24 GRMP railway network investment phases



Source: NSDF Study based on GRMP

The plan is informed by an analysis of existing future freight and passenger traffic using a computerized transport model. Inputs to the model comprise: (i) population and development trends in 39 zones in Ghana and six destination zones outside the country; (ii) existing road networks, links and performance; and (iii) competitiveness of rail compared to other transport means including road and air. The output of the

[121] The estimated cost for this plan is USD 5.4 million per km. In comparison, the current European costs range between USD 3 and 9 million per km.

model is different options to consider concerning future rational use of the infrastructure routes for the transport of cargo and passengers.

The plan evaluates the feasibility of transport on railways, compares the projected flow of freight and passengers “with” and “without a railway project”. Without the railway project, all freight and passenger transport are assumed to flow by road transport.

GRMP calculates that the new rail network will take some 60 percent of the projected freight load that would have otherwise been transported on roads. The four transversal east-west railroad lines (phase 3) will handle the freight demand from the interurban transport. The Tamale-Yendi link will take 90 percent of the freight load plus, potentially, the iron ore extracted from Shieni area east of Yendi.

The Fufulsu-Sawla link will carry some freight and might additionally carry manganese from the deposits at Sawla if extraction starts up before a Western Corridor line is constructed. The Techiman-Kwadwokurom line is expected to boost agricultural development in the area west of Techiman. The Nyinahin-Kumasi line connects to the bauxite mining areas in Nyinahin and will carry 68 percent of the cargo.

The plan calculates that the ECOWAS extension line along the coast will not carry much freight transport, this will continue to be carried by road. The transport model identifies the renovation of the old Central line as an option.

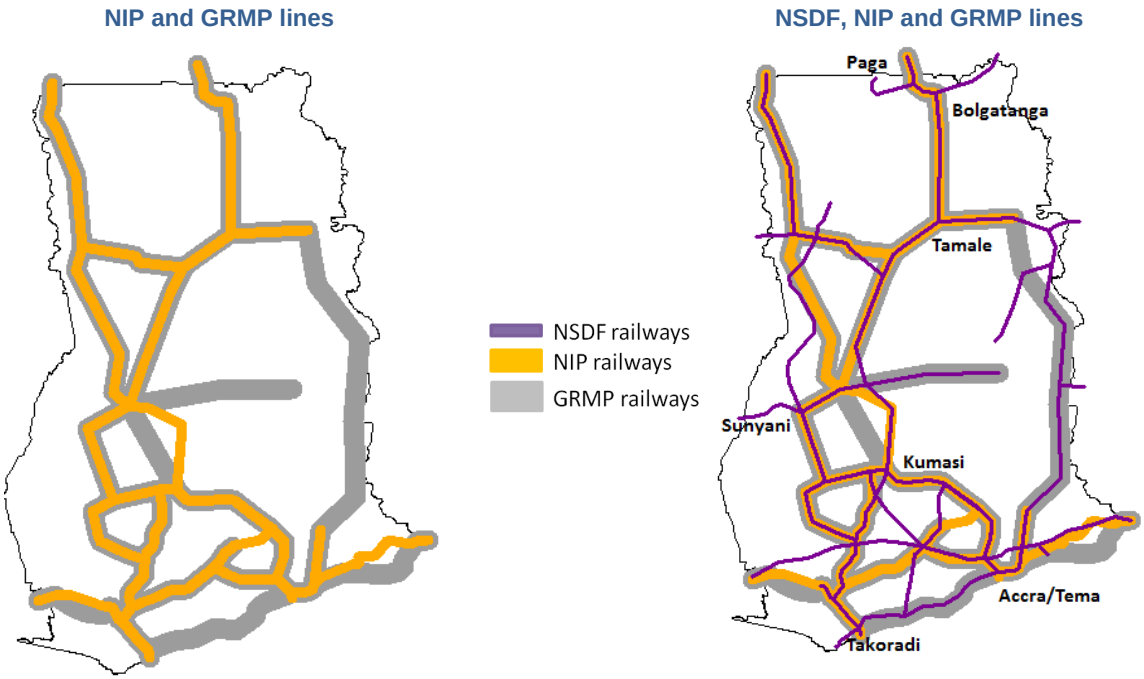
Concerning competitiveness with the other national railway lines in neighbouring countries, the GRMP argues that the Ghanaian ports and the efficient future railway system will be sufficiently strong to carry most of the freight to Ouagadougou and beyond. According to GRMP, Ghana is also negotiating with Burkina Faso the construction of a railway from Paga to Ouagadougou.

GRMP estimates that the new rail network will account for a slightly lower percentage (55%) of total passenger traffic than the one of freight. Some lines will be more in use than others. For example, almost all (99%) passengers between Tamale and Yendi will travel by rail, 83 percent of those between Kumasi and Paga, 75 percent of Accra-Ho travellers, 70 percent between Accra and Kumasi, and 47 percent of travellers along the coast.

5.8.5 Assessment of the proposed NIP and GRMP rail networks

In the following map (Figure 5.26), the NIP plan in yellow is overlapping the GRMP plan in grey. The major differences comprise the coastal alignment, the eastern corridor, the Kumasi-Techiman link and the Techiman-Kwadwokurom link. NIP does not have a coastal link between Accra and Takoradi which is an area of high development intensity, nor does it connect central Ghana to Togo and Ivory Coast.

Figure 5.25 NSDF considerations concerning the NIP and the GRMP

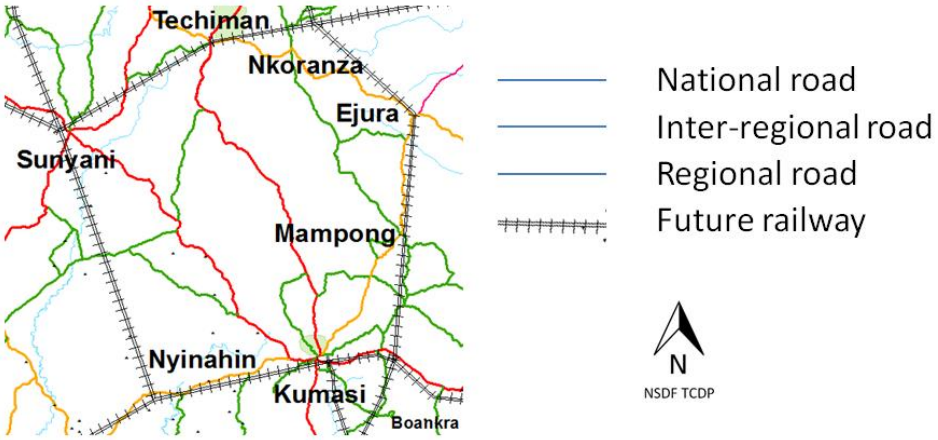


Source: NSDF Study 2014, draft NIP 2013 and GRMP 2013

GRMP's coastal railway positioned at the coastline may be subject to sea-level rise and may be destructive of wetlands. The plan gives priority in the 3rd phase to the Techiman-Kwadwokurom line although the population density in this area is low.

Both NIP and GRMP do link to the Boankra inland port, while GRDA calls for another inland port in Paga. However, both NIP and GRMP do not take into account the planned ECOWAS railway line Lome-Ouagadougou, which runs very close to Bawku and connects both to Ouagadougou and Niamey in Niger.

NIP and GRMP link between Techiman and Sawla, an area of low population density, through which a link may not be the least economically justified from a cost-benefit point of view. However, the Ghana Harbour and Port Authorities (GHPA) supports the proposal of a direct line between Techiman and the Tamale border which might be with the intention to strengthen competitiveness concerning transit cargos to destinations in Mali and the western part of Burkina Faso.



NSDF supports the NIP railway plan proposal of creating railway links between Boankra Effiduarse, Mampong, Ejura, Nkoranza, Techiman Sunyani Nyinahin and Kumasi. These links will create a ring of railway supporting interaction and connectivity, travel and transport in the urban cluster north of Kumasi.

NSDF gives low priority to a railway line in the Eastern Corridor and supports Ghana railway connections to the Togo north-south line. In the meantime, NSDF considers as an option an extension of the railway system from Akosombo to Hohoe as there are considerable passenger journeys between Ho and the capital area and a good transport link between Ho and Hohoe might strengthen the urban centres and service provision in Volta Region.

5.8.6 West African rail links

Connecting the railway lines between Ghana, Ivory Coast and Togo might stimulate the economic development and be a win-win situation for all enterprises in these countries, particularly those that rely on international transport.

It is in Ghana's interest to try to capture a large share of the freight transport business to and from land-locked countries, particularly the capitals, and the ports. The Takoradi-Ouagadougou transport route is the shortest of all routes from the coast to Ouagadougou. While the shortest route from Bamako is to Abidjan ports, and the shortest route from Niamey is to Cotonou or Lome, distance is not the only determining factor. Competiveness of a freight route is also determined by factors such as port berth, handling and storage facilities, departure routes from the ports, allowed axel load, inland ports and border crossings.

As the costs of infrastructure services in West Africa are around the double of the costs elsewhere, the transport route that can present the most cost efficient solution might obtain the freight transport regardless of the distance.

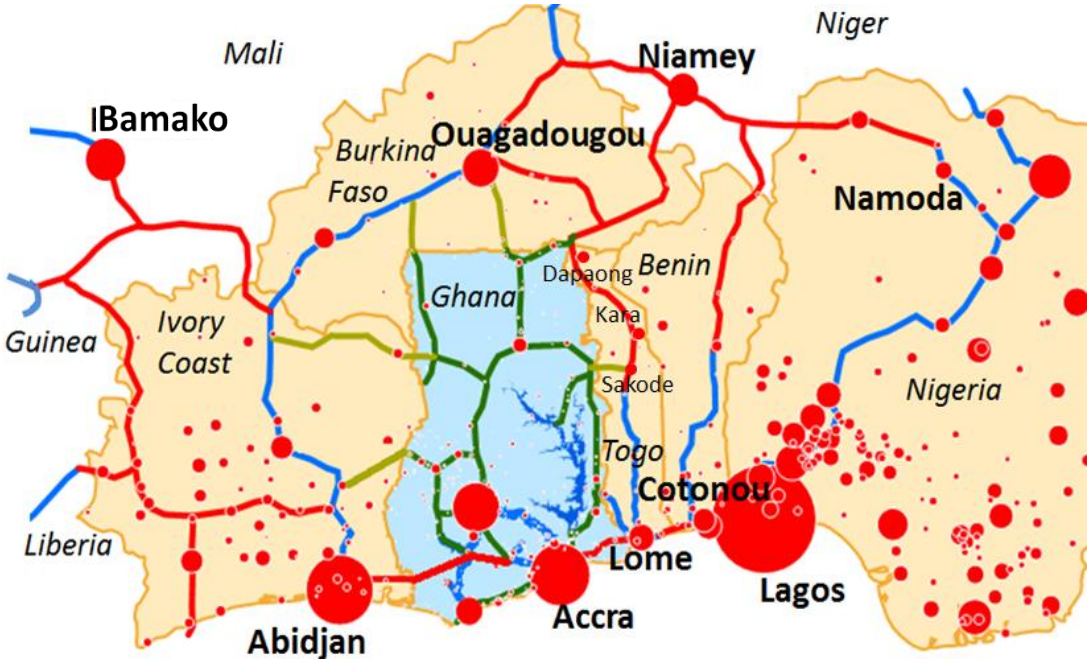
NSDF proposes that Ghana's future railway network connects efficiently to the ECOWAS railway system. The connections to the ECOWAS system and the NSDF Ghana railway plan are shown in green in Figure 5.27 where the blue lines are the existing West African railway lines and the red lines are the proposed future links.

The ECOWAS Railway Plan has two new east-west links, one goes from Namoda in Nigeria to Niamey in Niger and to Ouagadougou in Burkina Faso, the other goes from Lagos in Nigeria to Cotonou in Togo to Lome in Benin and to Abidjan in Cote d'Ivoire. New north-south links in Benin and Togo will connect their capitals to the northern east-west link.

NSDF proposes new rail links in Ghana that extend to the three internationals borders and connect to the national networks in neighbouring countries. Three connections are proposed between Ghana and Ivory Coast, three between Ghana and Burkina Faso, and four between Ghana and Togo.

As seen in the following illustration the Lome-to-Burkina Faso link will run parallel with and only 70 kilometres from Ghana's proposed north-south link through Volta Region. This gives the Ghanaian railway system the opportunity to connect Tamale and Yendi to the Lome-Ouagadougou railway line at Sakode and to connect Bolgatanga-Bawku to the same line just north of Dapaong. This will preclude the need for an extension of the Ghanaian eastern corridor railway from Hohoe towards the Northern region.

Figure 5.26 Proposed ECOWAS and NSDF regional railway plans



Legend: (Existing, Future, NSDF proposal)

Source: NSDF study based on ECOWAS Railway Master Plan 2009

There is an opportunity to extend the Tamale-Yendi line to the iron deposits at Shieni and further into Togo to serve the iron deposits there. There is also an opportunity to connect to the Togo railway system in Sokode.

With cooperation of the governments in Togo and Burkina Faso, the railway link to Togo, just northeast of Bawku, also provides an opportunity for a tri-country border-crossing. A common border-crossing might increase border crossing efficiency and reduce transaction costs. Transport from Ghanaian ports to Ouagadougou would still be shorter via a Paga line but transport to Niger's capital Niamey would be shorter through Bawku. The border-crossing in this location might further on strengthen the development in the urban cluster in this corner of the country and promote cross border development between Bawku and Dapaong.

Planning the connections from the Ghanaian system to the future West African railway system is an opportunity to prepare for sustainable and economical transport related to trade with neighbouring countries and transport of cargo to land locked countries. The railway connections might also be seen in relation to prepare for transport of heavy mineral ore from the neighbouring countries for processing or export from the Ghanaian ports.

5.9 Sea ports, fishing landings and inland ports

5.9.3 Sea ports

Ghana has two sea ports located at Tema and Takoradi including facilities for larger fishing boats. Sekondi-Takoradi has a second port with limited depth used as a fishing landing site. The Saltpond port is an open roadstead for anchoring only.

Several minor landing places for the fishing fleets are to be found along the coast, see map of Figure 5.27.

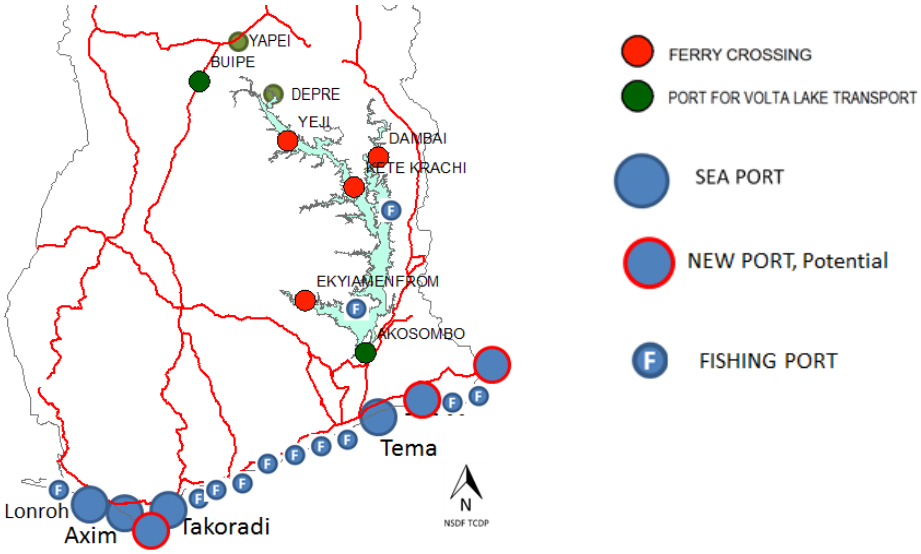


Figure 5.27 Sea and inland ports

Source: NSDF Sudy 2013

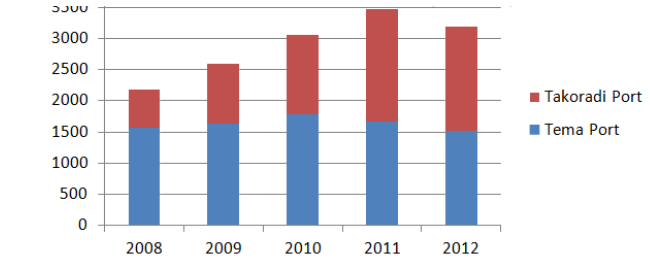
The Ministry of Transport directs the Maritime and Inland Water Transport including the sea ports which are administrated by *Ghana Ports* & Harbours *Authority (GPHA).*

Maritime transport current situation

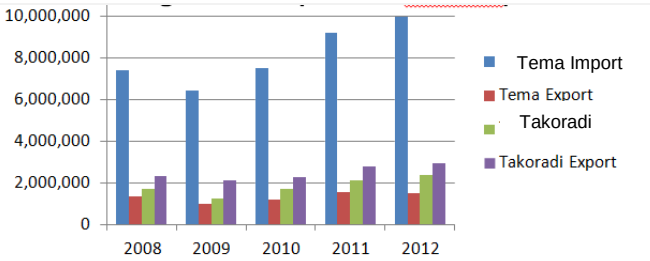
The two major sea ports at Tema and Takoradi handle the major bulk cargo and container freight in the country. They also provide for transit trade from the landlocked countries Mali, Burkina Faso and Niger. The vessel and freight throughput for the two ports have been increasing in the period 2008 to 2012 as shown in the following figures:

Figure 5.28 Traffic on the Tema and Takoradi ports

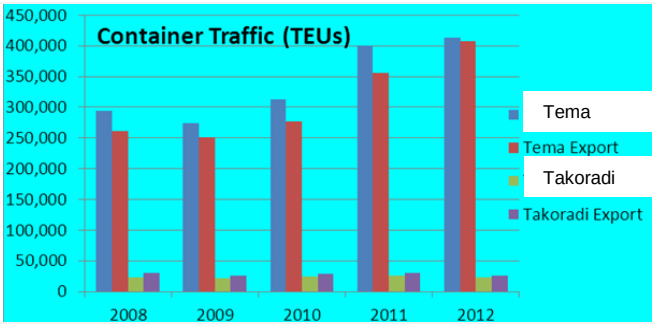
annual vessel calls



cargo volume



container units



Source: Ghana Ports & Harbours Authority (GPHA) 2013

The following paragraphs show the number of vessel calls and turn-around time for the ports of Tema and Takoradi. While the number of ships has increased, peaking between 2005 and 2006, there has been an increase in turn-around time, decreasing productivity and discouraging the use of the ports by shippers.

Tema port is the bigger of Ghana's two seaports with 70 percent of the national port trade and the transit cargo to and from Burkina Faso, Mali and Niger. Tema port handles the majority of the container movement. Different types of vessels are calling the port and the land facilities include inland clearance depots (ICDs), warehouses, transport and haulage companies, freight forwarders and related service centres. The port has undergone continuous modernisation and expansion since its inauguration in the 1960s. Today it covers an area of 3.9 km^2 and is well-connected to Tema's industrial area. Ongoing works extend terminal facilities, berth capacity and prepare for deep-water container vessels.

Takoradi port is located 225 km west of Tema port and 300 km east of Abidjan Port. It is well located in relation to the ongoing mining activities and the cocoa production sites in the western part of Ghana with good connections to the middle and northern parts of Ghana and the landlocked countries. In 2012, the port handled 30 percent of Ghana's seaborne traffic, 66 percent of national exports and 19 percent of national imports. The exports include manganese, bauxite, forest products and cocoa beans among others. From 2008, the Takoradi port became

strategically important for support to exploration and production activities at the off-shore oil and gas fields.

The Takoradi port is being improved by extension of breakwater and quay, dredging for 14 m draft, bulk cargo jetty, and reclamation to create additional area for oil and gas. Tenders are also ongoing for the Tema port expansion.

Development policy and challenges in the sea ports

GPHA follows the Government´s policy goals and develops the ports to be leading hubs and a beacon of trade and industry in West Africa by improving performance. However, the increase in activities and the future expected development in the maritime sector in both ports demand increasing berthing capacity for larger vessels, need for expansion of container terminals and improved provision for truck parking, warehousing and similar landside services at the ports. There are also cruise ships calling at both Takoradi and Tema, although the facilities for these vessels and passengers are reputed to be poor[122].

Major challenges in both ports are related to traffic congestion and concrete access problems. The limited water depths in both harbours are a major issue as modern intermedia cargo vessels need 14 metres of water to manoeuvre. Both ports are surrounded by urban centres which causes access problems and traffic congestions. Further on the poor national transport system and limited inter-modal linkages create bottlenecks for the transport to and from the ports. Major bottlenecks are delays in development of the national integrated transport system including railway lines on strategic stretches, the implementation of the Boankra inland port and the transport on Lake Volta.

5.9.4 Fishing ports and landing sites

Tema Fishing Harbour is the main landing site for sea going larger fishing vessels, though Takoradi harbour also has berthing facilities for fishing vessels. Tema and Takoradi are also landing sites for minor inshore vessels operating along the coast, together with the old fishing harbour and the Albert Bosomtwe-Sam fishing harbour at Sekondi.

The important artisanal coastal fishing landing sites are: Western Region: Axim, Dixcove and Shama; Central Region: Elimina, Moree, Gomoa Fetteh, Senya Beraku, Winneba and Mumford; Greater Accra Region: Ada, Teshie, James Town; Volta Region: Keta, Tepa Bofoase and Gyamani. Together, the artisanal landing sites are estimated to account for up to 69 percent of the total marine fish output.

There are about 300 landing beaches along the very long stretch of Lake Volta. Of these, Yeji is the most important. Others include Kwamekrom, Tapa Abotoase, Kpando Torkor, Dzemeni, Torkurroano, Dambai Brumben, Ekye Amenfrom, Nyuinyui Nos 1 and 2, Akateng and Akokoma Sisi. The number of boats is estimated to be over 20,000.

Of these, the GPHA has identified nine landing sites to be upgraded as mini ports and landing sites namely Axim, Dixcove, Elmina, Gomoa Fetteh, James Town, Keta, Mumford, Senya Bereku and Teshie. On Lake Volta, Abotoase and Dzemeni are selected to be upgraded.

[122] National Tourism development Plan 2013-27

The inland water transport system consists of 450 km ferry transport routes with ports at Akosombo, Buipe and Depre as well as several minor landing sites and four ferry crossings on the lake at Adowsa, Kete-Krachi, Dambai and Yeji.

The inland water transport infrastructure is administrated by the Volta Lake Transport Company (VLTC). However, the VLTC is estimated to handle only 20 per cent of the total transport activity on inland waterways, besides there are other private transport and small scale boat transports. The data available concerns the VLTC activities and are provided in Table 5.10 below.

Table 5.10 VLTC Ferry Routes and 2012 service provision

	Km	Tons	Vehicles	Passengers	Cargo
Akosombo -Buipe	415	137000			Fuel and cement
Akosombo - Yedi	290			6250	Passengers
Adawso -Ekyi Amanfo	4.5		31700	342000	Passengers and products
Yedi -Makango	11		9650	138300	Passengers and products
Kete Krachi - Deifur	12		106	14800	Passengers and products
Dambai	4.2		16900	153000	Passengers and products

Source: VLTC 2013

The VLTC transport includes passengers, bulk haulage of petroleum products and a significant quantity of cement. The level of freight traffic transported by ferry on Lake Volta is about 137,000 tons annually, including refined petroleum products and cement. Approximately 650,000 passengers are reported to be transported annually. Other cargo and machines are transported to the farms along the lake. Agricultural produce are being transported to Akosombo.

No minerals other than cement are being transport for the time being. One company is currently considering transport of limestone to Tema from deposits close to Buipe. Another enterprise is evaluating possibilities of larger scale transport of shae butter (oil from the calabash) from the north to the south[123].

The on-going projects in the inland water transportation system are: construction of four (4) new ferries on the Volta Lake, commission of the pipeline recently installed from Buipe to Bolgatanga and the installation of a new section of pipe-line from Debre to Buipe[124].

The cross-lake ferry services operate between several towns including Adawso, Dambai, Kete-Krachi, Kpando, Yeji, Ada and Akuse. Water transport connects these towns and many villages to each other, and in some cases to the road network. A random study at twelve lake-side market centres calculated that water transport serves almost 24,000 passengers on each market day (WBGUR 2013).

Other inland water transport

Whilst inland water transport does not constitute a significant part of Ghana's national transport system, some routes are critical to small communities. Small boats and canoes operate on Ankobra, Pra, Oti, Black Volta, White Volta, Volta south of Akosombo and Lake Bosumtwi. Small private owners operate in these areas, moving foodstuffs with literally no control or regulation. The Ghana Maritime Authority has introduced guidelines to enhance safety of inland water transportation such as checking for overloading and the safety of boats.

[123] Informed by VLTC April 2014

[124] Idem

5.9.5 Inland water transport on Lake Volta

The main challenges for inland water transportation are the need to improve the infrastructure and boat operations concerning reliability, cost and safety. The barges need at least a water depth of 3 m all year around to move. The surface of the lake moves at the Akosombo dam from 84.73 m (278 feet) highest level - to 73.15 m (240 feet) at lowest level. When the water level is at 74.7 m (245 feet) at the dam in Akosombo the barges cannot reach Buipe without drenched channels at critical points in the northern end of the lake.

Other challenges relate to the establishment of missing intermodal linkages where the Akosombo and Buipe ports connect to road, lake and pipe line systems. Further on, improved road access to ports and landing facilities around the lake are needed and improved infrastructure in general including vessels, navigation aids, ports, landing sites and ferry crossings.

Inland water transportation opportunities and ferry crossings

The NSDF suggests priority is given to the development of an efficient inland water transport system on the Volta Lake. Such development on the Lake will give efficient support to the socio-economic development around the lake and will in general be an opportunity for building up an affordable and environmentally friendly transport development in Ghana and might specially support the Savannah Agriculture Development Area (SADA) by providing cheaper transport links between the northern regions and the market and port in the metropolitan area.

NSDF plans for such an enhanced transport activity on the Lake and points at Buipe as a future important transport centre between the Boankra Inland Port and the border at Paga. NSDF also suggests that the railway system directly connect to Buipe for connections to Upper West and Upper East Regions.

The inland water transport, when well-functioning and fully linked up to other transport means, is able to substitute around 50,000[125] truck journeys per year on road between the north and the south. Linking Akosombo and Buipe ports to the national railway system running through the major urban centres, agricultural development zones and potential mining areas, the main infrastructure of the country will be connected, including also the two sea ports.

NSDF even suggests considering transport links on barges between Tema port and Akosombo taking advantage of transport on the River Volta from Akosombo to the sea.

Inland water way transport is slower but cheaper

A lorry might use 10 hours to go from Tema to Buipe. The transport from Akosombo to Buipe on the lake takes 26 hours excluding the reloading in Buipe. The travel time might be shorter having new vessels. Inland water transport has higher initial investment requirements but less maintenance cost.

However, transport on waterways is considerably cheaper than road transport due to fuel savings and lower infrastructure maintenance cost. German studies confirm the economic advantages of inland vessel freight in comparison with road or rail transport. For transport of bulk freight on road, rail and inland waterway the use of energy per ton is 0.92, 0.43 and 0.23 megajoule respectively. For transport of containers the use of energy per ton is respectively 0.5, 0.39 and 0.22 megajoule on road, rail and inland waterway. The road freight energy consumption even increases

[125] The Eastern Corridor Multi-Modal Transport Project

with driving in congested areas with many stops and surfaced roads need continuous maintenance.

The lake and rivers are potentials for tourism

There are currently no formalised passenger services for transport north-south, although a few cabins are available on the cargo vessels and are usually well utilised, mostly by international tourists.

Cruise services provided principally by the Volta Lake Transport Company (VLTC) have developed over the years but supplemented by an increasing number of private boat operators. A tourist service operated a popular day cruise service from Akosombo to Dodi Island with up to 350 passengers. Due to a fire in 2012 the activity was suspended but a new tourist vessel with cabins is being built in Akosombo to reinstate the service.

Development plans for transport on the lake includes docking facilities on the edge of Digya National Park, opening up improved access for conservation management as well as tourism[126]. There has also been a boat service on the Volta River, down-stream of the dams, linking to the coast at Ada. However, the extent of weed growth in the river is currently preventing any services from operating.

Improved ferry crossing on the Lake

NSDF has suggested moving the ferry crossing at Dambai 16 km to the south to shorten the journey from Kete-Kratchi to the Volta Region. NSDF has further on suggested establishing a new ferry crossing between Vireko and Dominase (or moving the ferry crossing from Adowsa to this location, getting a better connection between the northern part of Eastern Region and Koforidua as well as better access to the Accra area.

NSDF also supports the National Tourism Development Plan which points at the lake offering a major opportunity for recreational activities, providing a physical connection from south to north, to create a tourist movement circuit within the country. The tourist plan suggests that improved boat access opens up opportunities for tourist access to remote attractions, such as Digya National Park, as well as numerous locations and communities along the shoreline where tourism-related development could take place and grow. The natural environment of the lake itself is enhanced by the surrounding landscape of hills and mountains, which form a very attractive backdrop to any experience on the water.

5.10 Air Transport

The government aims to modernize the airports and turn Ghana into a competitive West African air transport hub and gateway to meet demands from economic growth, exports and tourism. Nevertheless, Ghana presently captures only about 10 percent of West Africa's aviation market, second to Nigeria, which captures 57 percent. Other airports in the sub-region also compete for the hub status.

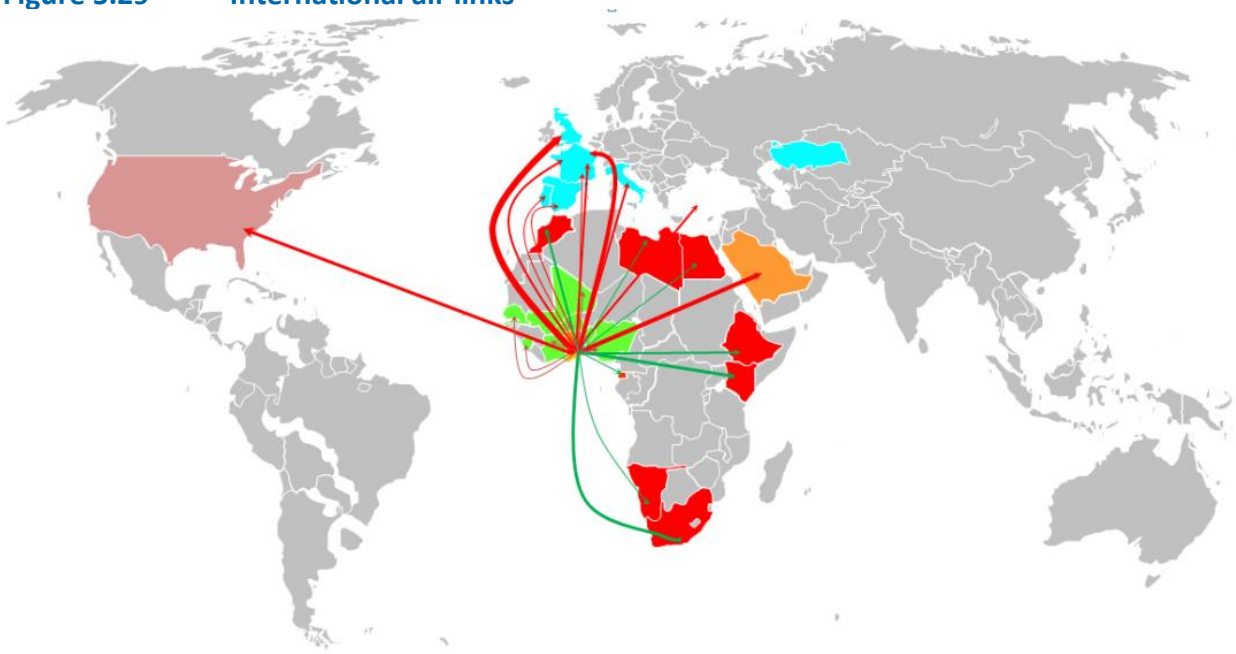
Air traffic and transport

By number of passengers in 2013, Kotoka airport (KIA) ranked 15 in Africa and 3 in West Africa after Lagos and Abuja airports in Nigeria. Of the 30 international airlines servicing KIA, 12 are from Africa, 5 from West, 3 from East, 3 from South, and 1 from North Africa; 1 from Middle East, 7 from Europe and 1 from USA. Seven cargo

[126]National Tourism Development plan 2013-27

airliners serve the airport with destinations in Africa and Europe and 4 carriers serve domestic airports at Tamale, Sunyani, Kumasi and Takoradi[127].

Figure 5.29 International air links

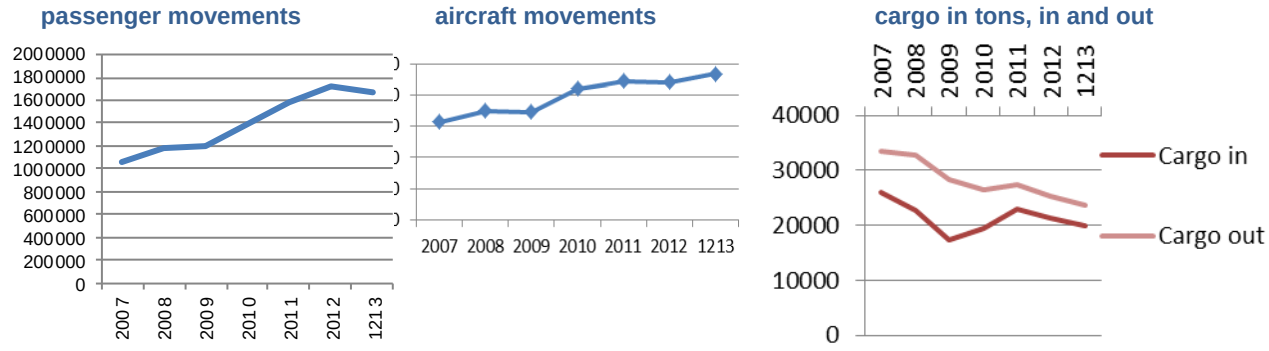


Source: NSDF Study based on data from Ghana Airports Limited

Of the fifteen countries in ECOWAS, only seven have air links with Ghana. Of the remaining thirty-seven African countries, seven have air links.

International flights to and from KIA are increasing (Figure 5.27). The number of aircraft movements increased by 7.2 percent to 23,400 between 2007 and 2013 and the number passengers increased by 7.6 percent to 1.7 million. Freight movements, however, decreased by 4.4 percent to 43,700 tons. The information is based on Kotoka Airport Accra, Traffic and transport (2007-2013).

Figure 5.30 Trend in international air passengers and cargo



Source: NSDF Study based on data from Ghana Airports Limited

Domestic aviation

In the last six years, the domestic airline sector has experienced massive increase in the number of passengers and flights. Domestic airline flights serve only five

[127] Ghana Airport Authorities 2014

regional capitals: Accra, Kumasi, Tamale, Takoradi and Sunyani, with Accra as the only hub. Air traffic between Kumasi and Accra accounts for the largest share. Five domestic airlines are operational with Starbow and Antrak as the most active. In 2012 there are scheduled services from Accra to four locations as shown in Table 5.11 below.

Table 5.11 Domestic air services, frequency and volume (January-July 2012)

route	airlines	aircraft movement	passenger numbers*
Accra – Kumasi	4	495	25,874
Accra – Tamale	3	194	7,528
Accra - Takoradi	5	400	4,363
Accra - Sunyani	2	43	880
		1,132	**38,654**

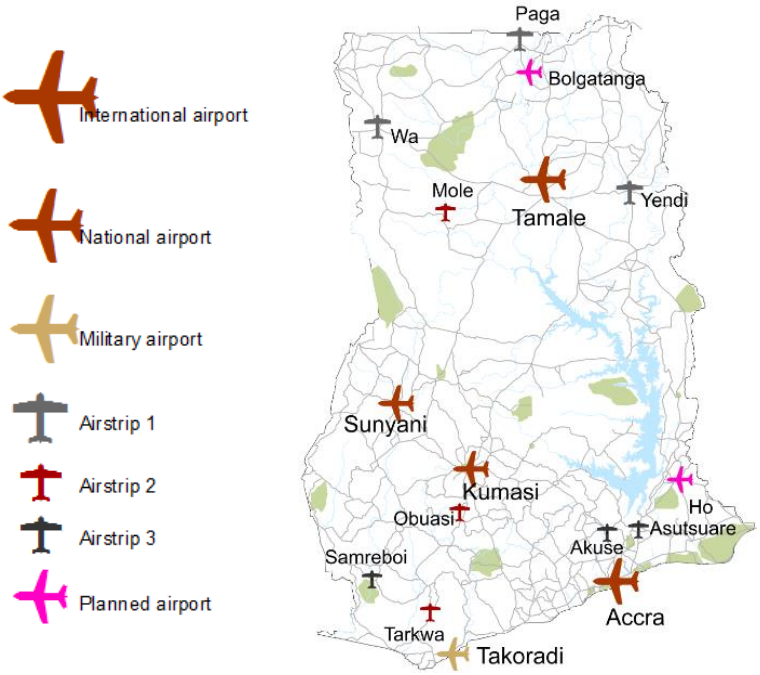
Source: Ghana Airports Limited

Ghana presently has one international airport, four national airports and eleven airstrips (Figure 5.30 and Table 5.12 underneath). All regions have at least one facility, Northern and Western have three, and Greater Accra has two. All of the airports and six of the airstrips are publically-owned. The private airport in Wa has a longer runway than the public airport in Sunyani.

Kotoka International Airport (KIA)

Kotoka International Airport has domestic, international, and freight terminals. It has thirteen parking bays including three that can accommodate wide-body aircraft. It has a 3,400-metre category II runway with the capacity for aircraft as large as the Boeing 747-8.

Figure 5.31 Aviation facilities location



Source: NSDF Study based on Ghana Airports Limited data

Table 5.12 Aviation facilities specs

town	type	region	runway length	runway width	owner	tower
Accra	international	Great Accra	3537	60	public	yes
Tamale	airport	Northern	2438	45	public	yes
Wa	airstrip	Upper West	2000	45	public	
Kumasi	airport	Ashanti	1981	45	public	yes
Takoradi	airport	Western	1751	45	public	yes
Yendi	airstrip	Northern	1423	30	public	
Obuasi	airstrip	Ashanti	1420	22	private	
Sunyani	airport	Brong Ahafo	1402	45	public	yes
Paga	airstrip	Upper East	1372	30	public	
Tarkwa	airstrip	Western	1200	60	private	
Mole	airstrip	Northern	1200	19	public	
Asutsuare	airstrip	Great Accra	300	10	private	
Akuse	airstrip	Eastern	200	7	private	
Samreboi	airstrip	Western	100	20	private	
Bolgatanga	airstrip	Upper East	0	0	public	
Ho	airstrip	Volta	0	0	public	

Source: Integrated Transport Plan

Although KIA is located in the south, some 78 percent of the population lives within 100 km of the airport.

Kumasi, Tamale, Takoradi and Sunyani airports

Kumasi's present airport, with a 2,000-metre runway, is located in the city proper; accordingly, a new airport is planned north-east of the city. Tamale airport, with a 2,400-metre runway is located 10 km north of the city centre and with ample room for expansion. Sunyani Airport is located close to CBD west of Sunyani. Takoradi's military airport, is also used for civilian passengers, it cannot be expanded and options are being discussed.

5.10.1 On-going and planned airport developments

The air transport sector suffers a series of challenges.

Kotoka International Airport (KIA)

KIA has not been able to obtain a FAA category 1 airport certificate status. The following issues are noted: traffic congestion limits timely access; runways need upgrading; aerobridges are lacking; aircraft turning space and parking is limited; there is no internal connection between international and domestic terminals; and there is insufficient cold-storage facilities. The Government response is to both upgrade the existing airport and plan a new one. Upgrading is planned for the next 20-year period and includes infrastructure and increasing storage capacity of perishable exports.

Improvements at other airports and airstrips

The Tamale Airport is being expanded to serve as complementary international airport to KIA with cargo capacity including cold stores and a maintenance centre for regional aircrafts. Improvements are planned for Kumasi, Tamale, Sunyani and Takoradi airports. The airstrips at Wa, Bolgatanga, Navrongo and Yendi are under

consideration for rehabilitation with the purpose to support development in these areas.

Proposed new airports

A new international airport is proposed at Prampram in the Dangbe West District of Greater Accra. On a 65 km^2 site, the airport will handle a maximum of 12 flights per hour and, annually, 4.5 million passengers, 33,000 passenger aircraft movements and 30,000 tons of freight. It will provide jobs for thousands and generate a demand for ancillary products and services.

Kumasi stakeholders have requested a new airport and a site has been identified in the GKUDP. It is understood that this airport has not yet been approved. New domestic airstrips are planned for Ho and Cape Coast.

5.11 Recommendations to address current and future challenges

5.11.1 General NSDF recommendations on road improvement

The urban population is expected to increase by about 6 million to about 18 million by 2035. Around 90 percent of the new urban population could be accommodated in the 17 cities with more than 50,000 inhabitants.

The urban population will require a high level of inter-modal traffic and transport connectivity. Only efficient transport links will ensure the distributed population access to business and job opportunities as well as service provision. Improved connectivity would support the expansion of trade and improved access to public and private services. Improved links are also important for agricultural and mining production centres as well as to industrial processing industries and export harbours.

NSDF suggests that the location of urban development centres must take place close to the transport corridors, as the corridors help the development of cost efficient productive projects and urbanisation. Investments close to the trunk road network and urban settlements will benefit more population than investment far from the trunk road network and the urban settlements. The urbanisation policy ought to encourage the citizens in disperse populated areas to relocate towards the trunk road network. Even priority to agricultural development projects should be given to projects in rural areas with higher population density to ensure efficient provision of education, health and other services.

As the road infrastructure commonly occupies up to 20 percent of land in urban, industrial and residential schemes, attempts to minimise road structures as much as possible should be kept in mind by, for example, increasing urban population densities in the rehabilitation of existing and planning of new urban settlements.

NSDF supports the National Tourist Development Plan which points at the need for improved service for travellers: The plan suggests more rest stops along the roads as there are only very limited rest stops or services for car drivers, even along the transit corridor routes. Whilst fuel filling stations are frequent and sometimes provide services of toilets and some supplies of food and beverages, the quality and condition of these are variable and are not specifically aimed at long distance travelers and/or tourists.

Other factors concerning the functionality of the road system must be taken into account. These relate to traffic management, law enforcements on road regulations, as well as roads' safety and improved driver skills. The local governments have an

important role to play in relation to administration, use, maintenance and planning in relation to feeder and urban roads. This concerns also the citizens' awareness raising and education to enhance safety and good driving manners. Concerns related to elderly people and children in traffic will be a special area of attention.

5.11.2 Develop a new national highway system

While the trunk road system connects all the regions and urban centres, it suffers from many deficiencies. In many places, links between urban centres are indirect, alignments, road widths and banking do not allow for higher speed traffic, there are no bypasses around urban centres, and extensive ribbon development slows down traffic and is unsafe. There are remedies for some deficiencies, for example, narrow roads can be widened, but ribbon development would render widening costly and disruptive. These deficiencies reduce the efficiency of the trunk road network resulting in longer and more costly trips, and increasing the effective distance between urban centres and other destinations.

Given the inevitable growth in the demand for transport and for connectivity, the planning of the future transport network must look for improvements.

Many modern countries have introduced a category of national level roads that is separate from their trunk road systems. For example, the USA has the interstate highway system, Germany has the autobahn, UK has its motorways.

Ghana, it would seem, is following suite. For example, to date, Ghana has constructed the Accra–Winneba Highway, George Walker Bush Highway and Tema Motorway. The Ghana Department of Highways is considering other stretches[128].

NSDF supports the development of a highway system and proposes a number of relevant links. Some of these links are upgrades of the Trans-Africa Highway System, corridors between neighbouring West African countries; others aim to strengthen internal connectivity.

The Trans-African Highway (TAH) project aims at connecting, using and improving the existing national roads as much as possible. However, despite its name, many of these roads are not highways. NSDF therefore proposes that the two TAH corridors in Ghana, the designated coastal corridor and the proposed north-south corridor, are upgraded to highways in order to cater for future increased demand. These highways will have to be well-connected to the national transport centres and future intermodal transport system that will include transport by railway, flights and vessels on the lake.

This new highway system should start with four highway corridors[129] that will have to be extended as the country develops. These four corridors are: (i) the Accra–Kumasi city-region highway as Phase 1 of the Ghana African highway link Accra–

[128] NSDF interview with Ghana Department of Highways, September 2014

[129] NSDF uses the term "highway" to mean a controlled-access highway, freeway or motorway designed for high-speed (more than 80 km per hour) traffic, with all traffic flow and ingress/egress regulated. Highways provide an unhindered flow of traffic, with no traffic signals, on-grade intersections or property access. They are free of any at-grade crossings with other roads, railways or pedestrian paths, which are instead carried by overpasses and underpasses across the highway. Entrance and exit to the highway are provided at interchanges by ramps which allow for speed changes between the highway and arterial roads and collector roads. On the controlled-access highway, opposing directions of travel are separated by a median strip or central reservation containing a traffic barrier or grass.

Elimination of the sources of potential conflicts with other directions of travellers in high ways dramatically improves safety, fuel consumption and travel times. Most technologically advanced nations feature an extensive network of freeways or motorways to provide high-capacity urban travel and high-speed travel through rural areas between urban centres. The land reservations for the highways should be coordinated with the reservations for the future planned railway, main electric transmission lines and the main gas pipeline.

Ouagadougou, (ii) the Kumasi–Paga highway as Phase 2 of the Ghana African highway link Accra–Ouagadougou, (iii) the Techiman–Sunyani–Kumasi highway, and (iv) the improvement of the TAH 7, Trans-West African Coastal Road.

The new highway system is justified by the projected increase in the national and, particularly, urban populations; the probably unavoidable increase in the average number of cars per person, and the need for improved economic competitiveness, and increased cross border cooperation and trade.

Figure 5.32 ECOWAS North-South Accra–Ouagadougou highway corridor

Source: COWIORGUT based on http://mapsof.net/map/map-of-trans-african-highways

Accra–Kumasi highway

The proposed north-south link between Accra and Ouagadougou may be divided in two sections, which lend themselves to phased implementation: the Accra–Kumasi link and the Kumasi–Paga link.

The Accra–Kumasi link is presently under consideration by the Department of Highways, with a possible alignment running parallel to the existing Accra–Kumasi national trunk road N1130. NSDF proposes an 'improved' alignment that would follow a more direct route and run through the centre of the 'triangle' formed by Takoradi, Kumasi and Accra. This alignment would have the following four advantages:

- the route would be about 8 percent shorter than the GHA-proposed alignment;
- the alignments would create a unique development opportunity for a new town, at the centre of the triangle, that might take some of the development pressure away from the triangle cities and share services with them;
- the alignment could become the spine of a future metropolitan highway system. This system would consist of four radials from and three rings around Accra; a link to a ring around Sekondi Takoradi and to two outer ring roads around Kumasi;
- the alignment would support the option of a new national and international airport for all three triangle cities at a location about 100 kilometres, which, with direct connection on highway, would take less than one hour on the highway and 35 minutes by intercity train.

Kumasi–Paga highway

The Kumasi–Paga link would complete the central, north-south corridor and connect the port cities of Accra - Tema and STMA with Kumasi, Tamale, Bolgatanga and further on to Ouagadougou and Bobo Dioulasso in Burkina Faso, Bamako in Mali and Niamey in Niger. When finished, the corridor will directly link the major

[130] NSDF interview with the Ghana Highways Department, October 2014.

Ghanaian cities and support development in the cities and towns along the route including improving the transport of agricultural produce to the major markets in the country. The corridor will strengthen Techiman as an important West African market and create other development opportunities along the corridor.

Kumasi–Sunyani highway

The Sunyani urban network has national importance for (i) providing an alternative to the four large city-regions, (ii) being the centre of high-value and high-output agricultural production, and (iii) having Techiman as an important market hub and one of the fastest growing urban centres. In addition, there are important urban centres in Cote d'Ivoire on the other side of the border.

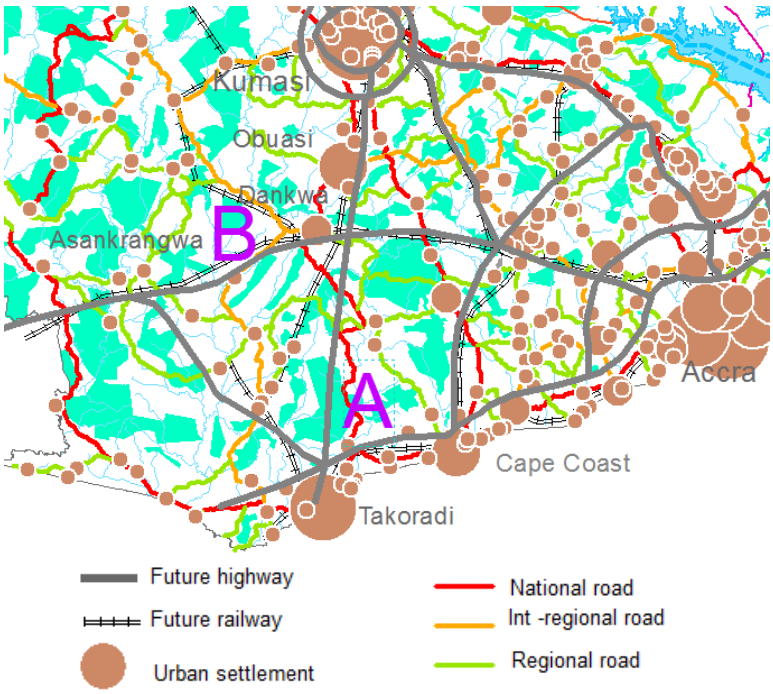
NSDF proposes a highway loop that connects Kumasi to Sunyani, Berekum, Dormaa and eastward to Cote d'Ivoire and from Sunyani to Techiman to the north-south highway. The highway link will reduce travel time between Sunyani and Kumasi to between 60 and 80 minutes, which would make commuting between these cities easier.

5.11.3 Re-align ECOWAS Trans–West African Coastal Highway

The ECOWAS Trans West African Coastal highway will connect what some consider as Africa's largest megapolitan area comprising the coastal cities of Cote d'Ivoire, Ghana, Togo, Benin and Nigeria[131]. A map of the proposed alignment of the highway is not available, but it is understood that it will be established on the existing national trunk roads.

NSDF proposes an alternative alignment in Figure 5.34. Instead of running along the coast, the high should run parallel to the ECOWAS coastal railway line through the centre of the 'triangle'. It would run between Takoradi and Kumasi close to Dunkwa and Asankrangwa. From Akroso towards the west, the reserved land for this new transport corridor will also include space for the future ECOWAS Highway.

Figure 5.33 Two options for alignment of Trans West African Coastal Highway



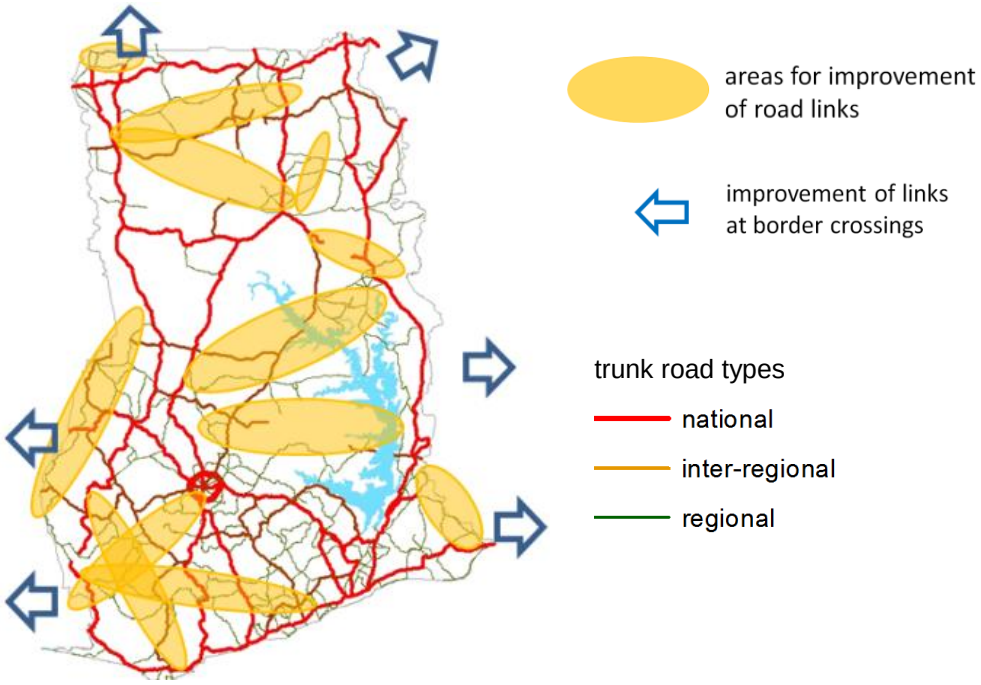
[131] http://www.theatlantic.com/international/archive/2013/07/how-africas-new-urban-centers-are-shifting-its-old-colonial-boundaries/277425/

Source: NSDF Study 2014

5.11.4 Improve regional connectivity with new and better trunk roads

NSDF recognises the need for improved road connectivity between major urban centres, industrial areas and agricultural production zones. The trunk network has in general a good coverage, but has to be reinforced in some areas. Figure 3.32 shows the areas where road links should be improved:

Figure 5.34 Areas for improvement of trunk road links



Source: NSDF Study, Road and Highway Authority 2012 and GSS data 2010

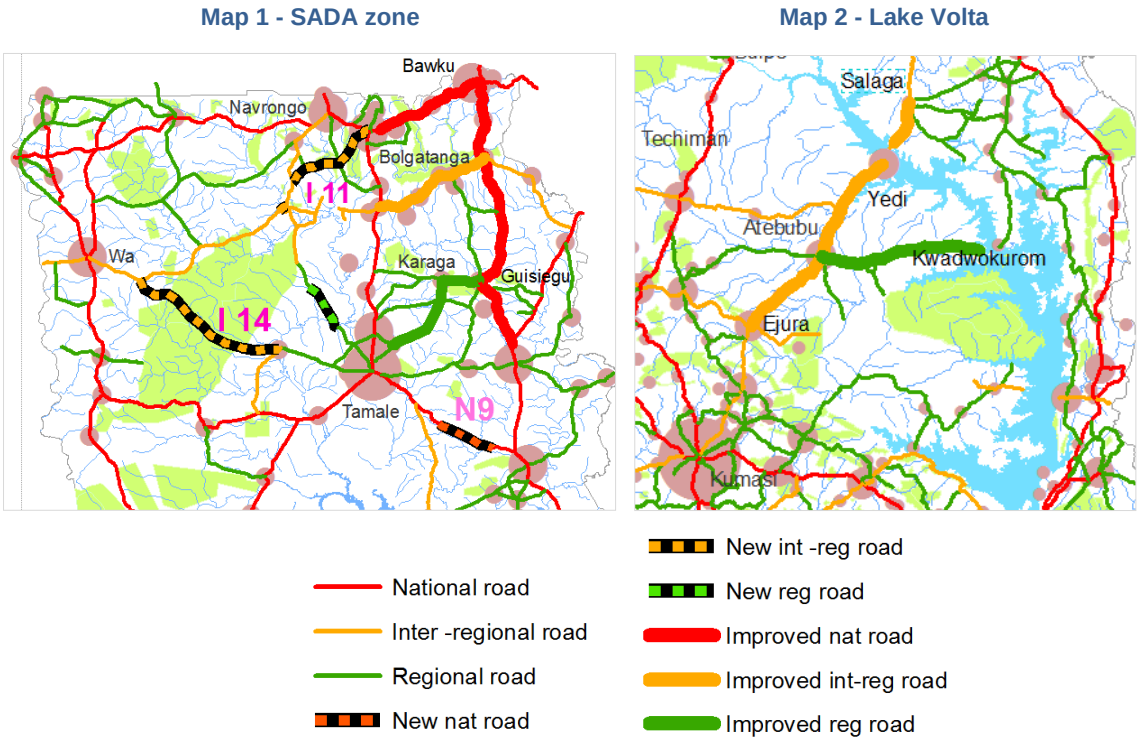
Improve SADA zone trunk road system

Special development support has to be provided to lift up the SADA zone. The zone has future development potential within agriculture, livestock, mining, forestry, food processing, service to and trading with the land-locked countries, solar energy production and tourism. It also has a number of urban centres to drive this development, namely the cities of Tamale, Bolgatanga, Wa and Bawku but also the other towns of Lawra, Jirapa, Tumu, Bole, Damongo, Savelugu, Yendi, Salaga, Bimbila, Walewale, Gambaga, Gushiegu, Navrongo and Zebilla.

The following trunk road improvements are proposed in the SADA zone (map 1 Figure 5.35):

- new trunk road between Wa and Tamale (I-14)
- new and upgraded trunks roads between Wa and Bolgatanga (I-11)
- new trunk road between Bimbila and Tamale (N-9)
- upgraded trunk road on the N-11 between Bolgatanga and Bawku
- upgraded trunk road on the I-11 between Nakpanduri and Walewale
- improved connection between Gushiegu, Karaga and Tamale

Figure 5.35 New and improved road links in SADA zone and Lake Volta area



Source: NSDF Study, 2014

Improve connectivity around and across Lake Volta

Lake Volta presently acts as a barrier between the Volta Region and the central corridor, Ashanti and Brong Ahafo regions. The impact of the barrier can be reduced through the following interventions:

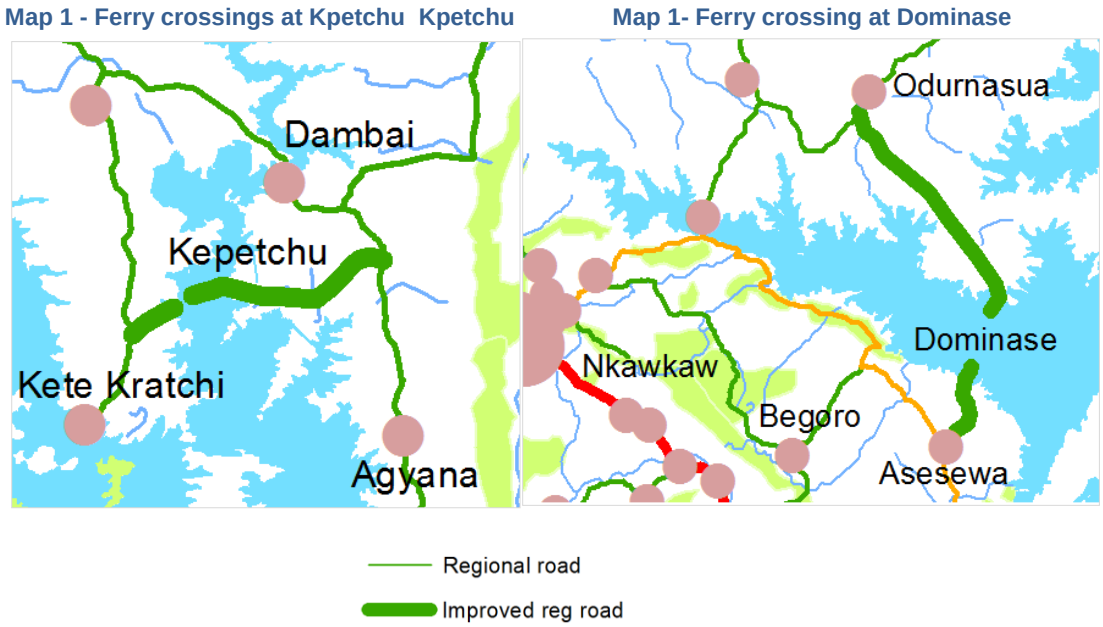
- strengthen the Kumasi, Ejura, Atebubu connection to Yeji and Kwadwokurom;
- modernise and increase the capacity, frequency, and attractiveness of the Yeji and Kwadwokurom ferry crossings;
- improve road connections around the lake;
- move the ferry crossing from Dambai to Kpetchu, which will reduce the travel time east-west;
- develop a new road and ferry crossing between the northern part of the Eastern Region to Dominase–Koforidua.

Improved connectivity between Volta Region and Ashanti and Brong Ahafo Regions will have numerous benefits. It will support development around the lake and improve the environment for tourism, particularly around this part of the lake close to Kumasi and Accra.

It will also help the Volta Lake area to realise its considerable agricultural potential by improving agricultural connectivity with the markets in Techiman and Kumasi. Finally, it will also provide an alternative to the coastal corridor for movement between West African countries, specifically, from Atakpamé in Togo via Techiman

to Yamoussoukro in Ivory Coast. The improved connectivity aims at strengthening development in the central parts of these West African countries.

Figure 5.36 Proposed ferry crossings and roads at Lake Volta



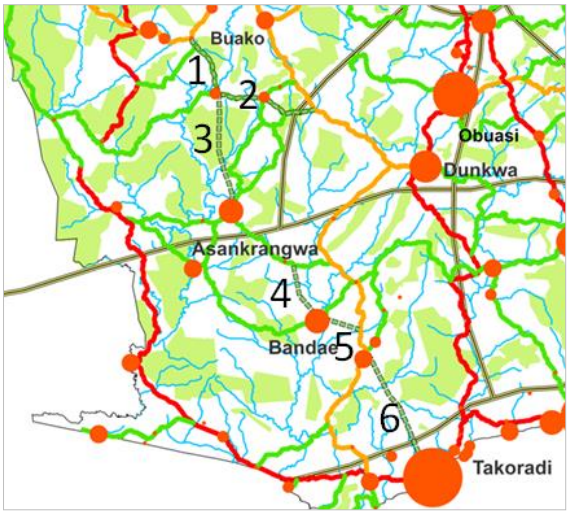
Source: NSDF Study 2014

Improve connectivity in Western Region

There are six opportunities to improve the road network in Western region. The new links would promote more interaction between urban centres and better connectivity to Takoradi (Map 1 on Figure 3.38).

Figure 5.37 Western region road improvements

Map 1 - Road improvement in Western Region



Map 2 - Improved road link in Brong Ahafo

1. Buaka –Wiawso
2. Wiawso–Diaso
3. Wiawso–Asankrangwa
4. Manso–Bandae
5. Bandae–Tarkwa
6. Tarkwa–Takoradi

Source: COWIORGUT, 2014

The improvements will enhance interaction between the urban settlements in the region and the communication to Takoradi. There is also an opportunity to improve road links along the western border from Adwufia in the south towards the north to New Drobo and from Sampa to Banda just south of the Bui Dam. These improvements aim at supporting the links to areas with agricultural production (map 2 on Figure 3.37).

Improve the Ho - Akanu border crossing

The southern part of Volta Region is located close to Lome, the Togo capital, which provides a sizeable market for produce from Volta Region and development of trade. Ho is located only 106 km from Lome. The NSDF considers this option and emphasises on improved connection along the R10 which links.

5.11.5 Improve the feeder road system

NSDF supports the objective of improving and maintaining the feeder road system. The priorities are: to connect the most populated rural areas to trunk roads leading to district capitals, urban service centres and urban markets; to link neighbouring rural settlements so that they can share services where possible and convenient; and to link agricultural production areas to the trunk roads leading to markets, processing plants and ports.

NSDF supports the draft NIP's call for feeder road improvements around Lake Volta to create better access from the productive rural areas to landing sites and ports. The tourist potential around the lake is also a concern and special places of interest must be given better accessibility. In mining areas, the feeder roads shall connect efficiently to railway lines where existent.

Sustainable maintenance of the feeder road system is important and in the long term technical assistance and economic resources must be given to the local

government to make them able to take over the responsibility of maintenance as direct users of the local road network.

Technical support must also be given to local government related to planning of new settlements and preparation of schemes as it is relevant to ensure that access and exit from new development schemes and parcels only take place along the access feeder roads, limiting as much as possible any direct road connection to inter-district and connector feeder roads. There is a good platform for this since the street naming and addressing system is based on the planning authorities' database.

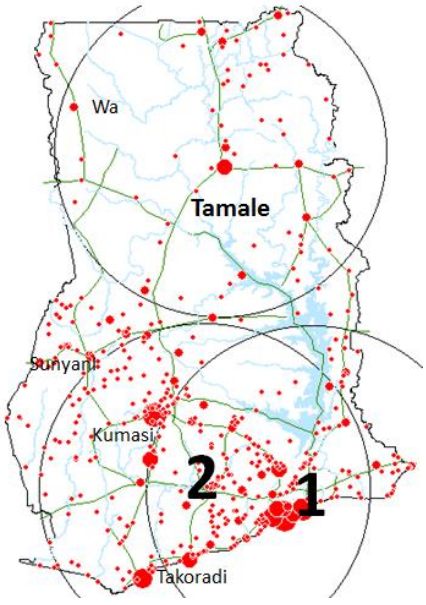
5.11.6 Consider options for new airports

Ghana's international airport service should be competitive with its neighbours in the region. However, constructing and maintaining modern airports is costly, in part because jets are bigger and heavier, and in part because passengers expect more[132]. An international airport, for example, could cost between USD 700 million and 1.4 billion depending on the technical level of the runway.

Accordingly, the decision to develop new airports must not be taken lightly. It is understood that four international airports are presently operating, or are being developed, or have been under consideration as options. These are KIA which is in operation, Tamale being developed, Kumasi is under consideration, and Prampram also under consideration. The location of Prampram is marked with (1) and the location in the “triangle” is marked with (2) in the map below.

The Government could not likely afford and therefore will not decide to develop all four airports in the next twenty years.

Accordingly, NSDF proposes an option for two international airports: one in Tamale and another in the southern part of the country. The latter would be located not in Prampram or Accra but in the centre of the “triangle” area, at location (2) on the map. It would have high-speed connections, less than 50 minutes to Accra, Kumasi, Takoradi and Cape Coast by modern highways and railways.



With an international airport in the “triangle” area, there would be no need for new international airports in Kumasi, Cape Coast/Takoradi and Accra. In addition, it may also be economic to close and redevelop the present airports in Accra and Kumasi or restrict them for shuttles to the 'triangle' airport.

Within a distance of 200 km, the two international airports at Tamale and the 'triangle' would be accessible by 85 percent of the population. Within the same distance, a two international airport option at Tamale and Prampram would be accessible by only 65 percent of the population.

Within the same distance, a new airport at Prampram together with the other 4 other airports would be higher, namely 97 percent. However, the cost would also be around 45 percent higher.

[132] The Spanish government has invested 1.2 Bn USD in the development of Malaga airport 1995-2010 and new runways alone in USA (Atlanta and Lambert-*St. Louis i*nternational a*irports*) have during 2000-2010 been constructed at a cost of 1.1-1.24Bn USD.

An airport in the centre of the “triangle” would require and stimulate investment in airport related service industries. Owing to the already attractiveness of an area in the centre of the triangle, NSDF has proposed this area for major new urban development.

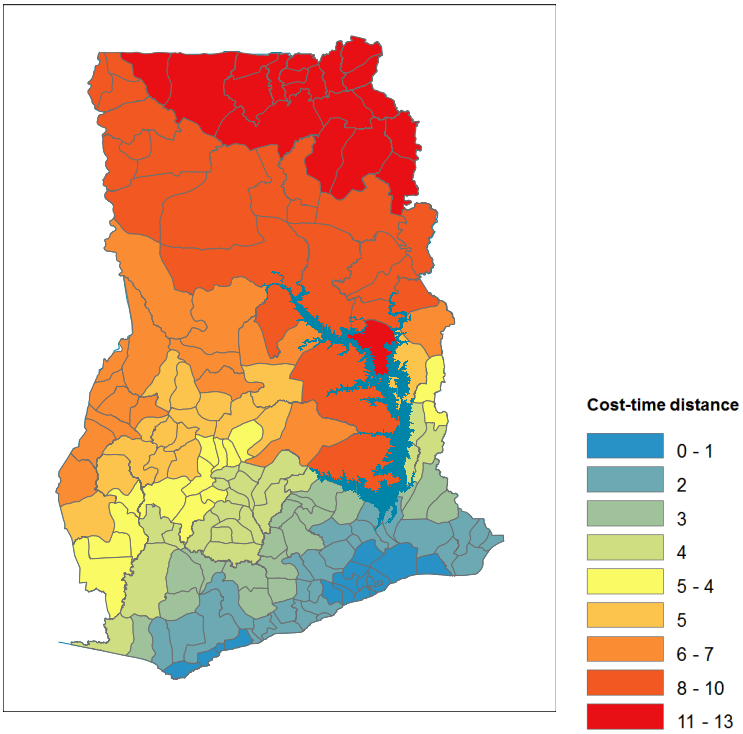
The suggestion of NSDF as of February 2015 seemed attractive to the key stakeholders, namely Ghana Civil Aviation Authority and Ghana Airport Company Ltd.

5.11.7 Consider options for new seaports

NSDF identifies future transport corridors with the inter-modal linkages between the different transport modes such as road, rail, water, and air. Tema and Takoradi ports are well-connected to the road, rail and in-land water transport systems with access to the major urban centres and mining areas. In the long term, the system will include improved West African road and railway connections and improved regional transport of cargo.

As illustrated in the following Figure 5.36, access to the ports is most favourable for development of production, service and commercial activities in the southern part of the country since the short distance to the ports will lower transport cost for export and import. However, the development of efficient transport corridors towards the north and development of cheaper transport means will reduce the differences in transport cost between north and south, for example, enhanced water transport possibilities on the Lake Volta.

Figure 5.38 Transport cost factor to the ports



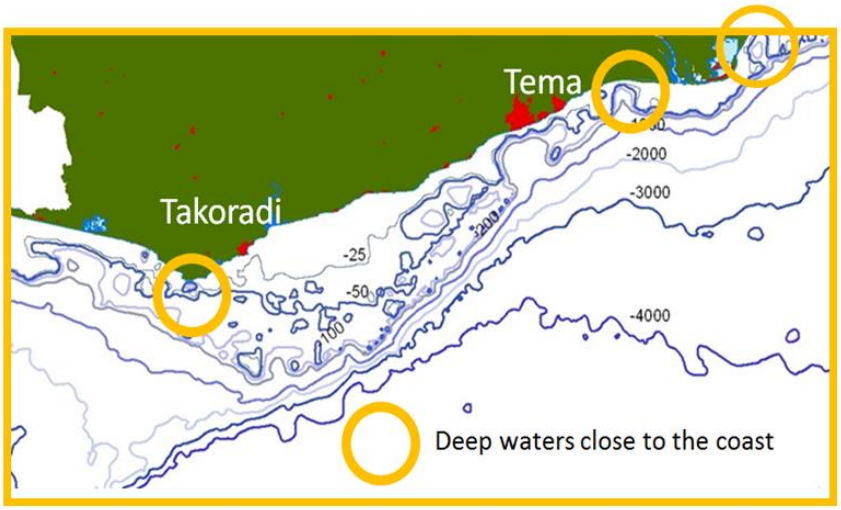
Source: NSDF Study based on data from World Bank

The spatial expansion of the two existing ports at Tema and Takoradi is physically constrained but doable for example with land reclamation. However, most onshore areas around the port have been already developed, and re-development costs may

be found to be prohibitive. Redevelopment costs may trigger a decision to search for other options for port development.

NSDF proposes three areas to be reserved for future expansion of the sea port activities. These areas have a number of advantages. They are near to deep water, close to the existing ports, and relatively free of existing urban development; they also have sufficient land for the development of inland facilities including access to railways and roads (Figure 5.39).

Figure 5.39 Future land reserves for development of harbours



Source: NSDF Study 2014

Two of the expansion areas are located east of Tema; one is 68 km from Tema and the other close to the Togo border. The latter might be developed as a joint Ghana-Togo project. The proximity of this area to the lower Volta River and Akosombo inland port provides an opportunity to connect it to the inland water transport system by either rail or canal. The expansion area near Takoradi port is located 37 km to the west and has a key central location for the oil and gas industry. Both areas could be easily connected to the future West African coastal highway and railway.

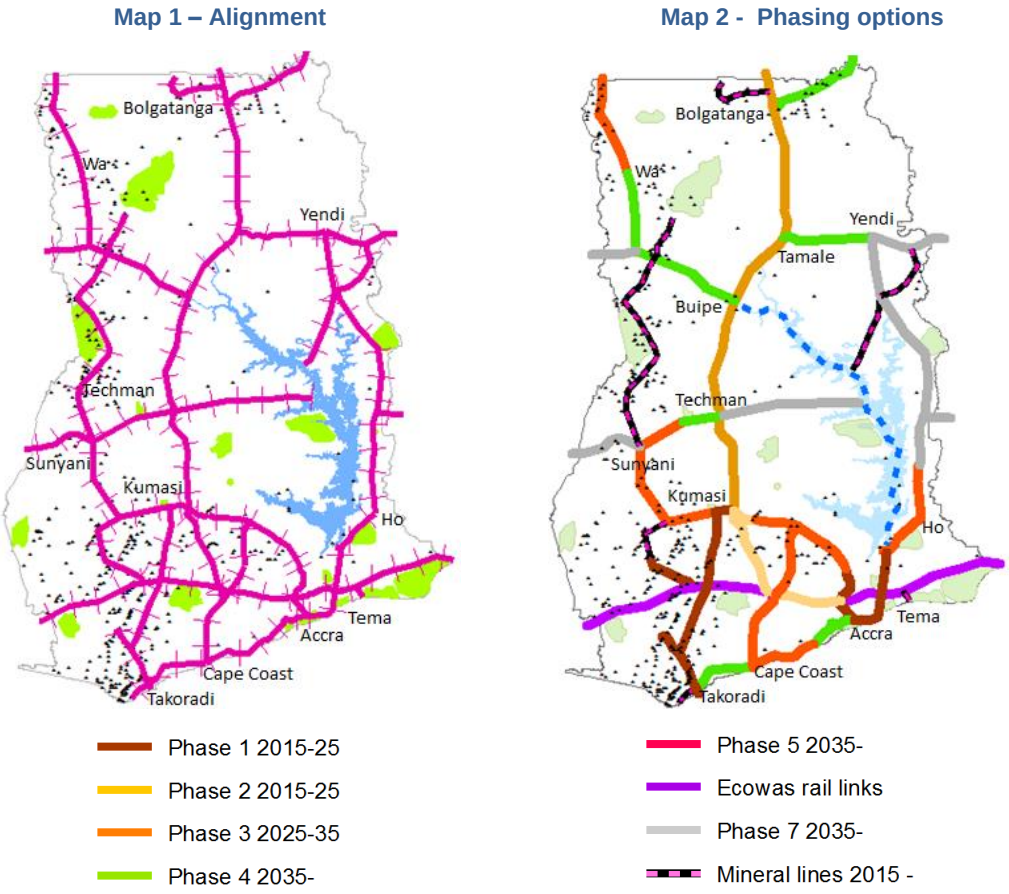
5.11.8 Consider option for railways

NSDF supports the development of a national rail network, but it proposes an alignment that differs somewhat from the proposals of the draft NIP and GRMP. NSDF takes a broader view than the other proposals and focuses on the role that railways can play for:

- structuring urban development around efficient transport corridors to minimise vehicle kilometres travel;
- improving access to job opportunities and services for the urban populations; and
- supporting economic development by efficient transport of freight between production centres.

NSDF proposed rail network is 4,330 km in length, almost double that of NIP's and 29 percent more than GRMP's (map 1 on figure 5.40). NSDF adopts the draft NIP and GRMP proposals to modernise the old railway system uniting the 'triangle' cities, to extend the railway system to Paga and to integrate the rail network with the Lake Volta inland water transport system. Nonetheless, it proposes new alignments in order to enhance development in the northern part of the country and rationalise development in the south.

Figure 5.40 Proposed NSDF railway network



Source: NSDF Study 2014

The major urban centres in the north will be connected, including new lines from Bolgatanga to Bawku and beyond to the Togo/Burkina borders.

Additional links are made to neighbouring countries from Sawla to the Comoe National park and Korhogo in Ivory Coast as well as from Yendi via Zabzugu to Kara and Sokode in Togo.

Agricultural areas in Upper Western and Eastern regions will benefit from the railway link to Tamale and to the large urban markets in the southern cities, with a maximum eleven-hour travel time.

Some trains will stop at all stations, providing local transport service, and others will stop at the main cities only, providing express service.

The railway will link the northern urban settlement system providing access to urban markets for the rural areas as well as the possibilities of sharing private and public services, such as education, health and public administration.

NSDF proposes the following priorities for the development of Ghanaian railways. Reference is made to map 2 on Figure 5.40 above.

Phase 1-3: 2015-35

- Involves the modernisation of the Western Railway Line from Takoradi to Kumasi and construction of a link to Boankra inland port, as well as construction of

branches to the most productive or potential productive mining areas along the line. The phase also includes modernisation and improvement of the suburban railway in Takoradi, Kumasi and Accra to Koforidua and construction of railway between Tema and Akosombo illustrated with the dark brown line in Map 2 of Figure 5.41.

- Development of a new high-speed line in the 'triangle' between Amasaman and Ejisu/Boankra inland port via the centre of the 'triangle' between Oda and Foso illustrated in the light brown line (Map 2 of Figure 5.41); reservation of land for rail alignments and about 300-400 km^2 of land along the line for a new urban development, international airport and a modern solid waste energy generation plant with recycling and hazardous waste treatment facilities between Oda and Foso.
- Construction of a new railway between Boankra inland port and Paga linking to Techiman, Kintampo, Buipe, Tamale, Savelugu, Walewale, Bolgatanga, Navrongo and Paga (dark brown line in Map 2 of Figure 5.41).

When phases 1 to 3 have been constructed, Ghana will have a railroad network which connects all major Ghanaian urban settlements and Burkina Faso. The railway might be used for efficient transport of passengers and cargo between the urban centres including agricultural produce to consumers and export facilities. The railway may even solve the serious problems related to cattle drives from north to south by transporting cattle from the border to markets and the meat industry, and other commodities.

Phase 4-7: 2035-onwards

- Construction of new railway lines Buipe-Sawla-Wa; Tamale-Yendi; Techiman-Nkoranza; Bolgatanga-Bawku; Accra-Winneba and Takoradi-Cape Coast (light green line in map 2 on Figure 5.41).
- Modernisation of the railway lines between Ejisu-Kofuridua, Akosombo-Ho- Hoe, Winneba-Cape Coast, Wa-Hamale, Kumasi-Nyinahin-Sunyani-Techiman and construct new lines (dark green line map 2 on Figure 5.41).
- Construction of the ECOWAS coastal extension line with links Achimota-Kano and Achiasi Abidjan via Tarkwa, and link Nkawkaw with Cape Coast (purple line in map 2 on Figure 5.41).
- Construction of the Nkoranza-Kwadwokurom, Sunyani-Dormaa, Hohoe-Yendi and the connections across the borders where possible (grey line in map 2 on Figure 5.41).

The lines directly serving the mineral deposit areas are independent of the principal priorities. The demand for these lines is conditional upon investment in the mining industry. The rails will be convenient to transport the heavy mineral ore (black line in map 2 on Figure 5.41).

5.11.9 Focus on the triangle area

NSDF proposes additional transport infrastructure through the triangle area due to the expected high level of urbanisation and population growth. Urbanisation will be concentrated along the existing triangle corridors: Accra-Koforidua-Nkawkaw-Kumasi; Kumasi-Obuasi-Takoradi and Takoradi-Cape Coast-Accra. NSDF also plans for transport infrastructure for the development of urban settlements within the triangle area.

Develop high-speed link between Kumasi and Accra

NSDF proposes a new railway line between Accra-Tema and Kumasi to carry cargo between Tema port and the Boankra Inland port as well as passengers at high speed, 80–240 km per hour. The line will be about 10-15 km shorter than the old

Eastern Line. This line will run through the countryside from the Kotoku Junction in Accra via Achiasi to Boankra Inland port. It will where possible run parallel to the proposed Accra–Kumasi freeway, simplifying land acquisition for both.

Consider new town at the centre of the 'triangle'

The centre of the 'triangle' provides a unique opportunity for Ghana to develop a new town or city. This area is attractive to developers and potential residents because of its links to and central location between the three large urban centres, proximity to the coast and location on the new rail and highway lines. The establishment of a new international airport accessible within 40 minutes from all triangle cities would render the area even more attractive.

NSDF identifies a potential site south west of Achiasi. The new urban centre could be a model that incorporates features that other urban areas could emulate, including smart-growth, transit-oriented development, ecological green design, well-planned and environmentally friendly industrial areas, affordable housing, and sufficient public and private services including recycling facilities including waste water and solid waste treatment plants.

The new town would provide at least two important benefits. First, it would provide a counter-magnet for migrants that might otherwise opt for the large cities or the coastal area between Winneba and Cape Coast. Diverting and even attracting population from coastal areas would help protect the natural resources and support the development for recreation and (inter)national tourism. Second, it would strengthen the connections between the 'triangle' cities and create a competitive economic regional centre in the West African context.

Transport infrastructure will not only be developed for the new town but will also be coordinated with the development of a new road structure of highways and freeways within the triangle area ensuring benefits to other urban settlements with development potential.

Equally centrally located, the triangle area also opens the possibility for the construction of a new modern solid waste power generation plant with recycling and composting facilities. The plant production line be supplied with solid waste from Kumasi, Accra and Takoradi and other urban centres in the triangle using the railway as main means of transport with direct access to temporary collection points in the urban areas.

5.12 Energy

This section discusses energy production and distribution. The main challenge is to ensure adequate supplies to an already under-served population while expanding production to meet the projected demand.

Electrical energy is presently generated by hydro-power and thermal plants based on oil, but natural gas is increasingly being used to lower consumer prices which, compared to competing countries, are relatively high. While Ghana has suffered cuts in gas supplies from the West African network, its oil and gas production is increasing and new thermal energy plants being built, which will rely mainly on supplies of gas through the Atuabo gas plant in Western Region brought on shore from Ghanaian off-shore oil fields.

The volume, trend and spatial distribution of oil and gas consumption are important to national spatial development for several reasons. First, consumption is an indicator of economic activity; regions and districts with higher and growing

consumption may be considered more economically vibrant than others. Secondly, transport-based energy consumption is influenced by the pattern of urban and regional development. Thirdly, emissions from oil and gas consumption are linked to both local health risks and climate change. Finally a substitute energy source for bio-mass fuels used in cooking can decrease the rate of pollution and global climate change.

It is generally accepted that the high consumption of fossil energy resources worldwide is contributing to climate change, which is affecting all countries but more so those without appropriate mitigation and disaster management contingencies.

Reliable and affordable energy supplies are essential to development and poverty reduction. Energy is needed for industry, residential use, transport, public lightning, equipment, public institutions, schools and universities, hospitals and health facilities, pumps, cleaner indoor air, food-processing, ICT, etc. Cleaner and affordable energy enhances income-generating opportunities and is essential to progress and development.

5.12.1 Energy Sector

The Ministry of Energy and Petroleum (MEP) is responsible for formulating, monitoring and evaluating policies, programmes and projects in the energy sector. It also implements the National Electrification Scheme (NES) 1990-2020 which is divided in three sub-sectors: hydro and thermal power, petroleum and renewable energy.

Hydro and thermal power: The goals of the power sub-sector are to increase installed power generation capacity to 5,000 megawatts (MW) by 2016, and ensure nationwide access to electricity supply by 2020. The challenges are: attracting investment in infrastructure, inciting private sector involvement and ensuring cost recovery of delivered supply and return on investments. The Volta River Authority and Bui Power Authority (BPA) manage power generation; Ghana Grid Company (GridCo) manages transmission; and the Electricity Company of Ghana (ECG) and Northern Electricity Distribution Company (NEDCo) manage distribution in the south and north, respectively.

Petroleum: The goals of the sub-sector are to ensure sustainable exploration and management of the oil and gas revenues. The sector includes upstream, midstream and downstream sub-sectors: (i) upstream sub-sector includes exploration, development and production of oil and gas from oil and gas fields; (ii) midstream includes transportation of oil and gas to the oil refineries or gas processing plants; and (iii) downstream includes rehabilitation and expansion of petroleum refining, storage, distribution and marketing infrastructure.

Renewable energy: The goal of this sub-sector is to increase the share of renewable energy to 10 percent by 2020. The major challenges facing the sub-sector are: ensuring sustainability and efficient use of wood fuel, reducing the costs of solar and wind energy technologies, reducing the cost of waste collection, and introducing waste-to-energy technologies.

5.12.2 Power generation

While there is sufficient electricity generation capacity to meet demand, actual generation falls short due lack of fuel, low water levels in the Lake Volta and inadequate transmission systems and distribution networks that lose up to 20 percent of the generated power due to poor piping and plants maintenance.

Of the total 2,900 MW installed power capacity, the share from hydro, thermal and renewable energy sources is 53.9, 46.0 and 0.1 percent, respectively. This comes from three hydro power plants at Akosombo, Kpong and Bui, ten thermal plants and one solar PV plant. In 2013 the generation of power from hydro, thermal and solar PV plants was only 52.8 percent of the installed capacity.

Table 5.13 Installed capacity of the existing power plants

facility	type	fuel type	installed capacity (mw)	% of capacity
Akosombo	hydro	water	1,020	40.0
Kpong	hydro	water	160	6.3
Bui HEP	hydro	water	133	5.2
TAPCO (T1)	thermal	lco/gas	330	13.0
TICO (T2)	thermal	lco/gas	220	8.6
T3	thermal	lco/gas	132	5.2
TT1PP	thermal	lco/gas	110	4.3
TT2PP	thermal	dfo/gas	50	1.9
MRP	thermal	dfo	80	3.1
Sunon Asogli	thermal	gas	200	7.9
CENIT	thermal	lco/gas	110	4.3
Solar	renewable	solar	2	0.1
Total			2547	100.0

Source: Energy Commission

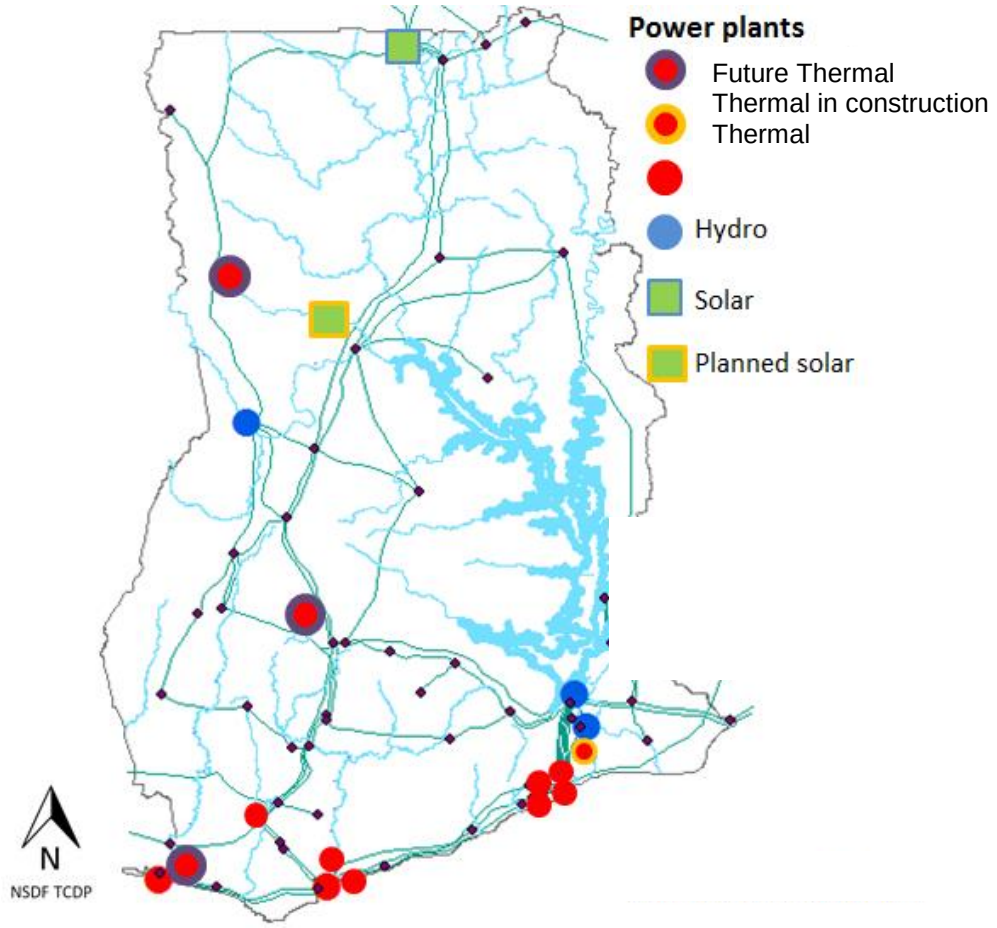
In addition to public power plants, a number of independent power plants provide about 733 MW, increasing overall capacity by 36 percent.

Electricity production between 2000 and 2013 has been plagued by a series of declines. While there has been a gradual recovery since 2007, it has not been sufficient to meet the growing demand. As a result, electricity customers have had to endure frequent power outages and planned load shedding exercises, particularly in 2006, 2007, and 2013 up to the present moment. Ghana has had to import over 20 percent of the fuel it needs for power generation, which has proven a costly affair.

5.12.3 Power transmission and international connections.

There are 43 existing and 11 proposed power substations. The three northern regions have only seven of the existing substations but are planned to receive four more. There is currently about 4,000 km of transmission lines throughout the country. Due to outdated transformers and an aging high-voltage transmission network, transmission and distribution account for losses of up to 19 percent of the capacity. Transmission losses account for 4.4 percent and distribution for 14.4 percent. Overloaded networks also lead to high electrical power distribution and transmission losses (World Bank, 2013). This level of loss is slightly higher than the average loss in 21 African countries (16.4 percent) and far higher than that in most Western Countries as well as Thailand, Chile and Guatemala, which range from 4 to 8 percent.

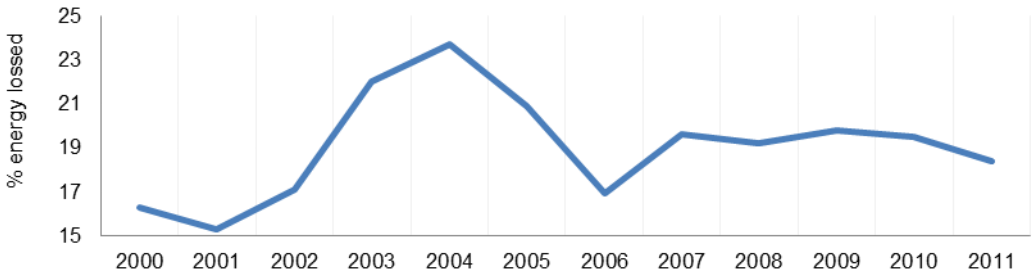
Figure 5.41 Power plants



Source NSDF Study 2014

Power losses peaked at 24 percent in 2004, remained at about 19 percent between 2007 and 2009, and only recently dropping 5-260 percent (Figure 5.42).

Figure 5.42 Power distribution and transmission losses (% of output)



Source: World Bank Country Statistics on Ghana (online Database), 2013

Even though, Ghana supplies power to neighbouring countries as well. The transmission grid is connected to Côte d'Ivoire and Togo. In 2014, a new 264 KW interconnection between the Volta region and Lome was envisaged. Ghana is also interconnected with Burkina Faso and the connection is planned to be improved during 2015 and 2016 and then connect to Mali. In 2020, a new interconnection with

Cote d'Ivoire at Prestea is projected to improve the exchange capacity between GRIDCo system and CIE system.

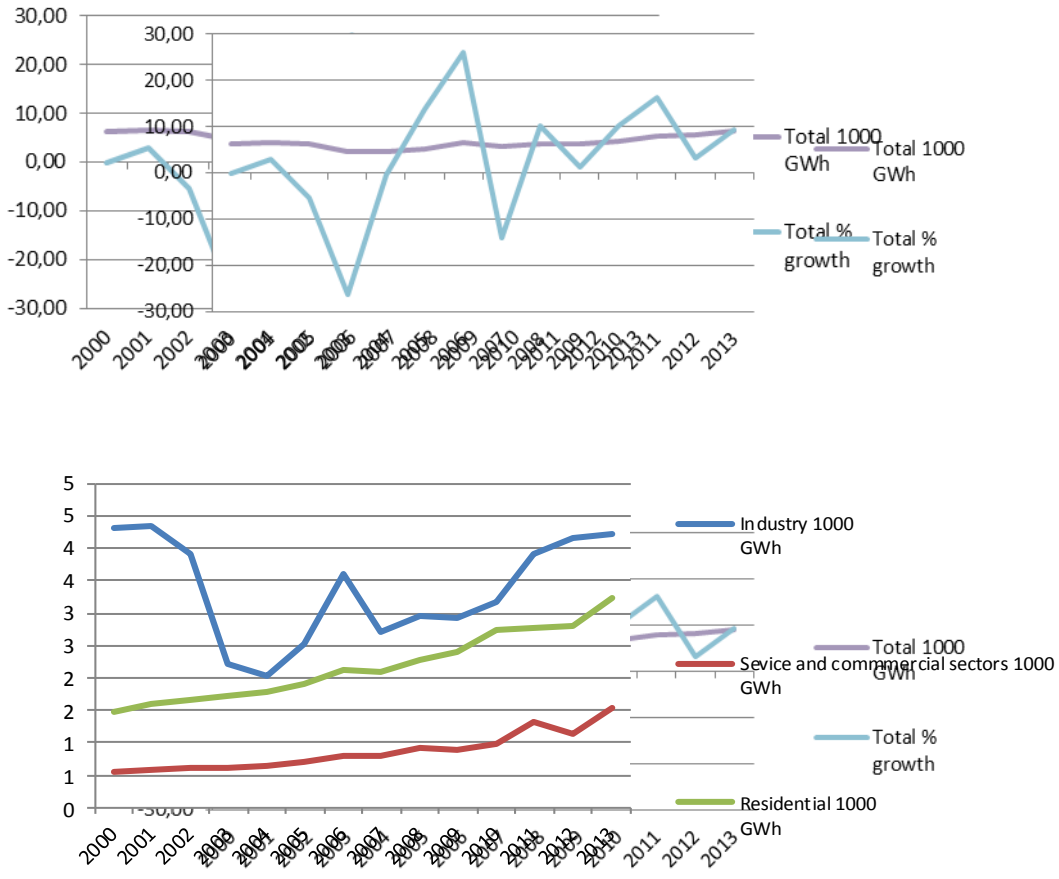
5.12.4 Demand for and supply of energy

Only 70 of the population is connected to the main power, leaving particularly rural communities located more than 15 km from the national grid to be still connected. Demand is growing at an estimated 10 to 15 percent per year, largely due to industrial development.

Power sub-sector

The power sub-sector supplies electricity for lightning, residential use, commerce and service sector, industry and other requirements. In 2013, residential, commercial, and miscellaneous industries accounted for 70 percent of electricity consumption. Mining firms consumed 14 percent with the Volta Aluminium Company (VALCO) alone consuming six percent. Export and other bulk users consumed 14 percent.

Figure 5.43 Energy demand and demand growth 2000-13



Source: Volta River Authority, 2013

Figure 5.43 and Table 5.14 show the growth rates in supply of energy to industry, service, commercial and residential sectors from 2000 to 2013. The Figure shows drastic changes in supply, which have affected all sectors, especially the industrial. Industrial consumption (for example VALCO) is being used to avoid too negative

impacts on other sectors in periods when energy availability is being reduced severely.

Table 5.14 Grid electricity supply, share and growth by sectors 2000-2013

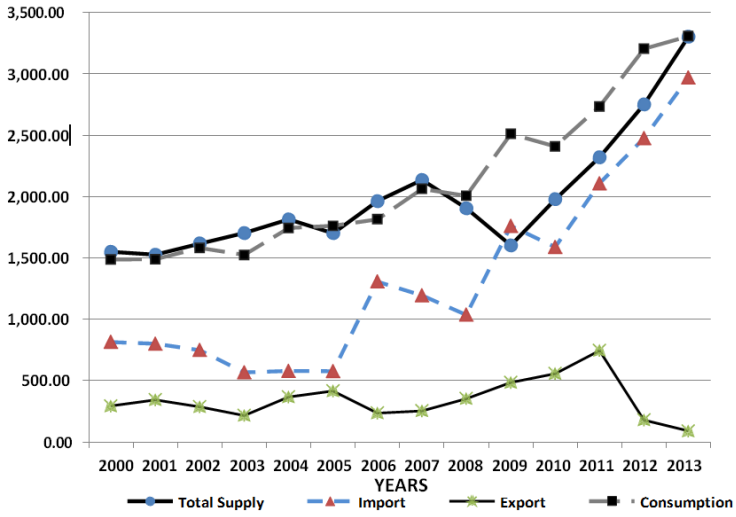
year	Industry			non residential			residential			Total	
	1000 GWh	% share	% growth	1000 GWh	% share	% growth	1000 GWh	% share	% growth	1000 GWh	% growth
2000	4.31	68.0	0.0	0.55	8.7	0.0	1.49	23.5	0.0	6.34	0
2001	4.33	66.3	0.5	0.58	8.9	5.5	1.61	24.7	8.1	6.53	3.0
2002	3.90	63.2	-9.9	0.60	9.7	3.4	1.67	27.1	3.7	6.17	-5.5
2003	2.21	48.6	-43.3	0.62	13.6	3.3	1.73	38.0	3.6	4.55	-26.3
2004	2.03	44.8	-8.1	0.66	14.6	6.5	1.78	39.3	2.9	4.53	-0.4
2005	2.54	49.2	25.1	0.70	13.6	6.1	1.92	37.2	7.9	5.16	13.9
2006	3.59	55.1	41.3	0.79	12.1	12.9	2.13	32.7	10.9	6.51	26.2
2007	2.70	48.3	-24.8	0.80	14.3	1.3	2.10	37.6	-1.4	5.59	-14.1
2008	2.97	48.2	10.0	0.93	15.1	16.3	2.27	36.9	8.1	6.16	10.2
2009	2.94	47.2	-1.0	0.88	14.1	-5.4	2.41	38.7	6.2	6.23	1.1
2010	3.16	46.1	7.5	0.97	14.1	10.2	2.74	39.9	13.7	6.86	10.1
2011	3.90	48.9	23.4	1.31	16.4	35.1	2.76	34.6	0.7	7.98	16.3
2012	4.15	50.4	6.4	1.15	14.0	-12.2	2.80	34.0	1.4	8.24	3.3
2013	4.22	46.9	1.7	1.53	17.0	33.0	3.23	35.9	15.4	9.00	9.2

Source: Volta River Authority, 2013

Demand and supply for petroleum products

Oil and gas consumption has increased by more than 120 percent between 2000 and 2013 (Figure 5.44). The Figure demonstrates the need to import petroleum products is increasing.

Figure 5.44 Total supply, consumption and trade of petroleum 2000-2013, 1000 tons



Source: Energy Commission

Table 5.15 shows the consumption of the various petroleum products. Gasoline and diesel consumption is high and has increased between 2011 and 2013 by 17,000 and 7,000 tons, respectively. Consumption of kerosene has decreased while that of LPG has increased. Higher consumption of LPG is partly due to government policy to encourage a switch from wood and charcoal-based cooking to reduce the rate of deforestation, and is partly due to the conversion of vehicles from more expensive petrol and diesel. Premix, low octane gasoline use for fishing boats, has increased

by 7.6 percent following the development of GDP. RFO, which is used in the industrial sector, increased by only 2.4 percent.

Table 5.15 Petroleum product consumption 2011-2013

Product	year 1000 tons			change 2011-13
	2011	2012	2013	%
LPG	214	269	252	17.8
Gasoline	807	993	1081	34.0
Premix*	46	59	53	15.2
Kerosene	62	46	28	-54.8
ATK**	135	141	132	-2.2
Gas oil/diesel	1512	1665	1723	14.0
RFO***	37.5	33.5	39.3	4.8
total	**2814**	**3206**	**3307**	**17.5**

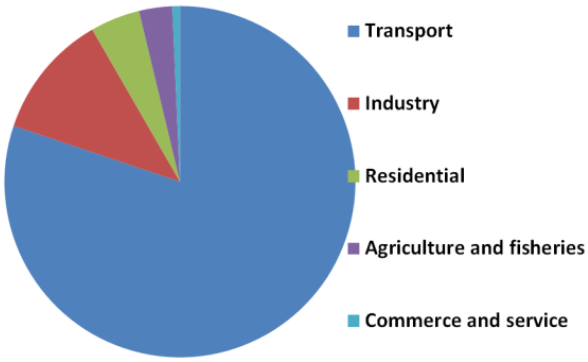
*Premix is low octane gasoline for fishing boats, **ATK is Aviation turbine kerosene, ***RFO is Heavy fuel.

Source: Energy Commission 2014

Figure 5.45 Sectors supplied with petroleum products in 2013, 1000 TOE

Sectors	1000 TOE
Transport	2645
Industry	380
Residential	151
Agriculture and fisheries	101
Commerce and service	23
Total KTOE	3300

1 TOE= approximate 1 ton

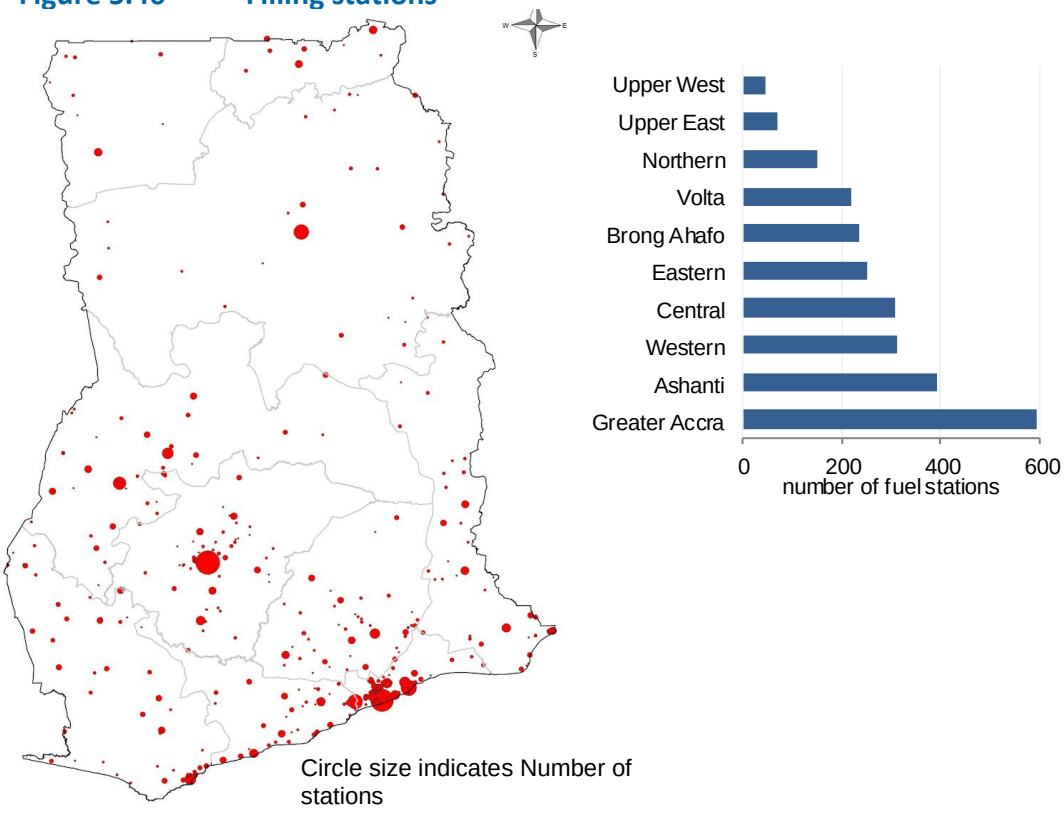


Source: Energy Commission 2014

The transport sector accounts for 80 percent of petroleum consumption (Figure 5.45). Strategies to reduce consumption include increasing public transport and cargo transport on rails and lake.

Figure 5.46 shows the distribution of petrol filling stations and outlets. Greater Accra (22%) has the most outlets while Ashanti accounts for 15 percent. The concentration of petrol stations in the most urbanised regions, Greater Accra followed by Ashanti, is indicative of a trend to increased use of motorised transportation in these regions.

Figure 5.46 Filling stations



Source: NSDF Study based on data from Energy Commission, 2013

Household demand for wood, charcoal and gas: Almost all households need energy for cooking, and cooking fuel demand is largely met by wood (40%) and charcoal (34%), followed by LPG gas (18%), while less than one percent use kerosene and electricity. Charcoal and gas consumption is related to urbanisation level; gas is most prevalent in urbanised regions; Greater Accra and Ashanti regions recorded about 41 and 21 percent, largely due to better gas distribution services. In an attempt to reduce deforestation, the Government has made considerable progress in reducing wood for cooking, from 56 to 40 percent between 2000 and 2010, however charcoal use has increased during this period.

LPG supply: the main constraints on the use of LPG are the inadequacy of transport and storage infrastructure, which has resulted in LPG shortages throughout the country. Government plans to establish and locate new oil refineries, bulk storage points and gas pipelines and plants which remain to date uncertain or rather is still underway.

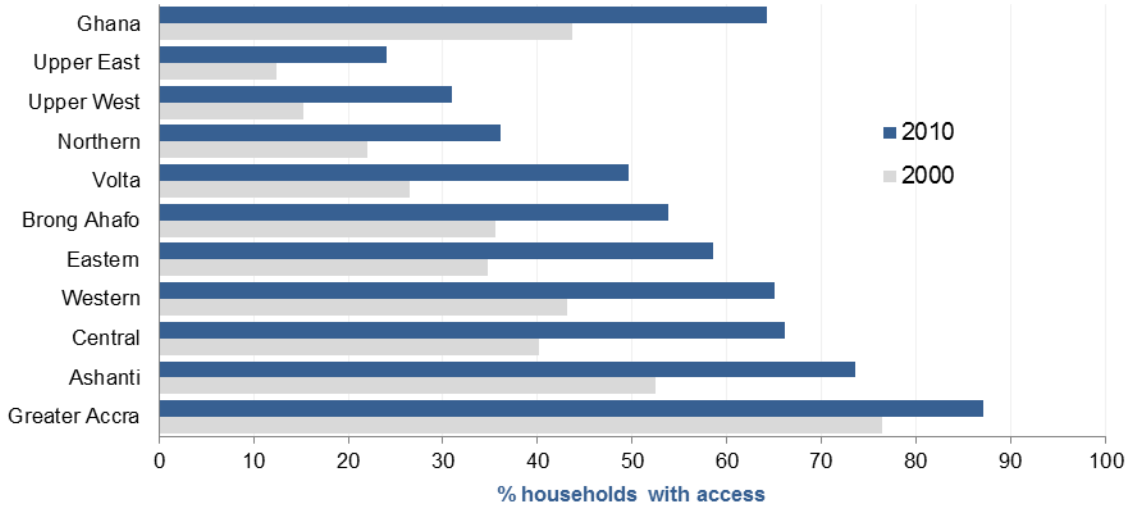
Long term gas transmission plan: The long-term national Natural Gas Transmission and Distribution Plan (2007) promotes the use of clean gas energy. It establishes east and west distribution zones. The east zone starts at Tema and goes northwards towards Hohoe, Nkawkaw and westward towards Saltpond. The west zone originates from Takoradi and goes northwards through Kumasi, Sunyani, Tamale and to the Upper East and Upper West regions. Between Konongo and Nkawkaw and at Saltpond, the system will have flow interchanges.

5.12.5 Access to electricity

The share of households with access to electricity rose from 43 to about 64 percent between 2000 and 2010 (Figure 5.48). However, while rates improved in all regions, the three northern regions still lagged behind with rates of less than 40 percent,

while Greater Accra enjoyed a rate above 80 percent. This is due in part to the high cost of providing infrastructure in areas with low population density. Therefore, densification has cost-benefit implications in terms of infrastructure and basic amenities provision investments including energy.

Figure 5.47 Percentage of household access to electricity in 2000 and 2010



Source: NSDF study based on GSS Population Census 2000 and 2010

Southern regions increased their rate of access to electricity faster than the others, with the rate increasing in Central, Eastern, Volta, Western and Ashanti regions by between 26 and 21 percent (Figure 5.47).

Between 2000 and 2010, access to electricity improved in all regions but at different rates (Table 5.16). Regions that improved the most were Upper West, Upper East, and Brong Ahafo which doubled the percentage for access. Nevertheless, regional disparities remain. In general, the southern regions have relatively higher access rates to electricity than those in the north. While Ashanti, Greater Accra, Western and Brong Ahafo had above average access rates, Upper East, Upper West and Northern regions had the lowest rates.

Table 5.16 Percentage of communities with access to electricity (2000-2010)

	Total			urban			rural		
	2000	2010	Change	2000	2010	change	2000	2010	change
Upper West	16	61	3.8	61	87	1.4	3	46	15.3
Upper East	13	34	2.7	58	73	1.3	3	18	5.5
Brong Ahafo	36	81	2.3	69	91	1.3	13	66	5.0
Volta	27	55	2.0	48	74	1.5	18	43	2.4
Northern	22	46	2.0	62	80	1.3	6	23	4.2
Eastern	35	69	2.0	67	83	1.2	16	54	3.4
Western	44	83	1.9	79	93	1.2	21	72	3.4
Central	41	76	1.9	67	83	1.2	24	68	2.9
Ashanti	54	91	1.7	83	96	1.2	19	78	4.0
Greater Accra	78	93	1.2	85	95	1.1	27	73	2.7
TOTAL	44	78	1.8	76	90	1.2	16	57	3.5

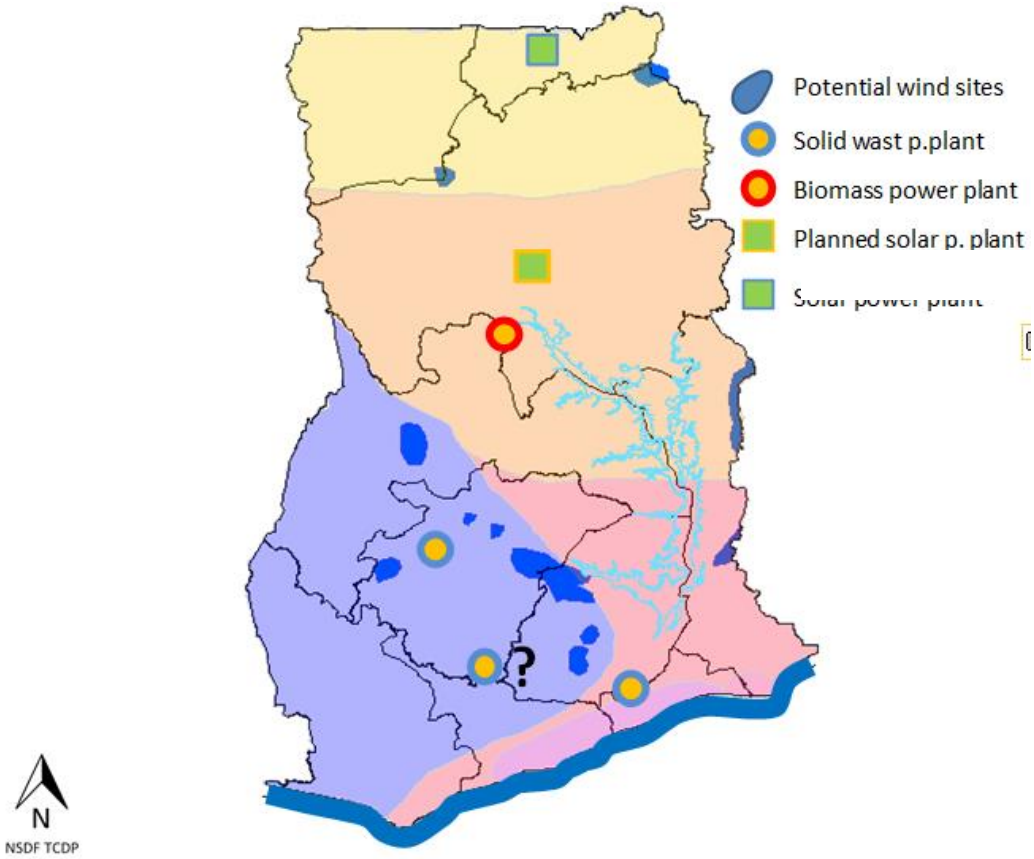
Source: NSDF Study based on GSS Population Census 2000 and 2010

Urban settlements (90%) in general have significantly better access to electricity than rural settlements (57%), despite the latter's higher rate of improvement by 3.5 times during the past decade. In Brong Ahafo, Upper East and Upper West regions increases reached between 5 and 15 times the 2000 figure. Nevertheless, rural settlements in Ashanti (78%) and Greater Accra (73%) have better or equal access than urban settlements in Volta (74%) and Upper East (73%).

5.12.6 Renewable energy potential

Solar energy: The northern regions and the northern parts of the Volta have a high potential for solar electrical energy development; they have high solar radiation (4 to 6.5 KWh/m^2 per day) and consist largely of rural populations without grid access. Ghana has close to 10,000 mini solar energy plants and a 2 MW grid-connected solar farm at Navrongo in Upper East Region[133]. Three more solar energy plants are being considered: two at Tamale[134] (2 x 200 KW) and one at the University of Ghana Accra (1 x 700 KW). Solar panels have also been introduced for urban street illumination and traffic signal equipment.

FIGURE 5.48 Potential location of biomass, solar and wind power plants



Source: NSDF Study 2014

Wind Energy: Studies confirm the potential for wind generated electricity at 13 sites along the coast on open hills. Additional studies are planned at isolated islands and

[133] Ministry of Energy´s official website January 2015

[134] Norwegian Embassy, Accra, 2014 and PPP Hospital Project

lakeside communities for hybrid mini-grid electricity generation. The Ministry of Energy expects to produce around 350 MW solar and wind energy by 2030[135].

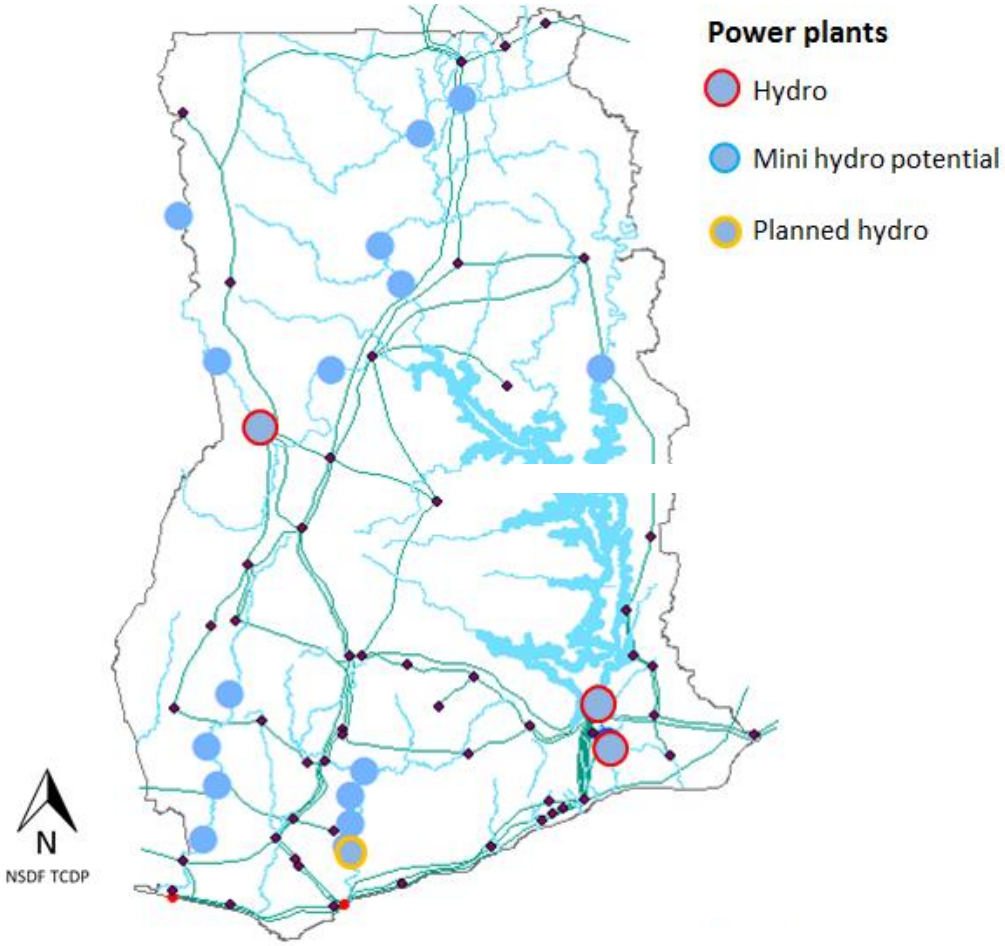
Biomass Energy: Biomass fuel includes wood, charcoal and crop residue; energy crops such as Jatropha; municipal solid waste and animal waste; and algae from inland and sea waters. Biomass fuel can complement and substitute for fossil fuel that is seen to be a main driver of climate change.

Grasslands that are not used for grazing or food production might be used to produce solid and liquid biofuels. The private sector has started to produce biofuels in Brong Ahafo, Northern and Volta regions.

Almost all rural households cook with a form of biofuel while about 60 percent of urban households still use charcoal. Nevertheless, these have harmful health impacts and produce high levels of CO^2 in the atmosphere. While LPG is a fossil fuel, it is clean burning and thus is promoted as a substitute to wood and charcoal.

Mini Hydro Power: Besides the three large hydroelectric plants with an installed generation capacity of 1,330 MW, there are other potential sites for hydroelectric and mini-hydro plants with a total potential of between 5MW and 25MW. Hydroelectric plants of over 10 MW are feasible on several sites on the Black Volta, White Volta, Oti River, Tano River, Pra River and Ankobra River (Figure 5.49).

Figure 5.49 Hydro power plants and potential sites for mini hydro plants



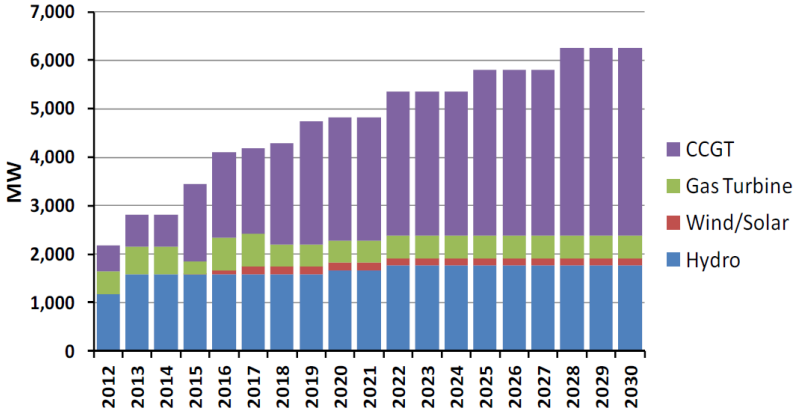
Source: NSDF Study 2014, based on Energy Commission, 2010

[135] Ghana Infrastructure Plan 2012

5.12.7 Energy development plans

The Master Generation Master Plan includes a thermal plant at Domunli (450 MW) and two additional hydro plants: Pwalugu Hydro Plant (48 MW), and Juale Hydro Plant (87 MW). It also includes a wind farm power plant (150 MW). In addition, seven private firms are expected to complement power generation after 2016.

Figure 5.50 Projected power generation, 2012-30



Source: Ghana Infrastructure Plan 2012

Plans for power, petroleum and renewable energy sub-sectors: The National Infrastructure Plan for the Energy Sector has been prepared by the Ministry of Energy for the period (2013-2020). The goals in the three sub-sectors are:

- Power sub-sector: achieve generation of 5000 MW, provide universal access to electricity, improve transmission and distribution;
- Petroleum sub-sector: sustain exploration, develop and produce oil and gas, process gas and increase access to household LPG;
- Renewable energy: make renewable energy 10 percent of national energy mix and improve efficiency in use of wood fuels.

The cost of the plan over the 8-year period (2013-2020) will be about USD 13 billion, distributed between power, petroleum and renewable at about 53, 43 and 4 percent respectively.

Table 5.17 Draft NIP Energy development plan

Energy sub-sector	Cost US$ million								Total US$ million
	2013	2014	2015	2016	2017	2018	2019	2020	
Power	760	674	577	2101	1518	1529	61	101	7321
Petroleum	1100	253	1000	450	3000	150			5953
Renewable energy	60	5	300		136				501
Total	1920	932	1877	2551	4654	1679	61	101	13775

Source: Ministry of Energy 2013

Transmission Master Plan, 2010: The Ghana Grid Company (GRIDCo) Transmission Master Plan covering the period 2010-2020, includes investments that total over USD 800 million for the period 2013-2020. This includes about USD 490 million for transmission lines and USD 320 million for substations (including bays, transformers and capacitor banks).

Electricity Distribution Plan: This plan has separate components for the north and south. Investments in the south include (i) new bulk supply points, primary substations and sub-transmission lines; (ii) reinforced distribution lines to reduce overloads and technical losses and increase supply reliability; and (iii) prepaid meters to reduce commercial losses. These projects are expected to be

commissioned 2014-25 at a total cost of USD 702 million. Investments in the north include: (i) on-going projects to improve distribution services at a costing of GHS 39 million; (ii) new 34.5 KV lines, substations, distribution network rehabilitation, and (iii) ICT systems costing USD 178 million.

5.12.8 Energy challenges and recommendations

Challenges: The main challenge is bringing electricity to 30 percent of the population without access today. Many educational and health institutions have no electricity supply. Workshops, industries, commercial and service activities are in lack of sufficient end continuous energy supply. The aged transmission system sustains large power losses. Costs are not fully recovered from users.

Measures to increase oil and gas production are not keeping up with the growing demand. Further, the West African gas supplies have been curtailed. LPG distribution must increase to substitute for wood and charcoal. The transport sector accounts for the largest share of petrol consumption but measures to reduce this, such as good public transport systems, remain rudimentary.

While hydropower share of the energy mix is significant, its future potential may be challenged by climate change and lack of protection of the water resources, which will worsen when e.g. the National Ghana Gas Plant at Atuabo, Western Region and other industries will start operations the need for water to cool their turbines will further accentuate the issue. Renewable energy is still more costly than hydro and fossil fuels, providing little incentive for investment and research.

Recommendations: The first three recommendations below are those suggested by UNDP on their website, while the others are suggested by NSDF.

- strengthen policy and institutional frameworks consistent with low-emission, climate-resilient development;
- mobilise public and private finance to support and modernise the regulatory frameworks removing barriers to energy efficiency, renewable energy and sustainable urban transport;
- develop effective approaches for energy service delivery that are financially and institutionally sustainable;
- ensure access to electricity in the regions and develop disaster mitigation plans and provide equipment to the areas at risk of oil spill as well as gasoline and gas explosions;
- invest in energy production to create potential for industrial development and job creation. Both in Tema and Takoradi, the concentration of energy generation plants supports the economic activities and employment;
- locate future power plants close to the planned national main transport infrastructure and in the corridors and areas where they can support preferred options for urban development. An exception will be the hydrological plants which have to be located where the physical conditions and resources are present;
- develop clean energy technologies at all levels and introduce these to encourage economic growth and mitigate the negative impacts of climate change;
- support further development of solar energy systems and farms in the northern regions, such as those started by VRA. With the high potential for solar energy, make Tamale a national centre for development of solar energy systems and production of solar energy plants and panels;

- engage the international scientific community and private sector first to develop a university curriculum in Tamale for solar energy innovation and production plants, having in mind the neighbouring countries as potential cooperation partners and potential markets;
- develop biomass energy plants to complement national energy production and locate these near biomass sources to reduce transport costs;
- locate a biofuel power plant in Buipe, strategically located for transport and delivery of biomass residues using road and rail system as well as the inland water transport. A plant located in Buipe could receive wood and crop residues from all northern regions and Brong Ahafo and receive solid waste from Tamale and environs;
- develop other biofuel energy plants in Accra and Kumasi based on the thousands of tons of solid waste produced daily. The main constraints for use of solid waste are the bottlenecks related to continuous and efficient waste collection. To ensure sufficient delivery of solid waste, a shared energy generating plant could be located between Kumasi and Accra along a new railway line connecting to solid waste collection points in Kumasi and Accra located along the urban railway line.

5.13 Water, environmental sanitation and flood control

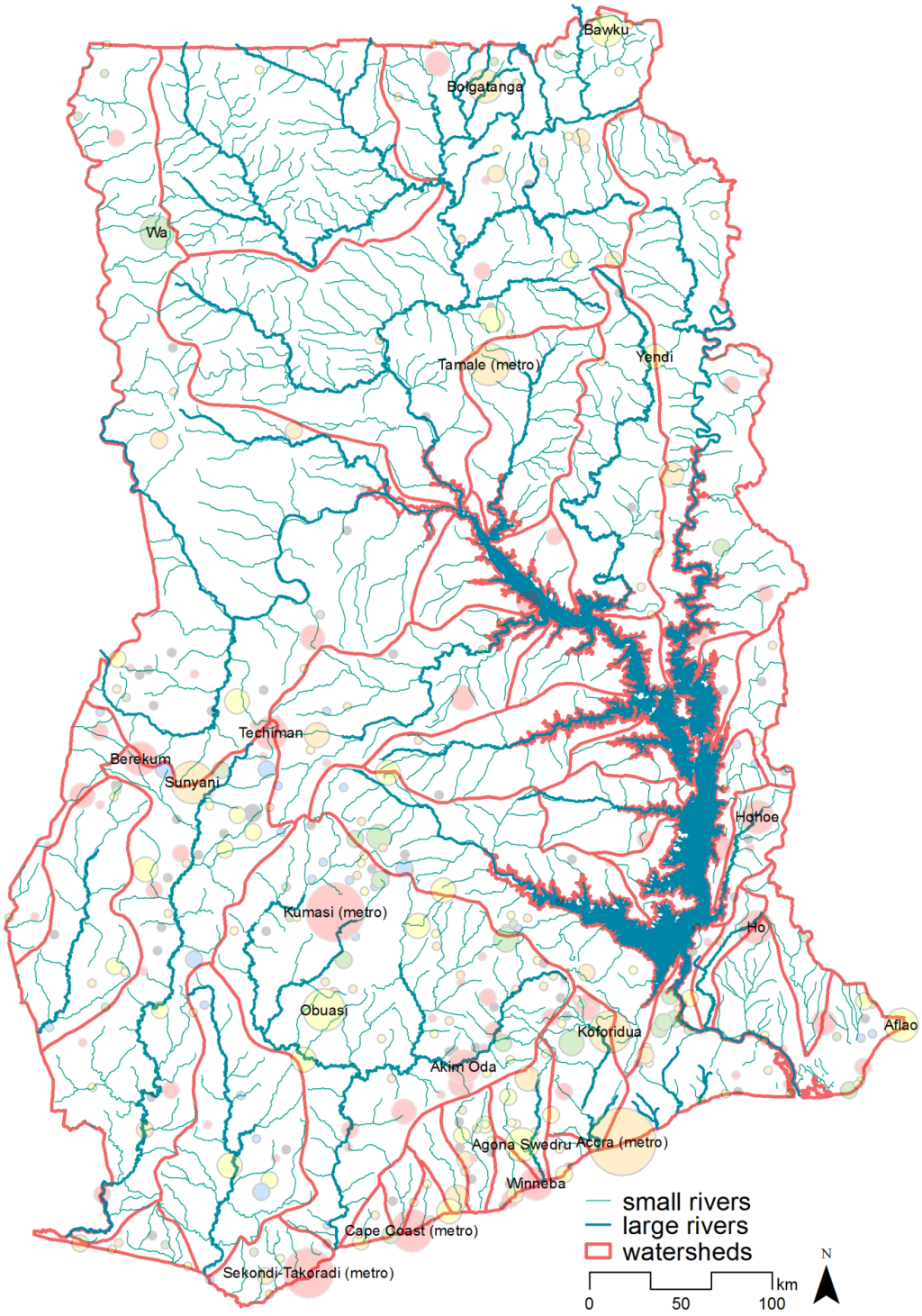
This section discusses water supply, environmental sanitation and flood protection. The GSGDA strategies for the water sector included improved water management, efficient exploitation of groundwater, protection of water sheds, aquifers, and promotion of rainwater harvesting, and reuse and recycling of wastewater. The vision of the water sector under the Water Sector Strategic Development Plan 2012-2025 (WSSDP) is “sustainable water and basic sanitation for all by 2025”. The strategy calls for rehabilitation and expansion of urban water treatment and distribution systems and providing access to rural areas by developing alternative sources of supply such as rain water harvesting.

The Ministry of Water Resources, Works and Housing regulates the water sector through three subsectors: Urban Water Supply, Rural Water Supply and Water Resources Management. Implementing agencies include the Water Company Ltd (GWCL) for urban water supply and the Community Water and Sanitation Agency (CWSA) for servicing rural areas and small towns. The Water Resources Commission (WRC) regulates the water resources through Water Basin Offices.

5.13.3 Water resources

Ghana has two types of water resources, surface and groundwater, both of which are tapped for both urban and rural populations. Figure 5.51 shows watershed boundaries and large and small rivers.

Figure 5.51 Watershed and rivers



Source: World Bank

Surface water: The main surface water resources comprise three watersheds: Volta, south western and coastal river systems. The Volta system comprises the Red, Black and White Volta Rivers and the Oti River; the south-western system includes the Bia Tano, Ankobra and Pra Rivers; and the coastal system comprises the Tordzie/Aka, Densu Ayensu, Ochi-Nakwa and Ochi-Amissah. These watersheds account for 70, 22 and 8 percent respectively of the total national land area. In

addition, there are three main freshwater lakes, among which is Lake Bosumtwi with a surface area of 50 km^2 and a depth of about 78 metres.

Ghana has two large river systems: Volta River System and the South Western System (Table 5.19). The table shows the percentage of watershed area falling within Ghana and within neighbouring countries.

Table 5.18 Trans-boundary watershed basins in Ghana (in km^2)

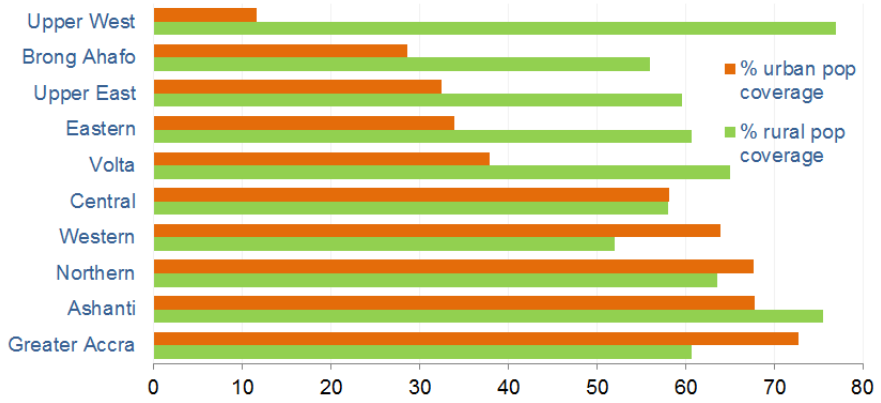
river basin	area in Ghana	% in Ghana	Area outside Ghana	total area
Volta River System	*176,751*	*43.1*	*233,054*	*409,805*
Black Volta	35,107	23.6	113,908	149,015
White Volta	45,804	43.7	58,945	104,749
Oti	16,213	22.3	56,565	72,778
Lower Volta	68,588	95.4	32,730	71,861
Tordzie Aka	1,865	83.7	363	2,228
South Western System	*52,862*	*96.9*	*1,718*	*54,580*
Bia	7,000	68.7	3,200	10,200
Tano	14,877	92.7	1,184	16,061

Source: Ghana Water Commission, 2010

Ground water sources: Groundwater has several advantages over surface water and is the preferred source for fresh potable water where available. It requires less or no treatment, and is therefore less expensive, depending on the depth of the aquifer. Nevertheless, it is generally considered to be unreliable throughout the year and in periods of drought. Therefore, for the groundwater-based systems, a supplementation with surface-water sources may be needed. Ghana is underlain by three main geological formations. Each type of formation has characteristics that affect the depth and volume of water that can be extracted.

5.13.4 Water systems

Figure 5.52 Population covered by water supply systems, 2010



Source: NSDF based on data from GSS Population Census, 2010

Access to water supply varies by region and none has achieved full coverage (Figure 5.52). For example, 72 and 68 percent of the urban population in Greater Accra and Ashanti, respectively, have access to piped water compared to 28 and 10 percent in Brong Ahafo and Upper West respectively. Urban population in three

regions, namely, Greater Accra, Northern, and Western, enjoy higher coverage than rural populations while the reverse is true in all others except Central, where the coverage is the same.

Rural water supply systems

In 2010, rural water supply covered over 10 million people with an increase of 3 percent from 2009 (Table 5.20)[136]. Because the targeted population is 16.5 million, about 4 million more than the total rural population in 2010, there must be some urban populations included. Coverage varies from 63 to 77 percent of the targeted population in Western and Upper West regions, respectively.

There are five types of sources of rural water supply. Boreholes supply water to the bulk of the systems although many also use hand-dug wells. There are only a few piped schemes, mechanized systems and rainwater harvesting systems.

Table 5.19 Potable water coverage in rural communities and small towns in 2011

	# communities	targeted population '000	boreholes	hand dug well	pipe schemes	limited mechanized systems	rainwater harvest	GWCL	pop served '000	% coverage
U West	926	625	1,621		17	1			481	77
Ashanti	2,830	3,266	6,436	886	38		3	59	2,466	76
Volta	3,234	1,777	2,327	56	126	23	11	167	1,156	65
Northern	3,906	2,152	4,026	598	46	39		8	1,369	64
G Accra	851	700	268	72	8				425	61
Eastern	2,771	1,643	2,384	1,066	29		8		996	61
U East	1,724	1,188	2,120	512	18				708	60
Central	3,224	1,559	1,583	259	46		3	54	906	58
B Ahafo	2,707	1,976	2,400	425	34	1			1,104	56
Western	1,766	1,692	1,317	454	55				887	52
TOTAL	23,939	16,576	24,482	4,328	417	64	25	288	10,500	63

Source: SIP Report, 2011

Urban water supply systems

Of the 81 urban water-supply systems, about half rely solely on surface water, 34 use only ground water, and seven are mixed systems (Table 5.21 and Figure 5.50). The number of systems varies by region; Eastern has the most, then Volta and Brong Ahafo, while the three northern regions have the least. All regions except Upper West and Northern tap both types of water sources.

Many of these water supply systems were built in the early 1970s and are presently overstretched; populations have increased about fourfold but there has not been a corresponding expansion of water treatment and supply systems.

Table 5.20 Urban water supply systems

[136] The table is sorted by the percent of coverage of the targeted population.

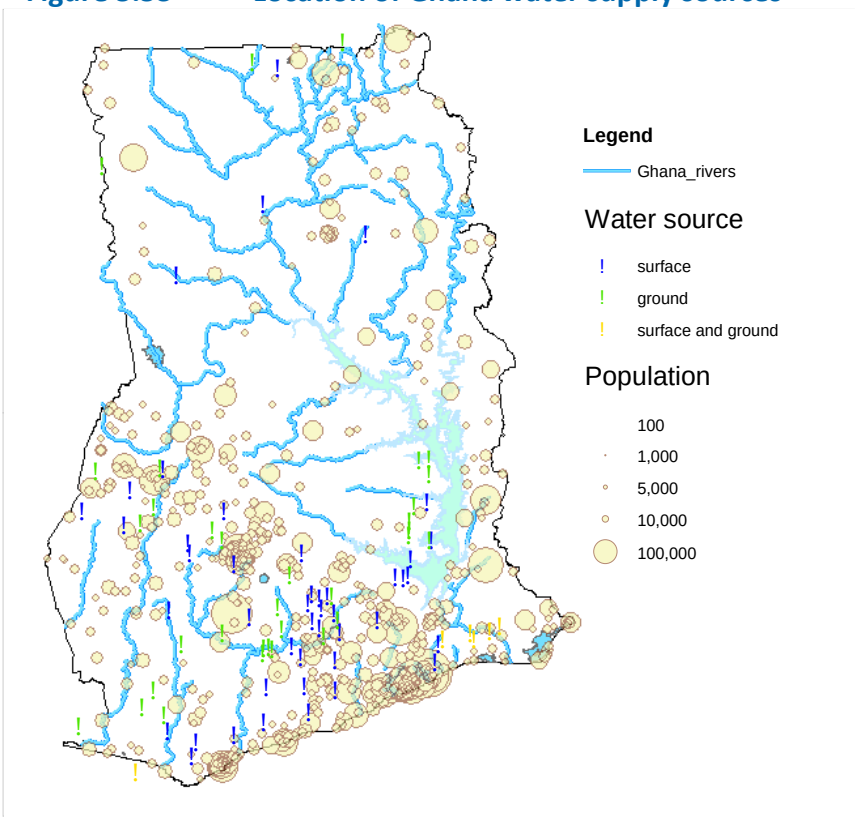
	number of systems				# of boreholes
	ground water	surface water	ground + surface	all	
Eastern	9	12	3	24	52
Volta	11	5	1	17	31
B Ahafo	4	5		9	16
Western	3	3	2	8	12
Ashanti	2	3	1	6	17
Central	1	5		6	5
G Accra	1	3		4	6
Northern		3		3	
Upper East	2	1		3	21
Upper West	1			1	17
Total	34	40	7	81	177

Source: SIP Report, 2011

5.13.5 Water demand

Water resources are used for consumption and for non-consumptive purposes. The main non-consumptive uses are hydropower generation, cooling of turbines, inland fisheries and water transport.

Figure 5.53 Location of Ghana water supply sources



Source: NSDF 2014 based on GWCL

Water from dams and their reservoirs is used for hydropower generation, potable water supply and irrigation. Ghana has three major hydro dams at Akosombo, Kpong and Bui. The Akosombo dam created one of the largest man-made lakes in the world, covering about 8500 km^2 at a depth of about 88 meters. It has an installed capacity that provides 912 MW. Over 37,000 m^3 of water are used for hydroelectricity generation at the Akosombo Dam each year[137]. The Kpong head-

[137] Food and Agriculture Organization of the United Nations. "Ghana Country Overview"

pond, covering an area of about 40 km^2, has an installed capacity of 160 MW. The Bui Dam was recently upgraded into a 400 MW facility on the Black Volta River at the Bui Gorge, at the southern end of Bui National Park. More hydropower generation plants are being planned such a one at Pra River North of Cape Coast and several minor plants on rivers with capacity.

Consumptive use: Water is consumed for domestic use, industrial use, irrigation and livestock. In 2000, the total water withdrawal was 982 million m^3 of which two thirds was used in agriculture, 10 percent in industry, and 24 percent for domestic use. The FAO projected that 2020 annual water demand would be 1,112 million m^3 for irrigation, livestock and rural and urban water supply based on the following assumptions[138]:

- total coverage of the rural population with portable water;
- rehabilitation of 3,500 ha existing small-and-medium scale irrigation projects;
- rehabilitation of 44 dams in Upper East and 22 in the Upper West regions;
- 20 new livestock watering points in Upper West and Northern regions;
- 1,000 ha of small-scale irrigation and potable water projects;
- 3,000 ha of large-scale irrigation downstream of Kpong hydropower project.

Based on FAO data, NSDF calculates that there will be sufficient water resources to meet projected demand in 2035; in fact, supply will be 90 times the demand[139]. The supply of 53 billion m^3 per year of renewable water, divided by the projected 42 million population resources, equals 1,260 m^3 per person and the demand will only be 14 m^3 per person[140].

Ghana Urban Water Limited operates 84 water systems with 94 water treatment plants. Although it has capacity to produce 345 million m^3 per annum, it delivers only 250 million m^3 per annum[141]. Therefore, although water production has increased by an average of 10 percent between 2005 and 2010, supply is still largely rationed and plagued by high levels of inefficiency[142].

The sector performance report (2010) estimates that 30 percent of Accra residents receive water only twice a week, another 30 percent get a 12 hours supply only once a week and 10 percent have no supply at all. The Accra poor segment of population is the worst affected and bears a disproportionately burden of the cost of water; only 15 percent have direct access to piped supplies.

5.13.6 Water supply plans 2012-25

A comprehensive strategic development plan for the water supply was approved by MWRWH in 2012 for the period 2012 to 2025. Urban water supply interventions will include rehabilitation and upgrading of the existing system at a cost of USD 1.06 billion while an additional USD 1.04 billion will be needed for expanding distribution and increasing production capacity. Rural water investments will cost USD 775 million.

[138] FAO.2015.AQUASTAT website, Food and Agriculture organization of the United Nations (FAO). Website accessed on 16.1.2015.

[139] Food and Agriculture Organization of the United Nations. "Ghana Country Overview"

[140] Demand will be a total of 1,416 million m^3 - 590 million m^3 for rural and urban water supply; 785 million m^3 for irrigation and 41 million m^3 for livestock

[141] WSSDP October 2011.

[142] Draft NIP 2013

5.13.7 Environmental Sanitation

Environmental sanitation covers liquid and solid liquid waste management and storm water drainage. Key sectoral agencies include the Ministry for Water Resources, Works and Housing (MWRWH) and the Ministry of Local Government and Rural Development (MLGRD), along with local governments. Other institutions with sectoral responsibilities include TCPD for land use planning and EPA for management and protection of natural resources and the environment.

Sewage systems and toilet facilities

MLGRD has formulated a National Environmental Sanitation Strategy and Action Plan (NESSAP) 2010-2025 that includes a Strategic Environmental Sanitation Investment Plan (SESIP). The plan addresses the inter-regional disparities in toilet facilities; for example, 10 percent of households have toilets in Upper East region compared to 80 percent in Greater Accra.

According to the Sector Performance Report for 2010, almost 54 percent of the population shared their household toilet facilities with other households, while 23 percent, i.e. more than five million people, have no toilets. Sewerage infrastructure is limited in Accra, Tema, Kumasi, Takoradi, Akosombo and Obuasi. While some settlements are served with sewage and septic/faecal sludge treatment facilities, many have broken down resulting in untreated waste water being discharged in often cases in densely populated neighbourhoods. Sewerage infrastructure is generally out of date and has in most cases inadequate treatment plants.

Solid wastes management

Ghana's five largest cities of Accra, Kumasi, Sekondi-Takoradi, Tamale and Tema, generate about 3,200 tons of solid waste per day, and solid waste collection and disposal remain serious problems. NESSAP calls for waste minimization, separation at source, recycling and reuse and waste-to-energy schemes. Under the Urban Environmental Sanitation Project (UESP) financed by the World Bank, an effort has been made to move away from the operation of dumpsites to fully-engineered landfills. All five major cities have benefitted from this investment.

Flood control

Uncontrolled peri-urban development, including building in waterways, has contributed to flooding of neighbourhood with severe consequences. Uncollected solid waste combined with deliberate dumping of waste in drains blocks the limited drainage systems that do sometimes exist. Nevertheless, MLGRD, through a series of Urban Environmental Sanitation Projects financed by the World Bank, has made substantial investments in storm water drainage including the main Odaw channel in Accra and several secondary drains in Accra, Kumasi and Takoradi.

5.13.8 Environmental sanitation plans

NESSAP provides an overall planning framework for waste management services for the period 2010-2025; it includes a Strategic Environmental Sanitation Investment Plan (SESIP) for the period 2011-2015. Of the total investment of USD 941 million, which includes capital and recurrent costs, some 63 percent is for solid waste management alone, the amount includes land acquisition. Investments are expected to be financed by MMDAs (58%), government (8%), user fees (21%) and private sector (13%).

Storm water drainage infrastructure is developed separately by MLGRD and MWRWH. MLGRD planned investments amounting to USD 23.7 million. MWRWH plans to spend USD 345 million for 39 storm drains for Accra alone. Given that both agencies are involved, MDAs will need to coordinate drainage development to avoid potential duplication.

5.13.9 Water sector challenges

Water supply

Eliminating water-supply deficits and meeting future demand presents huge financial and environmental challenges. The main challenge is that more than one third of the population still have no access to clean water. WASH estimates that USD 1.5 billion is needed to meet water supply demand by 2020. Increasing groundwater quantities and delivering quality water are also challenges. For example: saline intrusion is plaguing shallow aquifers along the coastal zone; high iron and fluoride content affect water quality in the Western, Northern and Upper West regions. Borehole yields are frequently insufficient and sources are known to run dry in the three northern regions and in Brong Ahafo. The hydro-geological conditions of aquifers are known to be unfavourable for large scale groundwater development. The national borehole success rate is 70 percent, varying from 95 to 30 percent in different regions.

Many water sheds and boreholes' sites are likely to be contaminated from point sources such as refuse dumps, latrines, abandoned hang-dug wells, industrial pollution and oil spill from many vehicle workshops[143] and gas stations. Intensive and uncontrolled use of pesticides in agricultural areas might create additional contamination of watersheds and wells as well as the mining activities.

Environmental sanitation challenges

The low access to household domestic sanitation facilities (13%) in particular is inconsistent with Ghana's status as a lower-middle income economy. The high rate of shared facilities and public toilets is at odds with the UNICEF standards for safe sanitation. Ghana has to perform better and promote stronger programmes for domestic provision and ownership of domestic sanitation facilities. The ambitious MDG target for 2015 will not be met.

Seasonally outbreaks of cholera and malaria in vulnerable neighbourhoods are mainly a result of poor environmental sanitation. The recent Ebola outbreak is another reminder of the urgent need to improve environmental sanitation.

NESSAP also reports that up to 85% of all solid waste generated is managed and dumped in an uncontrolled and un-engineered fashion and in some towns pose serious health hazard to residents.

Flooding is a seasonally challenge in the major urban centres with loss of lives and displacement of families. Flooding also carries around sewage waters and waste making the communities affected vulnerable for epidemics. Too little sewage and storm water drainage infrastructure has been constructed so far.

5.13.10 Recommendations

Water supply

Protection of the watersheds, water bodies and underground water resources are challenges to be handled carefully by the national planning institutions. The institutions are supposed to have the technical and scientific expertise required to locate the water resources to be protected and prepare the guidelines and regulations for their protection. The national institutions also will have the monitoring and evaluation functions to ensure that the guidelines are being implemented by the local government and the regulations enforced.

[143] Particularly hydro-geological formations such as those underlain by crystalline basement rocks with fractures and fissures that are channels for rapid transfer of pollutions.

TCPD has the responsibility to ensure that the water resource protection guidelines are passed on to the local government land use planning units and monitor that protection areas are indicated in local land use development plans. TCPD needs to develop guidelines for the type of development that can take place close to the water resource areas and which types of developments such as oil spilling workshops, industries, solid waste dumpsites, water treatment plants, have to be located away from water resource areas to mitigate any danger of pollution or destruction of the water resource.

Environmental sanitation and flooding

Environmental sanitation services are part of basic service provision to be guaranteed in communities and neighbourhoods. The local governments and their local technical departments, including land use planning, have to catch up with and plan for urban development by reserving land for waste water treatment plants and solid waste management sites.

In coordination with the MWRWH and the EPA, TCPD needs to develop guidelines for the planning of sanitation systems and distribute these to district assemblies. TCPD needs to ensure that the regional spatial development frameworks include consideration on the location of efficient final dumping sites within transport saving distances from the urban centres.

TCPD also needs guidelines to identify flood prone areas on which physical development should be strictly regulated.

5.14 Telecoms

The Ministry of Communication is responsible for ICT development, while regulatory agencies such as the National Communication Agency (NCA) and the National Information Technology Agency (NITA) supervise the Ministry's undertakings. The Ministry's policy is to develop, deploy and exploit the potential of ICT to aid the development of all other sectors of the economy.

Ghana ranks 113 out of 157 countries in ICT development but 8th among African countries. On a scale of 0-10, it scores a low (2.8) on ICT access, skills and usage, i.e. below the average of industrialised countries (4.35) and developing countries (3.44) [144]. Nevertheless, the ITC systems are continuously improving.

5.14.3 Mobile telephone communication

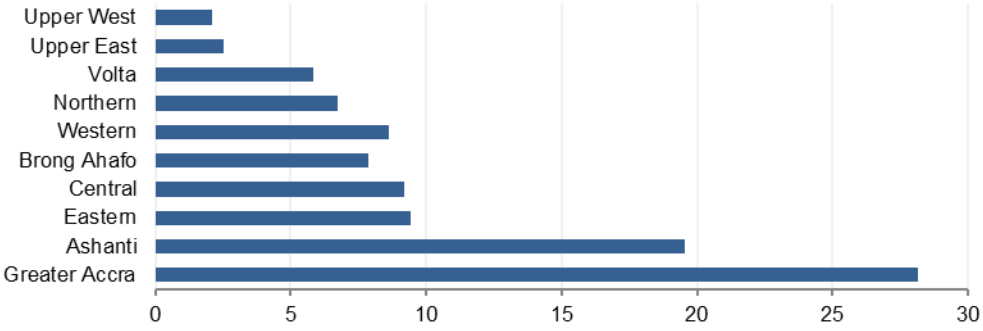
Mobile telephone subscriptions have more than doubled from around 11 million subscribers in 2008 to over 27 million in 2013[145]. However, regional disparities in telecoms towers coverage is striking (Figure 5.51). Accra has 27 percent and Ashanti 20 percent, while the other regions have no more than nine percent each.

Telecoms masts are concentrated along the main transport corridors and around urban centres (Figure 5.55). Mast density may be considered as an indication of the importance of the existing route and urban area and is itself attracting development that needs telecom connectivity. It can clearly be seen that the majority of facilities are concentrated in and around cities and towns, especially in Accra, Kumasi and the other larger urban areas.

[144] ICT Development Index (IDI) in the International Telecommunications Union 2013 Report 2014.

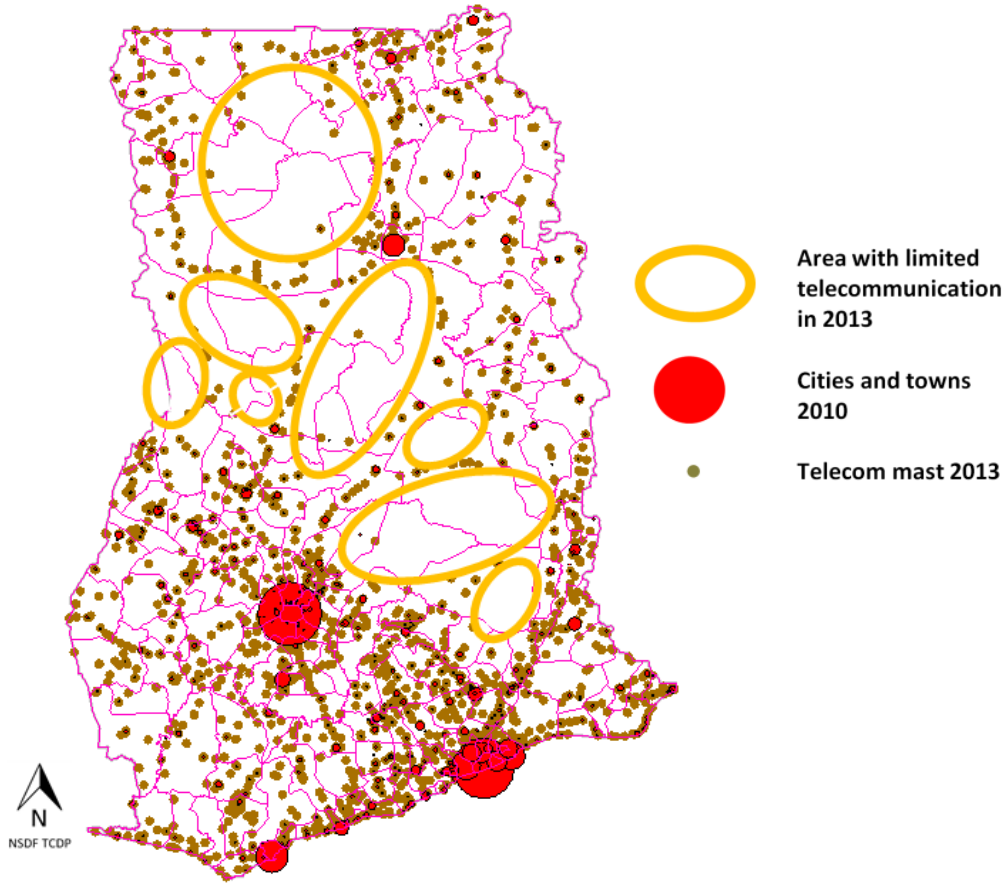
[145] Ministry of Communication addressing the Conference on ICT for Development and Empowerment of Africa (IDEA), Accra 2014

Figure 5.54 Regional distribution of telecoms towers, percent of all



Source: NSDF Study 2013, based on data from the National Communications Authority, 2013

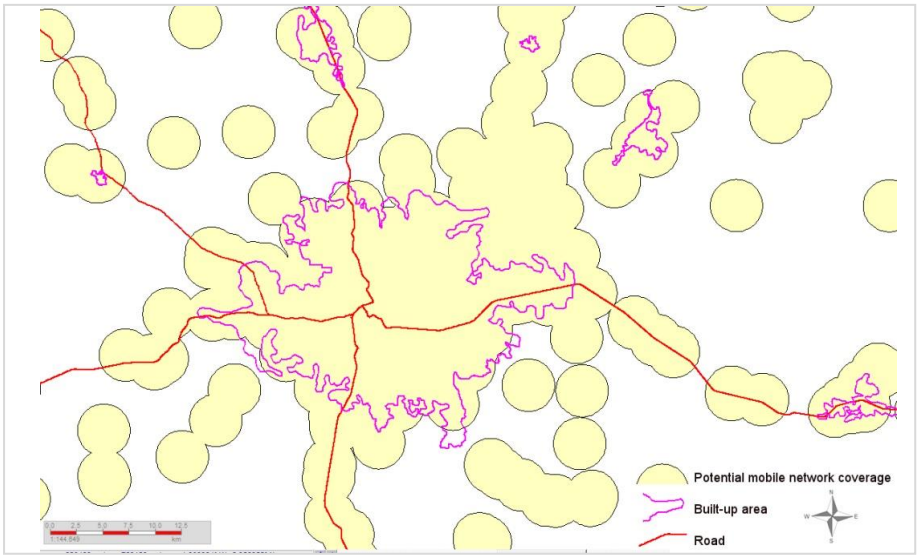
Figure 5.55 Telecom masts locations, 2013



Source: NSDF Study based on LUPMIS data

NSDF applies a radius around each telecom tower to estimate the telecom coverage area. Overlaying the coverage area on a map of a city reveals the extent to which that city is covered by the service. For example, Figure 5.56 shows a footprint of Kumasi's built-up area in violet overlain by the telecoms coverage at 2 km radius. It shows that Kumasi and its surrounding suburbs are well within the range of coverage zone.

Figure 5.56 Kumasi built-up area and telecoms with 2 km of coverage radius

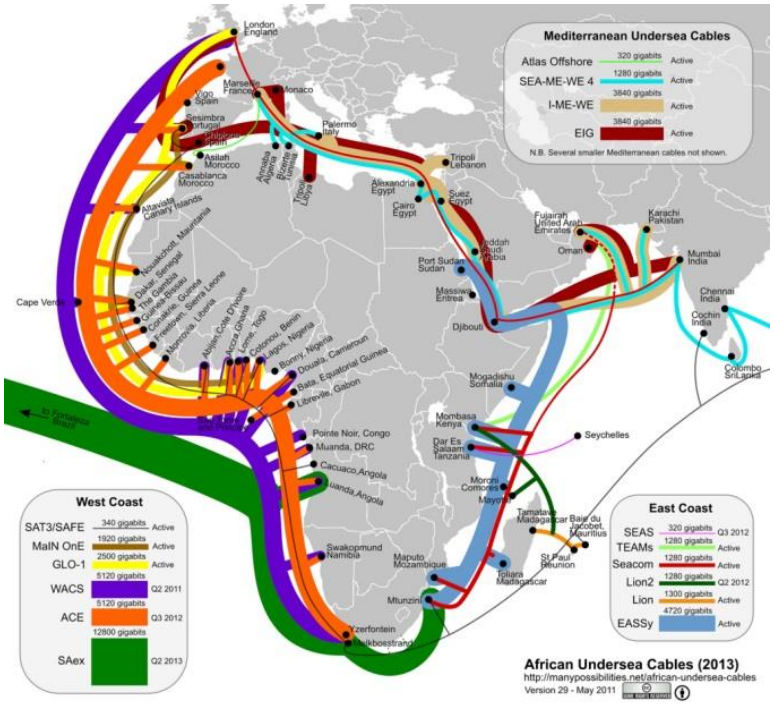


Source: NSDF Study 2013 based on LUPMIS data and satellite imagery

5.14.4 Access to the internet

The low cost of mobile broadband has made possible an impressive increase in internet access. Between 2000 - 2012, internet subscriptions increased from 30,000 to 3.5 million, with over 14 percent of the population connected. Mobile phone data subscribers reached 8.7 million by mid-2013. The 2014 Global Internet Report ranks Ghana in the 145th position of 179 countries with Nigeria as number 101.

Figure 5.57 Fibre optics capacity on the African shores



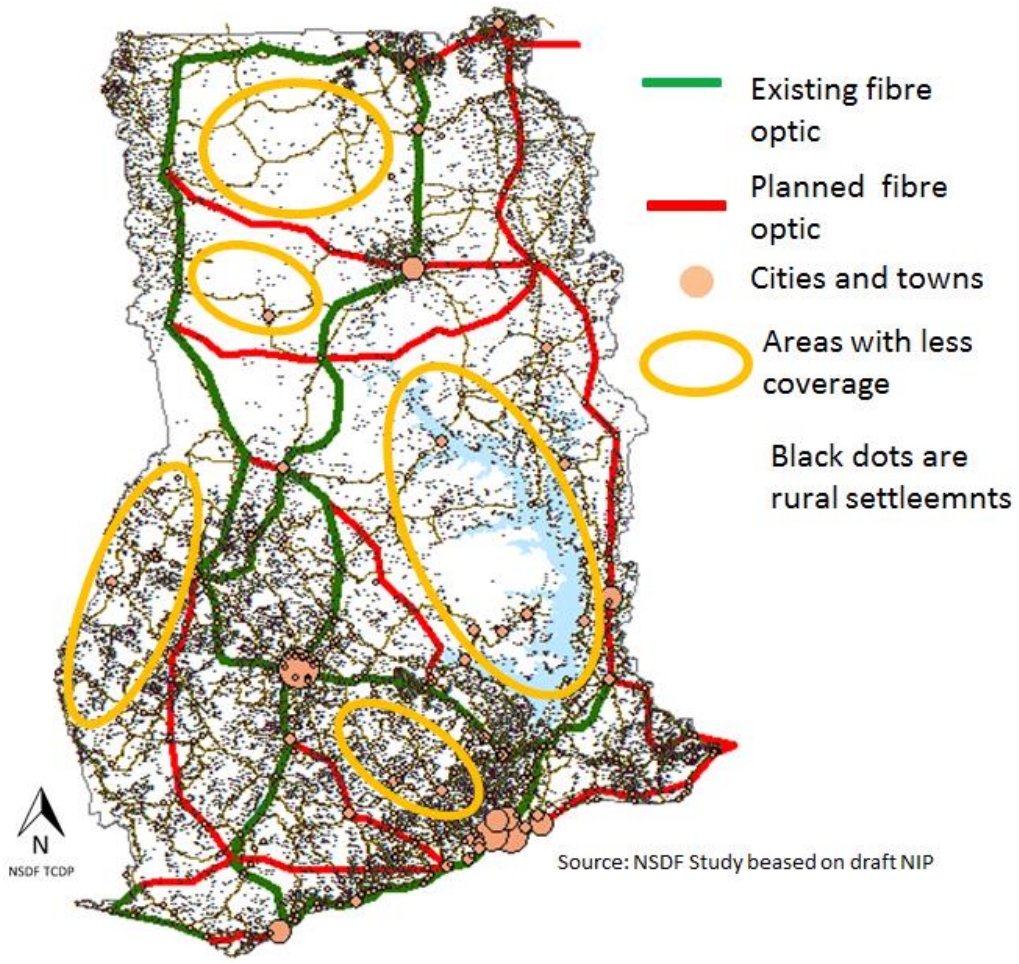
Source: African Under-Sea Cables 2013

5.14.5 National fibre network:

The National Information Technology Agency is developing a fibre network that is connected to three high capacity undersea fibre cables: West Africa Cable System, African Coast to Europe and Globacom-1 (Figure 5.57).

Broadband access will be improved by a new 600 km fibre-optic network along nine routes: Obuasi–Winneba, Prestia–Elubo, Prestia–Sunyani, Kintampo–Bamboi, Buipe–Bole, Tamale–Wa, Buipe–Yendi, Kintampo–Nkawkaw and Winneba–Prestea. These new lines will enable Ghana to develop ICT institutional structures distributed in the country.

Figure 5.58 Existing and planned fibre optic cable for broad band



Source: NSDF Study based on Draft NIP

The draft NIP calls for expanded coverage of ICT and proposes ICT programmes and projects, including the 600 km fibre-optic net, at a cost of USD 460 million. The NITAL programme will ensure institutional and administrative development of the ICT sector. The NITA LTE network project will upgrade existing base station equipment. The selected projects further include research concerning ICT and coordination with the international ICT cooperation programme GEANT and I2 as well as support to develop ICT in the MDAs and the establishment of 10 ICT parks.

5.14.6 Mobile telephone and internet services

E-applications have been developed to help users such as with uploading of phone credits, transfer of money, payment of bills and getting technical assistance in agriculture using the mobile phone. E-applications are available for the use of ATMs for money disbursements, internet banking and e-billing which are prevalent in banking, industry, commerce and service sectors.

The GovNET network allows MDAs to use data services such as the Integrated Financial Management and Information Systems and interconnect offices across the country. NITA currently has over 30 base stations and plans to cover all MDAs. NITA includes an e-payment platform which will allow the public to pay online for government services.

5.14.7 Challenges and recommendations

The main challenge is the unequal distribution of the services and lack of education and training to exploit ICT opportunities. ICT must be seen as an opportunity to enhance social and economic development across the country. It is a virtual world parallel to the real, that facilitates many activities online that inter alia avoids displacement, allows for e-learning and the costs related thereto. Therefore, NSDF recommends the following:

- promote small solar panel systems in areas without electricity supply to enable charging of mobile telephones;
- extend fibre-optic networks, that are more efficient and secure than conventional networks;
- expand the coverage of telecom masts in remote areas and enhance education and training for ICT in the basic education and special training courses;
- establish a special junior pioneer ICT and IT training centre in Tamale to promote ICT development in the northern regions.

Volume I

Chapter 6

Environment

6 Environment and land cover

6.1 Introduction

This chapter assesses the broad environmental context for national spatial development. It discusses the environmental policy framework, land cover and land cover change including wetlands; natural and cultural heritage resources; and mineral resources and the state of the environment in Ghana.

6.2 The environmental policy framework

Ghana's environmental policy is articulated in several documents. The main ones are the Constitution of Ghana, the National Environment Policy (2014); the Ghana National Climate Change Policy (2013); the Ghana Forest and Wildlife Policy (2012); the Medium-Term National Development Policy Framework (GSGDA 2010-2013) and the draft Medium-Term National Development Policy Framework (GSGDA 2014-2017).

6.2.1 Constitution of Ghana

The Constitution provides that, in addition to the government, it is the duty of every citizen to protect and preserve public property and to protect and safeguard the environment.

6.2.2 National Environmental Policy (2014)

The National Environmental Policy (NEP) has a vision for the environment "where all residents have access to sufficient and wholesome food, clean air and water, decent housing and other necessities of life". NEP aims to ensure quality-of-life, equal access to land and natural resources, and efficient use of social, cultural and natural resources. NEP defines "environment" broadly as including the biophysical, social, cultural, micro-economic and institutional aspects.

NEP is concerned with four main types of environmental issues: natural resource, socio-cultural, economic and institutional. Natural resource issues include land degradation and drought, desertification, deforestation, biodiversity loss, water pollution, soil erosion, marine and coastal degradation, air pollution, sand winning, wild fires, climate change, invasive alien species and illegal mining. Socio-cultural issues include poor land use planning, waste management, and environmental health and sanitation. Economic issues include industrial development, agricultural practices, tourism, unemployment and poverty. Institutional issues relate to institutional mandates and human resource capacity constraints.

6.2.3 Draft GSGDA II (2014-2017)

The draft matrix of GSGDA II (2014-2017) addresses environmental concerns under the sustainable natural resource management section of pillar III, which is "accelerated agricultural modernisation and sustainable natural resource management". Among the section's ten focus areas, the most spatially relevant are: (i) natural resource management and mineral extraction; (ii) biodiversity management; (iii) protected areas management; (iv) land management and restoration of degraded forests; (v) integrated marine and coastal management; (vi) wetlands and water resources management; (vii) climate variability and change and (viii) natural disasters, risks and vulnerability.

Natural resource management and mineral extraction: Important issues include the impact of harmful farm practices, conflicts between mining and forest conservation, over-dependence on traditional mineral resources, forest degradation, bio-fuels

dependence, inefficient use and management of natural resources. Spatially-specific strategies to address some of these issues aim to reclaim and afforest degraded areas; diversify mineral production beyond the traditional resources; expand the fibre optic network infrastructure; and harmonize policies and programmes with regional and international bodies.

Biodiversity: The main issue is loss of biodiversity. Two spatially-relevant strategies to address this issue aim to protect wetlands, especially in the western corridor, and establish marine protected areas along the coast.

Protected areas: The two main issues are a lack of connectivity between protected areas and their degradation due to encroachment from agriculture, mining, illegal harvesting and bush fires. The key protected-area policy is to maintain and enhance the ecological integrity of protected areas. Spatially-specific strategies to execute this policy include buffer zones around rivers and other protected areas and connectivity of wildlife areas and landscape corridors.

Land management and restoration of degraded forest: The key land and forest management policy is to reverse forest and land degradation through more efficient land use and management systems. Key issues are increasing population pressures, settlement expansion, charcoal production, cultivation on steep slopes, illegal timber harvesting, sand winning and surface mining. Some of the key spatially-relevant strategies to address these issues are those that aim to intensify forest plantation development, intensify agricultural production, promote LPG and energy efficient charcoal stoves, and improve land planning including integration of watershed management.

Integrated marine and coastal zone management: The key marine and coastal zone policy is to protect coastal forests, wetlands and marine areas and reduce pollution and poor sanitation in areas. Main issues are habitat and ecosystem degradation, sea water intrusion into aquifers, vulnerability of coastal communities, liquid and solid waste pollution from industries and domestic sources, and depletion of marine resources. Spatially-relevant strategies to address these issues are those that aim to map and conserve coastal forests, mangroves and wetlands, locate industries on appropriate sites, replant mangroves, improve liquid and solid waste management, provide fish processing facilities and promote alternative livelihood (including tourism) schemes.

Wetland and water resources: The key issues include over-exploitation and conversion of wetlands to other uses, pollution from indiscriminate waste disposal, climate change impacts, dwindling water resources, water pollution, salt water intrusion into coastal aquifers, deforestation in river catchment areas and siltation of water bodies. Some key spatially-relevant strategies to address these issues are those that aim to protect wetlands from degradation, rehabilitate degraded wetlands, adopt watershed planning, and promote the sustainable use of wetlands for farming, fishing, timber production and salt-making.

Climate variability and change: The key issues are the sea level rise, degrading urban waterfronts and changes to agriculture productivity and extreme weather conditions as flash floods. Strategies to address these issues aim to promote a “green” economy, promote energy efficiency in the transport and agricultural sectors, and prioritize innovation in the energy, transport, natural resource, waste management and eco-tourism sectors. Adaptation strategies that are spatially-relevant aim to provide alternative livelihoods for the vulnerable poor, better manage water resources, improve agricultural practices, adapt the national energy system to anticipated climate change impacts.

Natural Disasters, Risks and Vulnerability: Identified hazards issues include floods, droughts, forest and other fires, and earthquakes. Spatially-relevant strategies that address these issues aim to increase the resilience of the Accra capital region, especially to earthquakes, and restrict development in flood prone plains, waterways, and wetlands.

Tourism: The main issues are the limited exploitation of and inadequate investment in tourism, particularly at the local level. Strategies to address these issues are those that aim to diversify and expand the tourism industry, promote public-private investment, including in affordable facilities, integrate tourism planning in district development plans, and promotion of domestic tourism.

Social, community and recreational infrastructure: Key issues are inadequate space for recreational infrastructure, lack of social and cultural centres, inadequate maintenance of historical and cultural heritage, encroachment on waterways and natural reserves, and low interest in recreational activities. Strategies to address these issues aim to designate open spaces and establish green belts especially in urban areas to control urban sprawl; develop social, community and recreational facilities; promote healthy lifestyles and promote awareness of historical and cultural heritage.

6.2.4 Ghana Forest and Wildlife Policy

The Ghana Forest and Wildlife Policy (2013) includes guiding principles, policy objectives and strategies. The guiding principles that have spatial implications include the following: (i) maintain the ecological integrity of the forest and savannah ecosystems; (ii) increase forest and tree cover through natural regeneration, afforestation and reforestation; (iii) promote value-addition of timber and non-timber forest resources; (iv) promote trans-boundary, regional and international cooperation in forest and wildlife management; and (v) employ multi-sector approached to planning and management of forest and wildlife resources.

The key policy objectives with spatial implications are to: (i) enhance the integrity of forest, savannah and wetland systems to preserve soil and water resources, (ii) conserve bio-diversity and enhance carbon stocks; (iii) promote rehabilitation and restoration of degraded landscapes; and (iv) promote forest- and wildlife-based industries and livelihoods.

Key strategies with spatial implications are to: (i) establish a network of national parks, sanctuaries and other protected areas to adequately conserve ecologically representative areas and biological corridors; (ii) create biological corridors between existing networks of conservation areas to maintain genetic continuity of flora and fauna; (iii) promote trans-boundary management with neighbouring countries; and (iv) document and protect sacred forests and sites of biological, spiritual, cultural and religious and heritage values.

6.3 Land cover status and change

6.3.1 Introduction

This section describes and analyses the status of Ghana's land cover, the trends in land cover change over time, and the dynamics of the land cover change.

The key datasets for this analysis are the Forestry Commission's Landsat satellite images of Ghana for years 1990, 2000 and 2010. For each year, the images identify six types of land cover: forests, cropland, grassland, wetlands, settlements (or built-

up area) and a category called "other". The data also includes the dynamics of change that covers two periods, 1990-2000 and 1990-2010 and is analysed in 36 land-cover change classes, which show the extent to which each of the six cover types remain the same or change into one or more of the other cover types. The NSDF team vectorised the raw data and generated a 5 km grid over the entire country for analysis.

6.3.2 Land cover status in 2010 at the national, regional and district levels

Land cover may be thought of as canvas for all spatial development. Owing to its importance, NSDF has analysed land cover at the national, regional and district levels.

At the national level, forest, grassland, and crop cover account for about 38, 34 and 21 percent of the territory, respectfully. Wetlands and settlement cover account for only about 3.6 and 1.4 percent of the total, respectively (Tables 6.1 and 6.2). While there is a popular belief that urban development is encroaching on forest and crop land, it is clear from the data that the percentage of settlement cover has not (yet) reached a critical level[146].

Table 6.1 National and regional land cover (km^2 in 2010)

	forests	grassland	cropland	wetlands	settlement	other	total
Greater Accra	219	1,983	627	212	689	3	3,734
Central	6,078	1,095	2,137	27	275	34	9,645
Western	18,178	854	4,810	50	305	103	24,300
Eastern	8,960	3,379	3,734	2,393	303	133	18,902
Ashanti	14,721	3,228	5,631	97	726	13	24,415
Volta	5,446	6,851	4,889	2,877	251	217	20,531
Brong Ahafo	19,940	10,609	7,172	1,760	442	136	40,058
Northern	16,009	36,216	16,028	1,264	276	99	69,892
Upper East	1,840	12,332	4,274	24	116	155	18,740
Upper West	446	5,036	2,768	49	62	203	8,565
GHANA	91,837	81,583	52,071	8,750	3,444	1,096	238,781
% of total	38.5	34.2	21.8	3.7	1.4	0.5	100

Source: NSDF Study based on Forestry Commission satellite imagery (2010)

The large share of grassland cover raises a question as to whether it can and should be used for more economically-productive activities including, most obviously, for forestry, crop production, animal raising as well as for solar photo-voltaic electricity production.

National land cover distribution

Regional shares of national land cover types (Table 6.2a) vary considerably as does land cover type as a share of regional land cover (Table 6.2b). In general, regions have very different land cover profiles. For example, four regions account for about 75 percent of the national forest cover, these are: Brong Ahafo, Western, Northern

[146] At NSDF regional consultations, a few participants suggested that NSDF findings, particularly for forest cover, differ from those of others, such as FAO and the Forest Commission. This is not surprising. Differences may be due to different definitions of landcover, different remote sensing systems and methods, or different image dates and years and resolution of the imagery.

For example, the FAO defines "forest area" as the land under natural or planted stands of trees of at least five meters in situ, whether productive or not, and excludes tree stands in agricultural production systems (for example, in fruit plantations and agro forestry systems as cash crop trees) and trees in urban parks and gardens. According to this definition, Ghana's forest decreased from 22.2 to 21.1 percent between 2009 and 2011. Similarly, the Forest Commission forest cover figures usually pertain to "closed" forest reserves rather than all forest cover.

The FAO defines "permanent cropland" as land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. This category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber. According to this definition, Ghana's permanent cropland remained at 12.3 percent of the total between 2009 and 2011.

and Ashanti regions, while three regions have less than two percent each: Greater Accra, Upper East and Upper West.

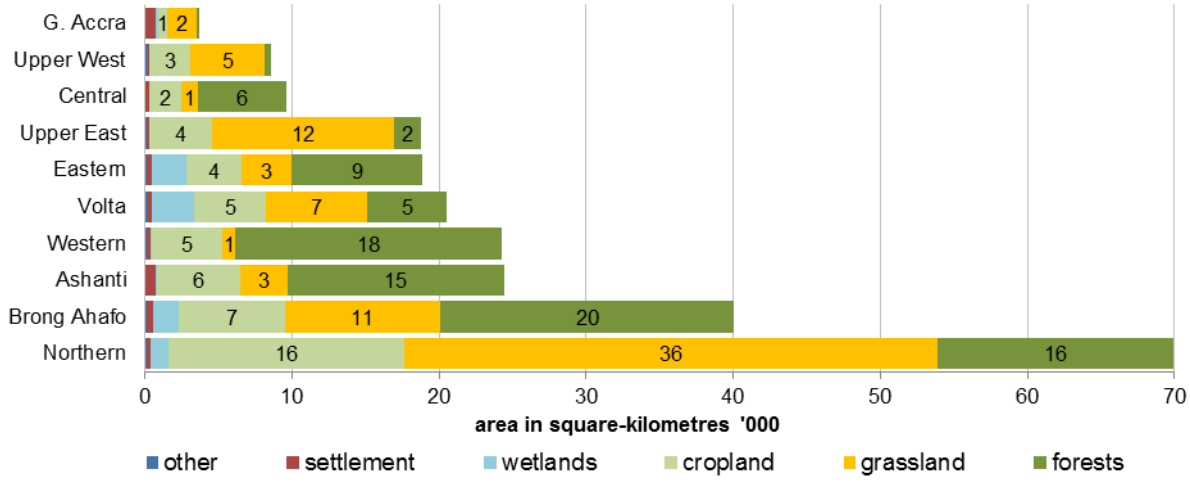
Three regions; Northern, Upper East and Brong Ahafo, account for 72 percent of national grassland cover. The Northern, Brong Ahafo and Ashanti together have 56 percent of the national crop cover while Northern region alone has almost a third (31%). Not surprisingly, the four regions that border Lake Volta: Volta, Eastern, Brong Ahafo and Northern regions, account for almost all of the water and wetlands cover. Finally, almost 60 percent of the settlements' cover is found in Ashanti, Greater Accra, and Brong Ahafo.

Table 6.2 Distribution of national land cover and regional land cover profile

	A. Distribution of national cover					B. Land cover as percentage of region				
	forests	grassland	cropland	wetlands	built-up	forest	cropland	grassland	built-up	wetland
G. Accra	0	2	1	2	20	6	17	53	18	6
Central	7	1	4	0	8	63	22	11	3	0
Western	20	1	9	1	9	75	20	4	1	0
Eastern	10	4	7	27	9	47	20	18	2	13
Ashanti	16	4	11	1	21	60	23	13	3	0
Volta	6	8	9	33	7	26	24	33	1	14
B Ahafo	22	13	14	20	13	50	18	26	1	4
Northern	17	44	31	14	8	23	23	52	0	2
U East	2	15	8	0	3	10	23	66	1	0
U West	0	6	5	1	2	5	32	58	1	1
Ghana	100	100	100	100	100	34	21	38	1.4	3.6

Source: NSDF Study based on Forestry Commission Satellite imagery (2010)

Figure 6.1 Regional land cover in 2010 (in 1000 km^2)



Source: NSDF Study based on Forestry Commission Satellite imagery (2010)

Regional level land cover distribution

From a regional perspective, a region's land cover endowment has a large impact on its development opportunities, constraints, and challenges. Regions with over 50 percent forest cover include Western, Central, Ashanti, Brong Ahafo, followed by Eastern. The challenge for these regions is more to protect their existing forests

from degradation and exploitation than to increase the area under forest cover. In contrast, the Volta and Northern regions, with only about a quarter of their land under forests, and Upper East, Upper West and Greater Accra, with only less than ten percent, may be more challenged to expand the percent of area under forest cover.

Regions with more than 50 percent grassland cover include Upper East, Upper West, Northern, and Greater Accra. These regions may be supported to find more productive uses of their grassland. Volta, Brong Ahafo and Eastern regions have moderate percentages of between 26 and 33 percent while Ashanti (13%), Central (11%) and, Western (4%) are the regions have the low grassland cover.

Perhaps owing to the economics of food transport and the need for local food production, cropland share of regional areas varies far less widely than that for grassland and forests; from a high of 32 percent in Upper East to a low of 17 percent in Greater Accra. All regions have maintained a reasonable share of crop cover.

Regions with significant shares of wetlands cover are Volta (14%) and Eastern (13%), Brong Ahafo (4%), again as a result of including Lake Volta. Nevertheless, unlike the other regions, Greater Accra's wetlands (6%) are in the coastal zone and may be considered as being more vulnerable than other wetlands.

Greater Accra, with 18 percent of its land under settlement cover, is an outlier, and a reflection of its high urbanisation level. In no other region does built-up cover exceed more than three percent of the territory.

District level land cover distribution

District-level analysis of land cover shows a wider range of differences than between regions. In many districts, one type of land cover dominates. For example, the top ten percent of districts have between 85 and 94 percent of their land in forest cover, between 61 and 76 percent in cropland, between 12 and 99 percent under settlement cover, and between 8 to 46 percent in wetlands. Conversely, the bottom ten percent have less than 4 percent of their area in forests, 5 percent in cropland, 1 percent in grassland, 0.3 percent in settlement cover and no wetlands.

Box 11 Comparing MOFA and satellite data on crop cover

MOFA keeps annual records of the area under food crops by district. This data is obtained from farmers who estimate the amount of their cropped area. Because MOFA data for 2013 does not include the area under cash crops, one could expect that the satellite figure for crop cover in 2010 -- which includes cash crops -- is greater than that recorded by MOFA, if the crop cover did not increase between 2010 and 2013.

A comparison between the MOFA 2013 and Landsat 2010 data on cropland area by district revealed significant differences. First, in four districts – Efutu, Awutu Senya 2, Cape Coast and Atwima Kwamwoma – the MOFA crop area exceeds that of whole district area. The fact that this is not possible raises concerns about the data that MOFA collects using the interview method.

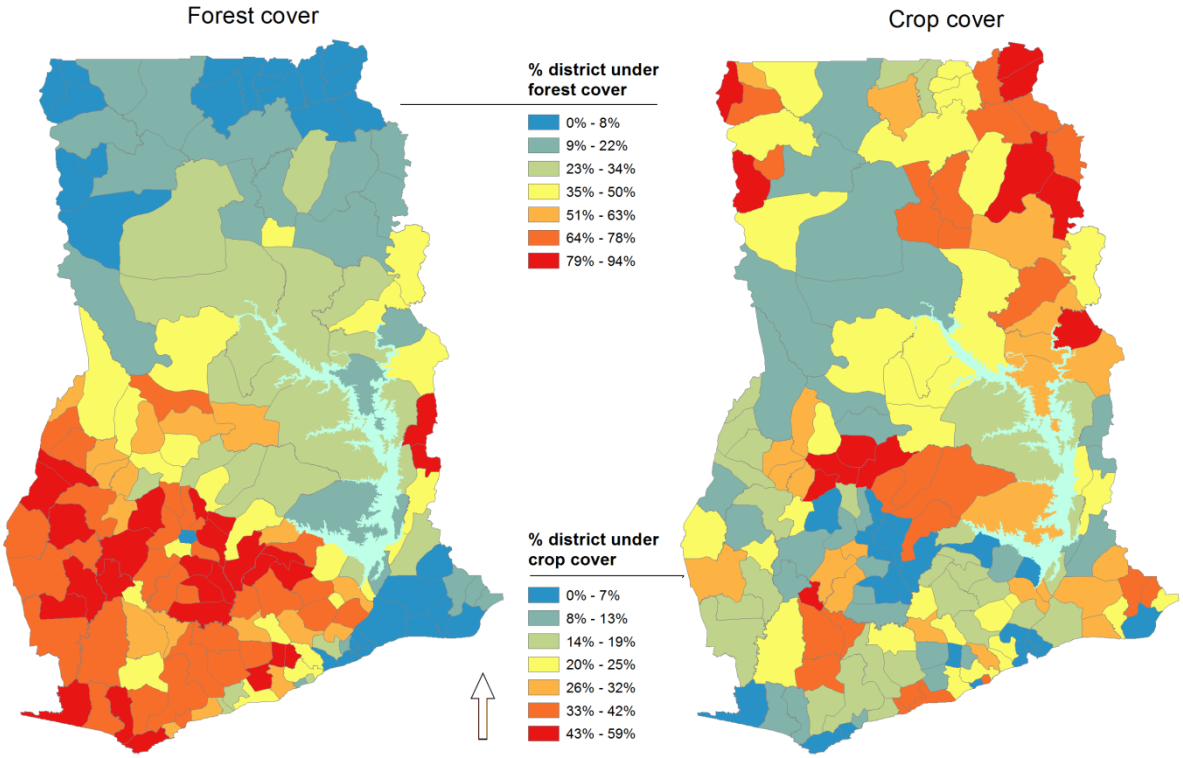
Second, in 86 of 171 districts, MOFA records show more crop cover area than the Landsat, with a median difference between MOFA and the Landsat of 118 percent and a maximum difference of over 5,000 percent. It is unlikely that crop cover would have increased this much in three years. In 85 districts, the reverse is true – more crop cover under Landsat than in MOFA records – with a median difference between MOFA and the Landsat of 112 percent with the maximum difference of over 1,000 percent.

These differences suggest a need to review the methods for quantifying the area under crop.

The maps in Figures 6.2 and 6.3 show the density of four land cover types, namely, forest, crop, grassland and settlement, over the 170 district boundaries in 2010. The density is derived by dividing land cover area by the district area.

Forest cover. In general, districts with high shares of forest cover are located in the south-western part of the country along with two districts in Volta Region, Kadjebi and Jasikan, corresponding to the wet evergreen, moist evergreen and deciduous forest agro-ecological zones (map 1 in Figure 6.2). There are several districts with forest cover shares that range from 35 to 50 percent in or near the Northern Region including Tamale, Zabzungu Tatele, Nanmuba South and Kintampo North districts. Districts with the lowest forest cover shares (<8%) are clustered in the northern part of the county, particularly in Upper East, in Greater Accra extending into Volta Region, and in KMA.

Figure 6.2 Forest and crop land cover density in districts

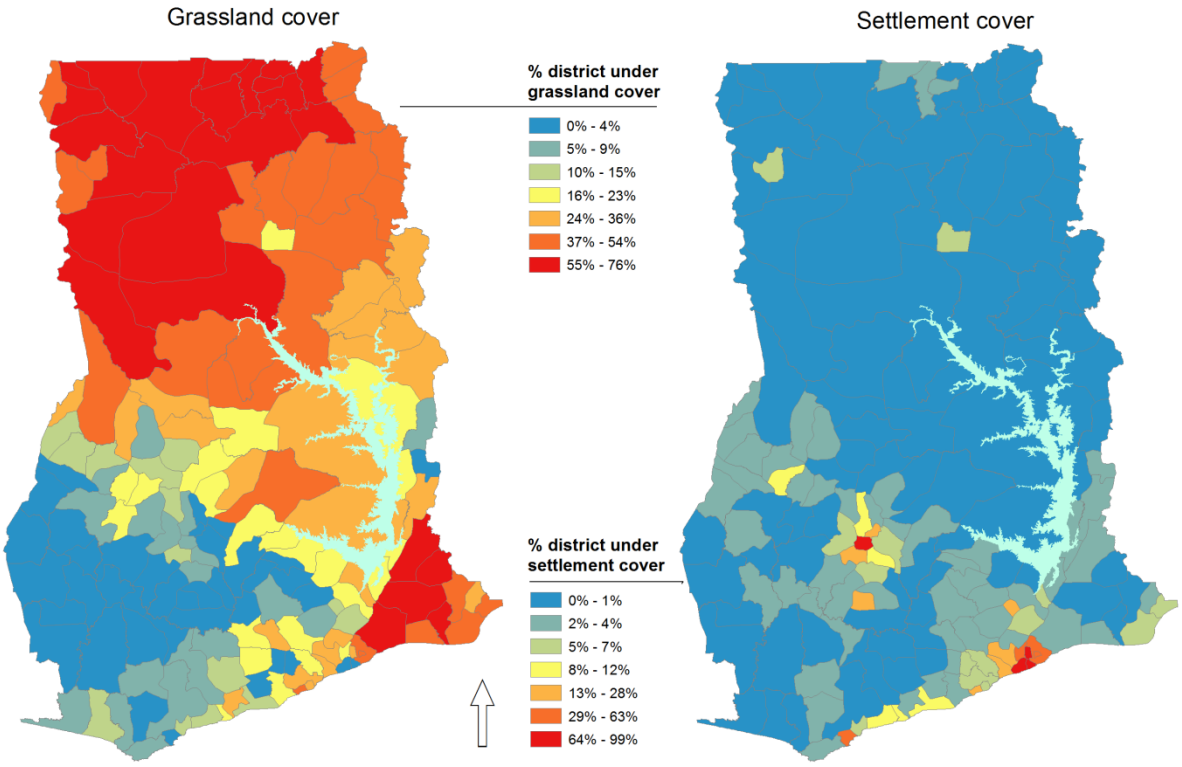


Source: NSDF Study analysis of Forestry Commission satellite imagery, 2010

Crop cover: Districts with the highest shares (>43%) of crop cover are clustered in Upper West, Upper East, Nkwanta North, north of Kumasi (Ejura Sekyedumase, Nkoranze South, Offinso North, and Tano South) and west of Kumasi at Bibiani Anhwiaso (Map 2 in figure 6.2). Districts with moderate shares of crop cover (26-42%) are also within a reasonable distance of large urban centres.

Grassland: Districts with the highest shares of grassland cover (55-76%) are clustered in Upper West and Western parts of Upper East and Northern Regions as well as the south-western part of Volta (Map 1 in Figure 6.3). As mentioned, there may be potential for grassland area, particularly when near the larger urban centres, to be put to agricultural use.

Figure 6.3 Grassland and settlement cover density in districts



Source: NSDF Study analysis of Forestry Commission satellite imagery, 2010

Settlement Cover: Not surprisingly, districts with high settlement cover also tend to have high urbanisation levels (Map 2 in Figure 6.3). Districts with the highest shares of settlement cover (69–99%) are in Greater Accra Region (Accra Metropolitan, Ledzokuku Krokor and Adentan) and in Ashanti Region (Kumasi Metropolitan). Districts with moderate shares (29–63%) include AMA's bordering districts (Tema, Ashaiman, Ga East) as well as STMA. Districts with between 13 and 28 percent of settlement cover are also around AMA (Ga West, Ga South and the more distant Efutu and New Juaban) as well as near to KMA (Kabre East, Atwima Kwamwoma and, more distant, Obuasi). Districts with between 8 and 12 percent of settlement cover are along the coast in Central Region, around Kumasi, and Sunyani. Finally, districts with 2 and 4 percent settlement cover—which may be considered as containing insipient urban areas—are evident at the coast, around Accra, Kumasi and Sunyani, and in the north around Bolgatanga.

6.3.3 Land cover change between 1990 and 2010

The existing status of land cover in Ghana must be viewed against the historical land cover change from one type to another. An understanding of the magnitude, direction, and location of changes in land cover provides insight into the factors that may be causing the change and a view of possible future land cover patterns. Land cover change may be viewed at the national, region and district levels.

National level

Land cover has changed dramatically over two decadal periods: 1990-2000 and 2000-2010 (Table 6.3 and Figure 6.4). During both periods, the area under grassland cover decreased while that of all other land cover types increased. Moreover, grassland area decreased by about 17,000 km^2 in each decade, the greatest absolute change of any land cover type. These decreases were matched by decadal increases of between 10,000 and 12,000 km^2 for crop cover, 3,000 km^2

in both periods for forest cover, between 1000 and 1,400 km^2 for settlement cover and less than 1,000 km^2 in both periods for wetlands.

Table 6.3 National land cover change (in km^2 '000)

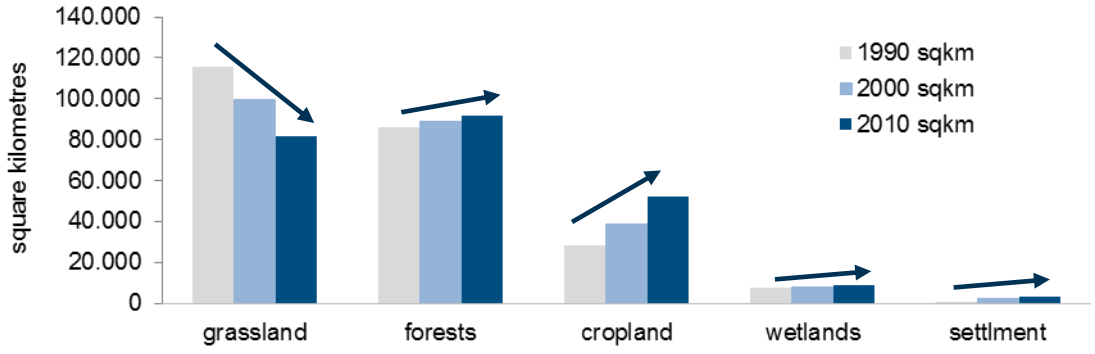
	land cover km^2 '000					% change		% distribution by type		
	status			change						
	1990	2000	2010	1990-2000	2000-2010	1990-2000	2000-2010	1990	2000	2010
grassland	115	99	82	-16.0	-17.8	-14	-18	48	42	34
cropland	28	39	52	10.7	13.1	38	34	12	16	22
forests	86	89	92	2.8	2.9	3	3	36	37	39
settlements	1	2	3.4	1.0	1.4	99	69	0.4	0.9	1.4
wetlands	7.7	7.9	8.8	0.2	0.9	2	11	3.2	3.3	3.7

Source: NSDF Study based on Forestry Commission satellite imagery, 1990, 2000 and 2010

The percentage change in each land cover type is an indicator of the pressures of competing land uses. Grassland cover decreased by 14 percent between 1990 and 2000 and 18 percent between 2000 and 2010, perhaps a result of an increasing need to use grassland more productively. Cropland cover increased by around one-third in each decade period, or about three percent annually, which may be regarded as a positive trend. In the same two periods, forest land increased only marginally by three percent, or about 0.3 percent per year, in each period[147]. Wetlands increased by about 2 and 11 percent.

Built-up or settlement cover recorded the largest percentage change, doubling between 1990 and 2000 and gaining 70 percent between 2000 and 2010, which translates into annual growth rates of 7.2 and 5.4 percent, respectively. During the same two periods, the urban population—which is assumed to reside on the built-up land identified in the satellite images—grew by annual rates of 4.7 and 4.2 percent, respectively[148]. This means that settlement cover increased at annual rates of 2.5 percent and 1.2 percent faster than urban population in these two decadal periods. This is strong evidence of urban development densities that are decreasing but, interestingly, at a declining rate.

Figure 6.4 Land cover change between 1990, 2000 and 2010



[147] The World Bank's figures for forests vary from those derived from the Forest Commission. According to the World Bank, forest area declined as a percentage of the national territory between 1990, 2000 and 2010 from 32.7 to 26.8, and to 21.7 percent respectively. The difference may be explained by different definitions. According to the World Bank, forest area is land under natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excludes tree stands in agricultural production systems and trees in urban parks and gardens. NSDF did not have access to the World Bank dataset.

[148] The urban population rate of 4.7 percent is derived from the growth of the urban population, as recorded in the GSS population census, between the 1984 and 2000 population censuses because there was a population census in 1990.

Source: NSDF Study based on Forestry Commission satellite imagery, 1990, 2000 and 2010

Regional-level change in land cover

There are distinct, regional differences in the long-term direction of land cover change. These are shown in Table 6.4, which presents combinations of gain and loss by land cover type over the two decadal periods: 1990-2000 and 2000-2010. Going against the national trend, Greater Accra gained grassland over both periods and Volta in the more recent period. The four highly-forested regions—West, Eastern, Central and Ashanti—experienced forest cover declines over two decades and Upper West in the recent period. Volta was the only region to lose cropland, in the more recent period, while Greater Accra and Upper East reversed their declines most recently. Three regions have lost wetlands: Greater Accra and Central over two periods and Western over one. Finally, and as expected, settlement cover has increased in all regions in both decadal periods.

Table 6.4 Directional change of land cover by region over two decades

	G. Accra	Central	Western	Eastern	Ashanti	Volta	B Ahafo	Northern	U East	U West
grassland	GG	GL	GL	LL	LL	LG	LL	LL	LL	LL
forests	LG	LL	LL	LL	LL	GG	GG	GG	GG	GL
cropland	LG	GG	GG	GG	GG	GL	GG	GG	LG	GG
wetlands	LL	LL	GL	GG	GG	GG	GG	GG	GG	GG
settlements	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG

Note: gain in two periods is marked “GG” and coloured red; loss in the first and gain in second is marked “LG” and coloured pink; similar coding applies to losses in both periods and gains and losses

Source: NSDF Study based on Forestry Commission satellite imagery, 2013

Table 6.5 quantifies the percentage change of land cover type by region over each decadal period, with the change in the most recent 2000-2010 decade regarded as an indication of possible future changes. During this period, Volta’s 20 percent grassland increase occurred in part at the expense of cropland, which saw a sharp 30 percent decrease. Forest cover decreases were critically high in Upper West (21%) and Western Regions (15 %) and serious (<10%) in Ashanti and Central Regions. The most dramatic change in crop cover was the 233 percent increase in cropland in Western Region, fuelled by losses in grassland and forest cover. Large and critical decreases in wetlands were seen in Central, Western, and Greater Accra regions of 40, 36 and 22 percent, respectively. Settlement cover has increased by over 38 percent in all regions but over 69 percent in four regions—Ashanti, Brong Ahafo, Eastern, and Western—an indication of their high rate of urban development expansion and perhaps a matter of concern.

Table 6.5 Percent change in region land cover in two decadal periods

1990-2000						2000-2010				
Grassland	forests	cropland	wetlands	built-up		grassland	forests	Cropland	wetlands	built-up
6	-36	-40	-15	80	G Accra	0	4	8	-22	56
157	-18	69	-7	55	Central	-14	-9	47	-40	48
11	-4	91	36	81	Western	-26	-15	233	-36	69
-3	-13	40	0	116	Eastern	-4	-1	8	5	71
-22	-2	86	12	135	Ashanti	-33	-8	86	19	101
-38	16	52	5	80	Volta	20	17	-30	5	67
-19	12	43	2	179	B Ahafo	-32	15	37	22	99
-14	46	40	3	121	Northern	-21	39	43	40	47
-4	60	-1	26	61	U East	-10	14	28	126	38
-9	85	15	11	99	U West	-12	-21	27	16	45

Source: NSDF Study based on Forestry Commission satellite imagery, 2013

District-level land cover change 1990-2010

Land cover change is more likely to be considered as a trend the longer the period it has been occurring. Gains (or losses) in both periods may indicate long-term trends and are considered to be more important than mixed gains and losses. For mixed gains and losses, the change in the more recent period is considered to be more indicative of future change.

Table 6.6 shows the percentage of districts loosing and gaining land cover by type over the two decadal period and reveal both positive and negative trends. Positive trends are considered to be gains in forest cover and cropland while negative trends are considered to be losses in these cover types. Some 30 and 26 percent of districts recorded forest cover gains over the two and one decade periods, respectively, while 29 and 15 percent recorded losses over these periods.

Table 6.6 Percentage of districts with land cover change over two decades

	forests	cropland	grassland	settlement	wetlands
gain-gain	30	56	9	100	63
loss-gain	26	16	16	0	8
gain-loss	15	22	28	0	24
loss-loss	29	6	47	0	5
total	100	100	100	100	100

Source: NSDF Study based on Forestry Commission satellite imagery, 2010

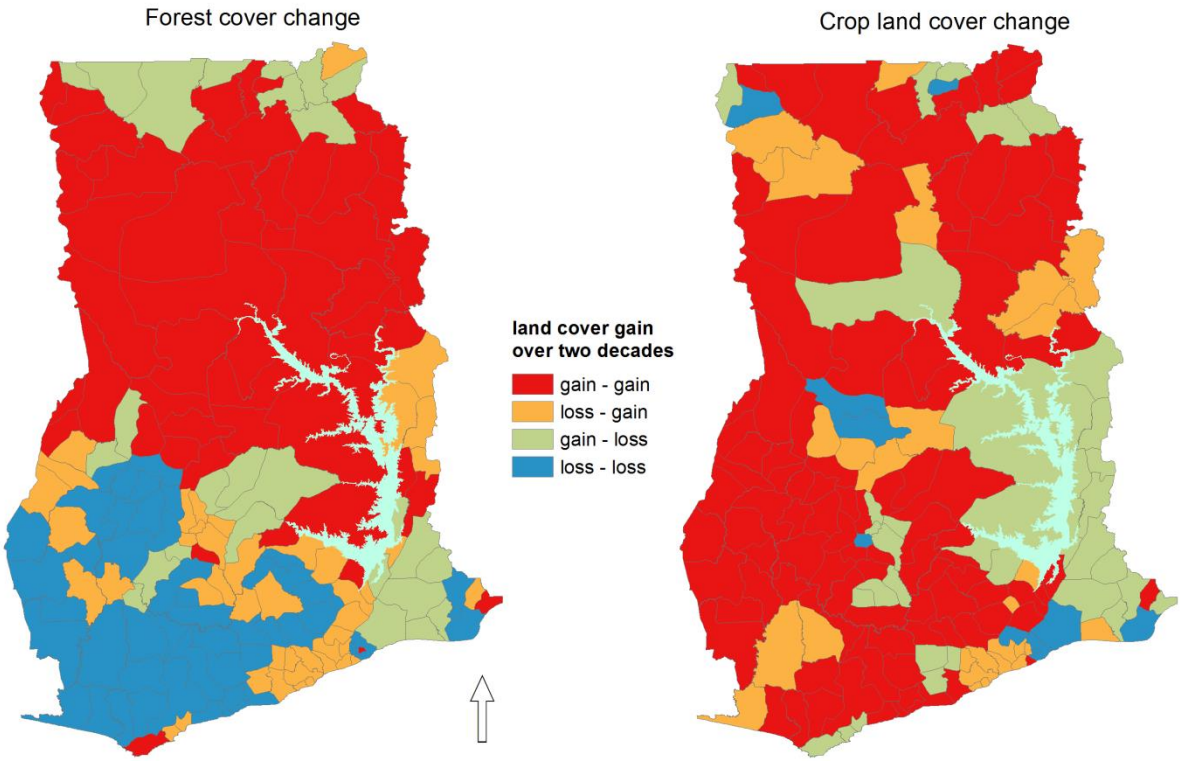
While cropland cover increased in 56 and 16 percent of districts over the two- and one-decade period, some 6 and 22 percent of districts recorded losses in these respective periods. Another negative trend is the 5 and 24 percent of districts losing wetlands over the two- and one-decade periods, respectively. As is expected, all districts have recorded gains in settlement cover during both periods.

Maps of the direction of land cover changeover the one and two decadal periods help to pinpoint the districts where land cover management policies and strategies are most needed.

The **forest cover change map** in figure 6.5 shows that long-term, two-decadal forest cover loss has occurred mainly in south-eastern and south-central districts

and in a few districts in the southern Volta Region, largely areas of high forest cover. Long term-forest cover increases are found in the northern half of the country, with the exception of the northern-most districts. Districts with short-term, one-decadal losses and gains fall largely between the long term change areas and roughly balance each other. While forest cover loss is well-documented, forest-cover gain is not. Some stakeholders at NSDF consultations in the northern regions suggest that forest cover increase is partly a result of the SADA afforestation programme, the sites of which can be seen along major trunk roads.

Figure 6.5 Forest & crop cover change in districts (1990-2000 and 2000-2010)

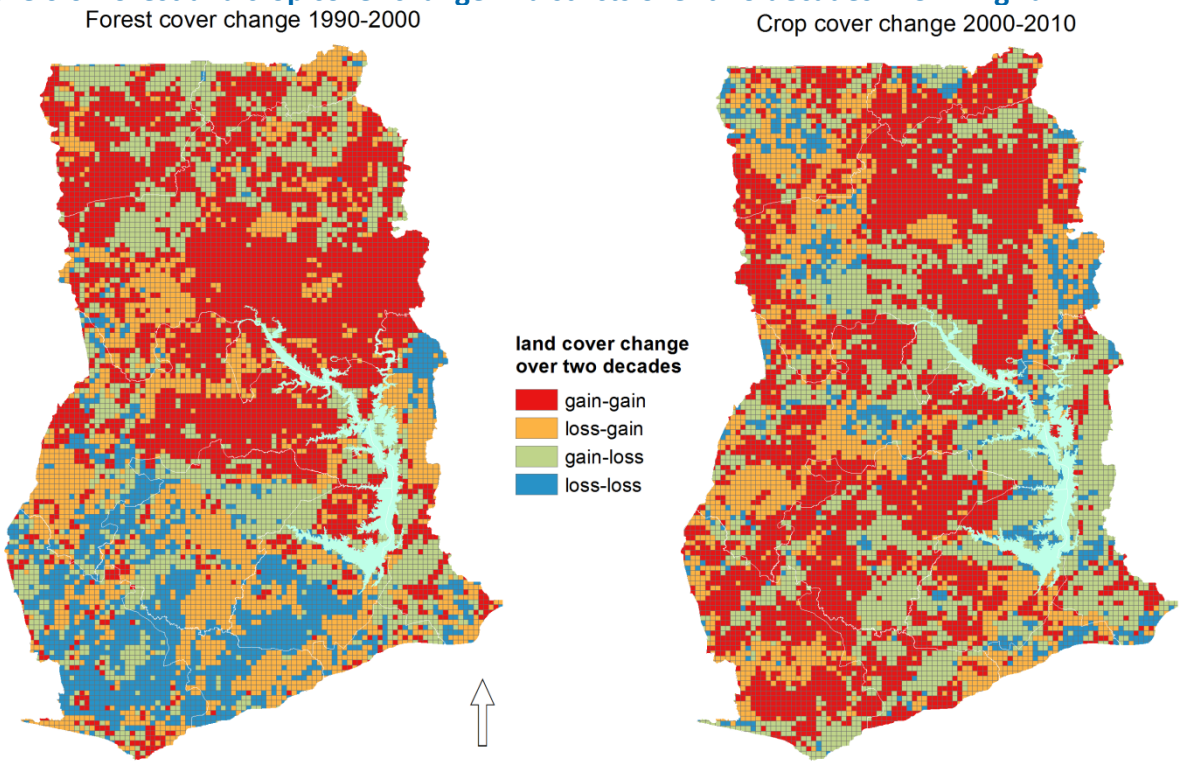


Source: NSDF Study based on Forestry Commission satellite imagery, 2013

The **crop cover change map** in figure 6.5 shows long-term crop cover loss in only ten districts (6%) and short-term loss in 23 districts (14%). Thus, most districts have experienced crop cover gains. District with long-term losses include four in Greater Accra and one in Volta, as well as two in Brong Ahafo and one each in Upper East and Upper West. Districts with short-term losses are more numerous and comprise 3 more in Upper West, 1 in Upper East, 4 in Northern, 4 north of Kumasi, 7 along the coast between Cape Coast and Accra, and 3 more in Western region. Losses in these districts have been somewhat compensated by short-term gains in 16 percent of the districts.

The above aggregated picture of land cover change at the district level masks the finer grain changes in these two important cover types at the sub-district level. To understand these changes, Figure 6.6 provides a useful view of the forest and crop cover changes that have occurred within a 5 km^2 grid overlaid on the national territory. The loss-gain pattern at this level is much more complex than at the district level, suggesting that land cover policies need to be further developed in the context of sub-national SDFs.

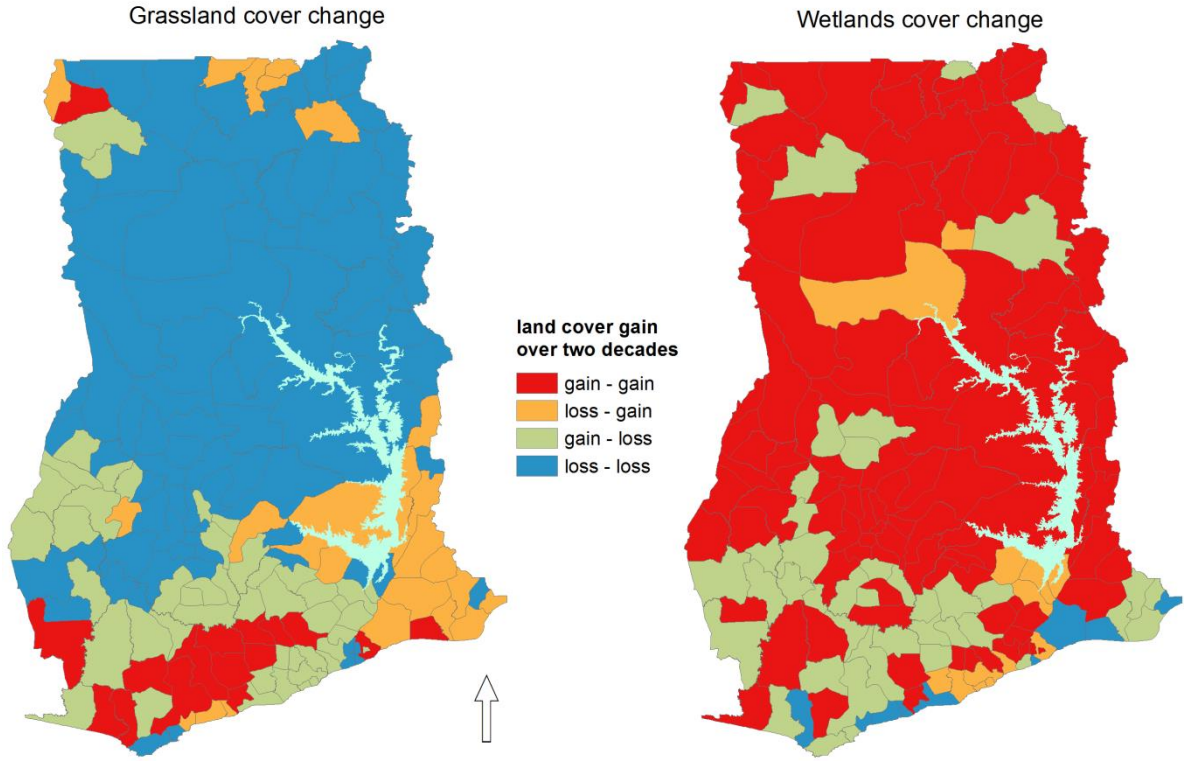
Figure 6.6 Forest and crop cover change in districts over two decades in 5 km^2 grid



Source: NSDF Study based on Forestry Commission satellite imagery, 2010

The **grassland cover change map** in Figure 6.7 shows that long-term grassland cover loss occurred in almost half of all districts, largely in the northern two-thirds of the county and a few scattered districts along the coast. Long-term grassland gain is found mostly a band of districts in Western and Central regions and in a few scattered districts in Greater Accra and Upper West. In the shorter term, grassland loss has spread in many districts in the south western part while grassland gain has spread to the east. The gain in grassland cover in these 20 percent of districts warrants further study under regional or district SDFs and or other lower levels of the planning hierarchy.

Figure 6.7 Grassland and wetlands cover change in districts over two decades



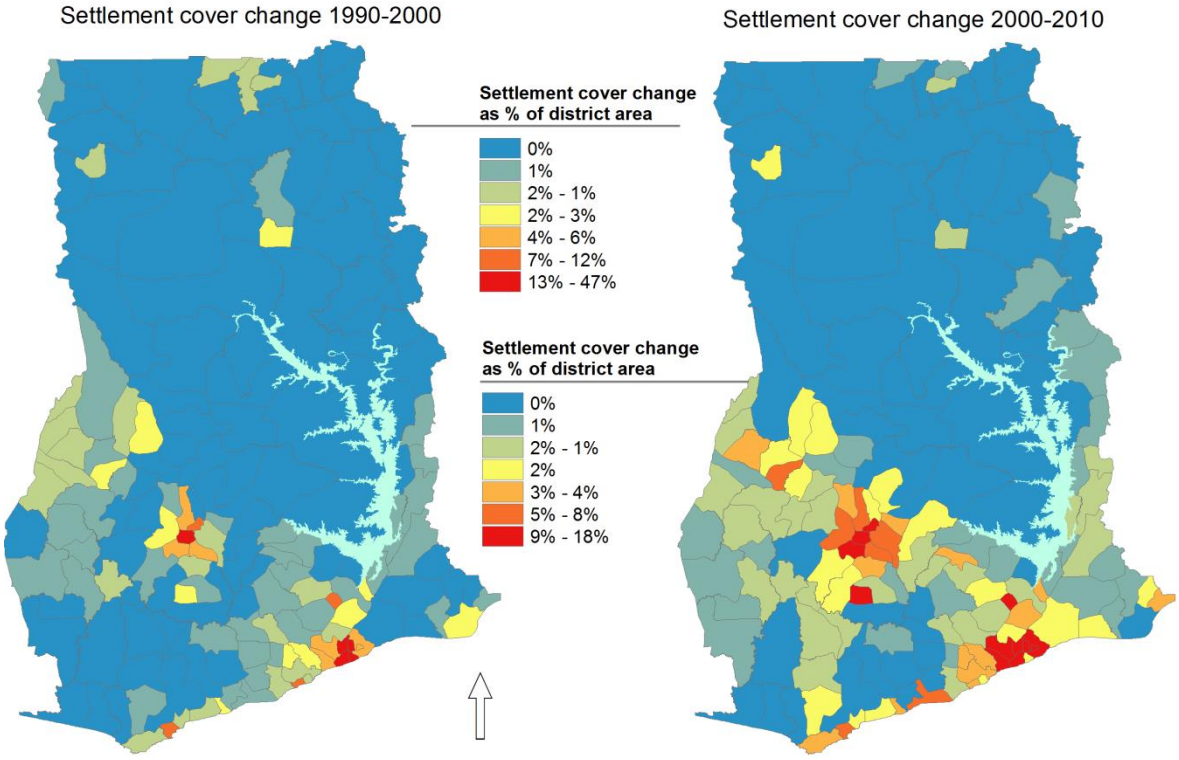
Source: NSDF Study based on Forestry Commission satellite imagery, 2013

The **wetlands cover change map** in Figure 6.7 shows that long-term wetlands loss has occurred only in five percent of the districts, but critically, all are along the coast. An additional 24 percent of districts have seen short-term loss, of which seven districts are those with expanding urban populations at the coast. The loss of wetlands in 29 percent of districts warrants further study under regional and district SDFs. Some 63 and 8 percent of districts have experienced long and short-term gains, which may be attributed to the varying precipitation during the period in which the satellite imagery was taken.

The **settlement cover change maps** in Figure 6.8 show the magnitude of settlement cover increases in all district in both decadal periods. In both periods, the greatest increases, as a percentage of district area, were seen in and around the Accra and Kumasi areas. However, many other districts have recorded significant increases, including those along the coast and around Sunyani.

Comparing the changes in both periods provides an understanding of the changing pace and pattern of settlement cover expansion. For example, settlement cover increases are generally higher between 1990 and 2000 than they are between 2000 and 2010. The range of the highest category in 1990-2000 is 13–47 percent compared to 9–18 percent in 2000-2010. In addition, there are more districts that show increases in 2000-2010 than in 1990-2000, particularly around these Accra and Kumasi city environs but also along the coast and around Sunyani.

Figure 6.8 Settlement cover change in districts over two decades



Source: NSDF Study based on Forestry Commission Landsat satellite Imagery

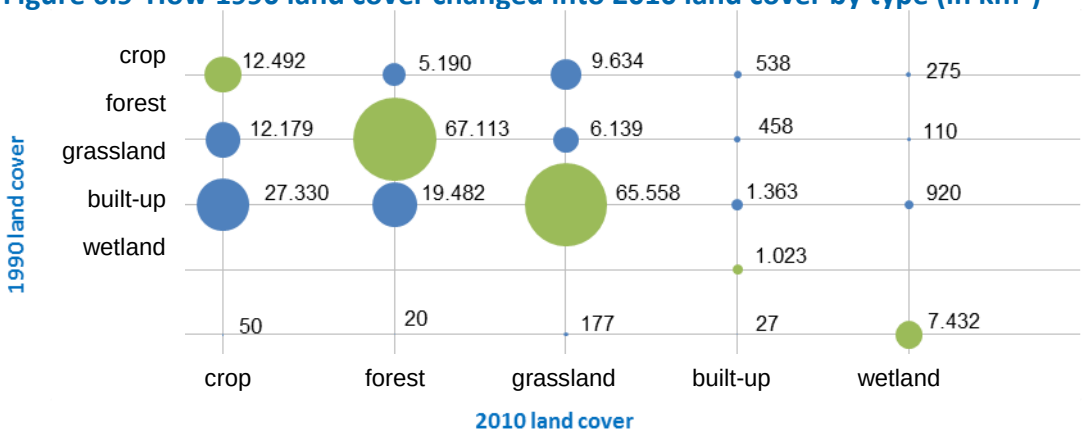
6.3.4 Land cover change dynamics

The above analysis considers the net result of land cover change in a given area. Nevetheless, land cover change is more complex than this analysis would suggest, and it is important to understand this complexity to better understand the trends and forces driving change.

Land cover change in a given area particularly at a 15 m resolution, has both a static component and two dynamic components. The static component is the physical area that remains under the same land cover type between different time periods. The dynamic components are (i) the area of one land cover type that is lost to a different land cover type and (ii) the area that is gained from a different land cover type. The difference between the area lost and the area gained is the net change in land cover. For example, a district with 100 km^2 of forest cover in 2000 may lose 25 km^2 of forest cover to cropland and gain 50 km^2 of forest cover from the afforestation of grassland, for a net increase of 25 $km^{2.}$

Figure 6.9 and table 6.7 show and quantify the land cover change dynamics between 1990 and 2010. The size of the bubbles are proportional to the area of the land cover type. Green bubbles depict the static component while blue bubbles show the dynamic components. Land cover in 1990 is given by the rows and land cover in 2010 is given by the columns.

Figure 6.9 How 1990 land cover changed into 2010 land cover by type (in km²)



Source: NSDF Study based on Forestry Commission Landsat Imagery, 1990-2010

Table 6.7 Area of 1990 land cover changed into 2010 land cover type (in km²)

1990 \ 2010	crop	forest	grassland	other	settlement	wetlands	total
crop	12,492	5,190	9,634	155	538	275	28,284
forest	12,179	67,113	6,139	174	458	110	86,172
grassland	27,330	19,482	65,558	761	1,363	920	115,414
other	20	33	76	2	36	13	180
settlement					1,023		1,023
wetlands	50	20	177	4	27	7,432	7,709
total	52,071	91,837	81,583	1,096	3,444	8,750	238,781

Source: NSDF Study based on data from Forestry Commission, 1990-2010.

Table 6.8 shows land cover change between 1990 and 2010 from two perspectives: as a percentage of the original 1990 cover and as a percentage of the 2010 cover.

First, consider 2010 share of 1990 land cover. Nationally, about two-thirds of 1990 land cover remained under the same cover type while about one-third changed into a different cover type. While all land cover types had both static and dynamic components, the relative percentage of each varied. Land cover types with the large static components, expressed as the 2010 share of 1990 land cover, included built-up (100%), wetlands (96%), and forests (78%); land cover types with smaller static components comprised grassland (57%) and crop cover (44%).

Conversion of cropland and forests into other cover types is a matter of concern because it indicates that these types are not being protected. Some 34 percent of cropland changed to grassland while 18 percent changed into forestland, perhaps as a result of cropland left to lie fallow. Only three percent of cropland was converted into settlement cover and wetlands, showing that urban expansion is not the main cause of cropland loss.

The main cause of forest cover loss, about 14 percent, was conversion into cropland. It would seem that this loss may have been preventable had other options for increasing crop production been promoted and used, such as increasing crop yield or converting grass land to cropland. Another seven percent of forest cover changed into grassland, perhaps as a result of degradation. Less than two percent of forest cover changed into settlements and wetlands, showing that urban expansion is not a significant cause of forest cover loss.

Most (96%) of wetlands cover remained intact over the period, with only about two percent changing into grassland and one percent into crops. The amount of wetlands changing into settlement cover was negligible.

Table 6.8 Share of 1990 land cover changed into 2010 land cover type

		2010 land cover													
		% 2010 share of 1990 cover							% 1990 share of 2010 cover						
		crop	forest	grassland	other	built-up	wetlands	total	Crop	forest	grassland	other	built-up	Wetlands	total
1990	crop	44	18	34	1	2	1	100	24	6	12	14	16	3	12
	forest	14	78	7	0	1	0	100	23	73	8	16	13	1	36
	grassland	24	17	57	1	1	1	100	52	21	80	69	40	11	48
	other	11	18	42	1	20	7	100	0	0	0	0	1	0	0
	built-up	0	0	0	0	100	0	100	0	0	0	0	30	0	0
	wetlands	1	0	2	0	0	96	100	0	0	0	0	1	85	3
	total	22	38	34	0	1	4	100	100	100	100	100	100	100	100

Source: NSDF Study based on data from Forestry Commission, Landsat imagery 1990-2010.

Analysis of the share of 2010 land cover that was gained from 1990 land cover types provides another perspective of land cover dynamics. Consider cropland: more than half came from grassland, a positive trend, while almost a quarter was converted from forests, a negative trend. For forests, over a fifth came from grassland, a positive trend, while six percent came from crops, a negative trend.

For settlement cover in 2010, in addition to the static component of 30 percent that was retained from 1990 settlement land cover, the largest share of land (40%) came from grassland cover, followed by cropland (16%), forest (13%) and wetlands (1%). The latter three changes are important because of the concern that urban expansion is occurring at the expense of crops, forests and wetlands. It may be that some or all this land (and wetlands) cover loss could have been prevented or reduced though land cover protection and improved urban planning, but this would require assessment at the local levels.

For wetlands, 11 percent came from grassland and less than 4 percent came from cropland and forests combined. For grassland, some 12 and 8 percent came from forests and cropland, respectively.

Regional land cover dynamics

Table 6.9 shows, for all regions, the composition of 2010 land cover that came from 1990 land cover types. The Table reveals a number of positive trends as well as matters of concern as follows:

- **Settlements**: Settlement cover gains from cropland conversion exceeded 25 percent: in Volta (38%), Upper East (32%), and Upper West (26%). Settlement gains from forest conversion were high in Western (40%) and Eastern (35%) regions. Conversion of wetlands to settlements was appreciable but low in Central region (5%). Almost half or more of the settlement cover in Brong Ahafo,

Greater Accra and Ashanti was gained through grassland conversion, a positive finding.

- **Crop cover:** Forest-to-crop cover change is extremely high in Western (91%) and Central (84%) regions, and moderately high in Eastern, Ashanti and Brong Ahafo regions. About six percent of Great Accra's cropland was gained from wetlands. The static component of cropland is particularly low (<20%) in Brong Ahafo, Ashanti and Western regions.
- **Forest cover**: Crop-to-forest cover change is high in Volta (26%) and Greater Accra (15%) regions. The static component of forest cover is the highest in the regions with the most forest cover, and lowest in the northern regions.
- **Wetlands cover:** Wetlands-to-forest conversion is high in Central (24%) and Western regions (38%).

Table 6.9 Share of 2010 land cover gained from 1990 land by region

2010 land cover	1990 land cover	G Accra	Central	Western	Eastern	Ashanti	Volta	B Ahafo	Northern	U East	U West
crop cover	crop	38	11	5	26	13	41	18	26	36	38
	forest	9	84	91	48	39	5	21	1	0	1
	grassland	46	5	4	25	48	54	61	73	63	61
	other	0	0	0	0	0	0	0	0	0	0
	settlement	0	0	0	0	0	0	0	0	0	0
	wetlands	6	0	0	0	0	0	0	0	0	0
forest	crop	15	7	2	7	2	26	5	5	7	1
	forest	58	91	93	84	90	60	63	43	42	35
	grassland	27	2	4	9	8	14	31	52	51	63
	other	0	0	0	0	0	0	0	0	0	0
	settlement	0	0	0	0	0	0	0	0	0	0
	wetlands	1	0	0	0	0	0	0	0	0	0
grassland	crop	30	13	4	22	17	15	11	8	14	15
	forest	6	69	88	28	23	7	12	2	2	2
	grassland	59	17	6	50	61	77	76	90	85	83
	other	0	0	0	1	0	0	0	0	0	0
	settlement	0	0	0	0	0	0	0	0	0	0
	wetlands	4	1	2	0	0	1	0	0	0	0
settlement	crop	12	9	13	16	16	38	9	16	32	26
	forest	4	22	40	35	14	1	8	0	0	0
	grassland	47	20	13	22	47	27	61	53	23	40
	other	0	0	2	0	1	0	5	0	0	0
	settlement	36	43	33	27	21	33	18	31	45	35
	wetlands	1	5	1	0	0	1	0	0	0	0
wetland	crop	3	3	1	2	3	3	3	5	4	3
	forest	1	24	38	0	9	1	1	1	3	2
	grassland	7	9	2	2	13	8	15	25	56	17
	other	0	0	1	0	0	0	0	0	2	0
	settlement	0	0	0	0	0	0	0	0	0	0
	wetlands	89	63	58	95	75	88	80	69	35	77

Source: NSDF Study based on Forestry Commission Landsat Imagery, 1990-2010

6.4 Minerals

Ghana has significant quantities of mineral resources that include gold, bauxite, manganese, diamonds, limestone, iron, silver and salt. In addition, there are deposits of barite, basalt, dolomite, feldspar, granite, gypsums, marble, micas, kaolin, laterite, magnesite, phosphate, phosphorus, sandstones, slates and talcs.

The mining industry of Ghana accounts for about five percent of GDP and minerals make up about 37 percent of total exports. The country has 23 large-scale mining companies producing gold, diamonds, bauxite and manganese. In addition, there are over 300 registered small-scale mining groups and about 90 companies providing support services to the sector. Export earnings from minerals averaged 35 percent and the sector is one of the largest contributors to Government revenues through the payment of mineral royalties, employee income taxes, and corporate taxes.

Figure 6.10 shows the location of mineral deposits, mining areas and mining concession areas. Map 1 in this Figure gives the location of mining deposits, present gold production sites, gold and alluvial gold prospects, diamonds, iron ore, limestone, clam shells and manganese. Map 2 shows the location of diamond fields, bauxite fields and mining leases.

6.4.1 Gold

Gold is Ghana's most valuable mineral resource, accounting for over 90 percent of the total mineral exports. The country is presently ranked as Africa's number two gold producer and number ten in the world. It boasts of several million ounces of proven gold reserves, found below ground as well as along rivers, where it is termed "alluvial". With the increase in gold prices, small-scale mining of alluvial gold has increased significantly (Minerals Commission brochure, 2013). Ghana produces over two million ounces of gold per annum, most of which are exported as bullion for refining abroad; yet feasibility studies confirm the viability of refining gold in Ghana, with potential to serve other gold producing countries in the West Africa region[149].

Gold is most abundant in the southwest, with concentrations in the southern margin of the Ashanti belt, the Sefwi belts, the Chirano area in the Bibiani Belt, and alluvial deposits in the Kibi-Winneba Belt. As identified by the Minerals Commission, there are 33 gold producers, 32 alluvial gold prospects and 405 gold prospects. Current producers are located in a corridor that runs south from Tano North through Asutufi, Bibiani, Obuasi, Upper Denkyira East, and clustered in Prestea Huni, Tarkwa and Ellembelle. Alluvial gold prospects are clustered around the rivers that run through Atwima, Kwaebibirem, Birem Central and Akim East; Dangme West and Tongu North; Nzema East; and between the Ashanti and Central regions. Finally, gold prospects run in a broad band along the western side of the country but also in a few districts in Upper East, Eastern and Central regions.

6.4.2 Manganese

Manganese has several important uses. It is an essential steel- and aluminium-strengthening alloy, an ingredient in alkaline batteries, a fertilizer, and a petrol-additive to improve combustion.

The only operating manganese mine belongs to Consolidated Minerals (Consmin), a Jersey-based (USA) company. Most manganese mining takes place near Takoradi, from where it is exported. Manganese reserves are still plentiful; Consmin estimates that only three percent of its concession has been mined and estimated manganese carbonate reserves are over 24 million tons, with a manganese content of 29 percent[150].

[149] Ghana, Country mining guide; KPMG Global Mining Institute

[150] Ghana, Country mining guide; KPMG Global Mining Institute

Manganese deposits are found in five main locations, which are usually near gold deposits. These are: (i) a linear strip in Upper West region in the districts of Lawra Nandum, Jirapa, Nawdoli and Wa West; (ii) a linear strip from Wa East, Sawla Tuna Kalba, Ganja West, Bole and northern Tain at the Cote d'Ivoire border; (iii) in four areas in Kasena Nankani East and Talensi Nabdam districts, about 40 kilometres of Bolgatanga town; (iv) in Amansie West, about 50 km from Kumasi, and in two areas within 8 kms of Tarkwa town; and (v) in two locations in Ahanta West between 15 and 30 kms from STMA. Other areas with known deposits include the Dixcove area of SE Ashanti Belt, the Axim-Salman area in the SE Ashanti belt; South Bole District in Northern Region; and Wa-Lambusie-Hapa District in Upper West.

The most productive mine is the Nsuta mine, which still has several decades of life. But there has been a recent drop in production, attributed to deterioration of the rail connection to Takoradi port. The Minerals Commission believes that investment in improved transport, including rail and barges on Lake Volta, and the new electric power from Bui dam, would render these mines economically viable.

6.4.3 Bauxite

Bauxite, the main ingredient of aluminium, has been mined since the 1940s. Presently Chinese corporations are the most prominent in the industry through Bonsai Minerals Group's ownership. Bauxite ore deposits are estimated at over 600 million metric tonnes. There are three main bauxite areas as follows:

- Awaso (referred to as the Sefwi-Bekwai group) in Western region has high quality bauxite. Market studies, conducted for the ECOWAS market of 250 million plus people, have identified a potential annual demand for this bauxite of about 80,000 metric tonnes of alum[151].
- Nyinahin, in the far west of Ashanti region, has the largest reserves, estimated at over 350 million metric tonnes with a high content of alumina and silica.
- Atewa Range, in Kibi District in the Eastern region, only 70 km from Accra, has reserves estimated to be over 200 million metric tonnes.

Other occurrences of bauxite include Mt Ejuaneme, north of Nkawkaw, in Eastern region. Many bauxite deposits remain un- and under-exploited, plus there are opportunities for both bauxite production, establishment of alumina plant, and the transformation of alumina into aluminium by electrolysis.

6.4.4 Iron

Iron's role in making steel is well known. The Minerals Commission identifies two main iron deposit areas: (i) Sheini, along the northeast Ghana-Togo border and (i) Opon-Mansi, in Dunkwa in Western region, where huge reserves of high commercial-grade iron ore, estimated at over 150 million tonnes, extend over a distance of 24 km. Some studies consider the Sheini ores to be the finest in Africa and of sufficient reserves to last 100 years[152]. Other iron-ore deposits are found near Pudo, at the Burkina Faso border in Upper West, but the Commission considers that these reserves are too modest to exploit at this time.

According to the Commission, mining of the Sheini deposits would become more economically viable if four conditions were met: (i) the ore could be upgraded on site; (ii) transport is improved to a coastal port; (iii) lower-cost power is provided, perhaps from the Nigerian gas; and (iv) Ghana and Togo cooperated in a long-term iron-ore development plan. The map in figure 6.10 shows that iron ores are found in four districts: Sisala East district in Upper West region, Zamzungu Tatale in Western

[151] Ghana, Country mining guide; KPMG Global Mining Institute

[152] http://npong2franco.wordpress.com/2013/09/12/president-mahama-must-take-keen-in-sheni-iron-project/

region, Zambzugu Tatale in Northern region near the Togo border, In the eastern part of Krachi East, and Wassa Amenfi East in Western region.

6.4.5 Limestone

Limestone is an ingredient for making cement, lime, and paper as well as in neutralising acidic soil and building roads. Ghana's limestone resources are considered to be modest and, as mapped by the Minerals Commission, comprise three major limestone areas, 16 regular limestone sites and two clam shell sites.

Major limestone deposits are found in Nauli, a small coastal village in Western region; Buipe, at the northern end of Lake Volta; and Bonga-Da, in the northeast of Northern region. The Nauli limestone deposit, with an estimated 400 million tonnes, is suitable for production of cement clinker and could substitute for all clinker imports presently required by Ghana's two major cement mills at Takoradi and Tema. These deposits could yield over 1.4 million tonnes clinker per annum. The Buipe deposit contains an estimated 10 million metric tonnes. The Bango-Da deposit has over 15 million metric tonnes of limestone and over 30 million metric tonnes of dolomite. Daboya has over 162,000 metric tonnes of limestone and over 500,000 metric tonnes of dolomite[153].

Other limestone deposits are found near Upper East and Northern region border, about 70 km west and south of Tamale, less than 30 kms from Atebubu; around the southern part of Lake Volta and along the coast near to Nauli in the west and Togo border in the east. Clam shell sites are found less than 20 km east of Odumase. Shell deposits are found along the Volta River in Volta and Greater Accra regions.

6.4.6 Diamonds

Ghana contributed about 0.3 percent to the global production of gem diamonds in 2012, but the trend is negative; production declined from 240,000 carats in 2011 to 180,000 carats in 2012.

Areas where diamonds have been found include two large fields – one in Tarkwa district in Western region and the other spanning several districts in Eastern Region. Artisanal miners have also found diamonds from alluvial and in situ diamond deposits near Akwatia in the Birim Valley.

The only formal commercial production is at Akwatia in Eastern region. One of Ghana's oldest diamond mines, Akwatia is currently being prepared for disinvestment. Yet known reserves in the mine, which has a concession of over 240 km^2, exceed 24 million carats, with other known minerals also present.

Paramount Mining Corporation Ltd has recently found diamonds at Osenase, about 25 km south of the Akwatia Diamond Project and at Ochinso, an area of 37 km^2 within the Birim Diamond Field of southern Ghana.

6.4.7 Kaolin (China-Clay) and clay

Kibi, in Eastern region, and Abandze-Saltpond, in Central region, have large deposits of Kaolin. The deposits are not yet exploited but could be used industrially for the manufacture of tiles and household utensils. They could also be used as basic raw material for the paper industry, insulators, powder and as a filter in the manufacture of pharmaceutical products.

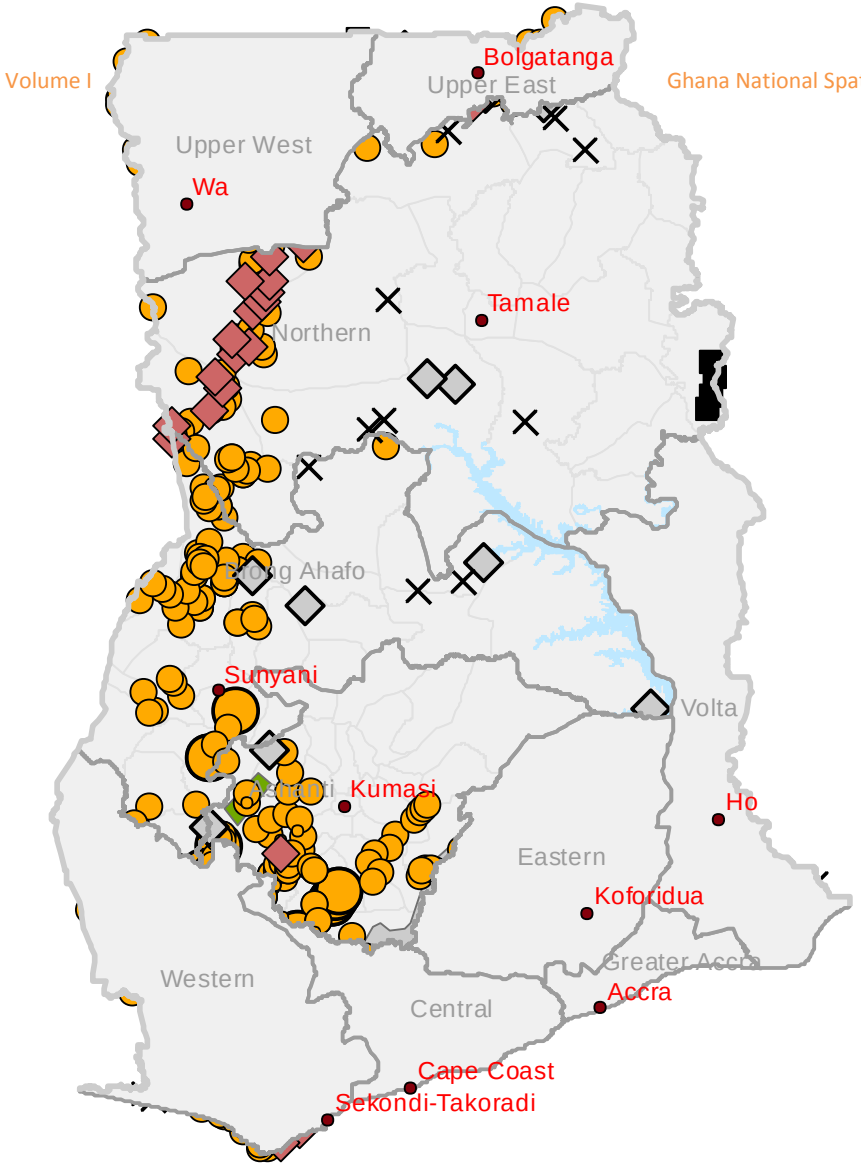
[153] Investment opportunities in minerals and mining; High Commission of Ghana, New Delhi, India

Clay deposits in economic quantities occur in all regions. Some of the deposits, particularly those occurring at Apinamang in Eastern region, have been proven suitable for paint manufacture. Other deposits are good for brick production, ceramics, and roofing tiles.

6.4.8 Environmental impact of mining

Mining activities can have and had a harmful impact on the environment. For example, mining cuts up the landscape and generates waste (or tailings) that pollute land and water bodies. Illegal gold mining, known as *galamsey*, is particularly damaging, as operators have no incentives to protect the environment. Galamsey is accused of degrading land and causing "massive" pollution to water bodies through tailings and the use of dangerous and poisonous chemicals as mercury and other cleaning agents. While there has been no survey that locates and quantifies the extent of galamsey, press reports indicate that it takes place in at least two regions, Tontokrom in the Ashanti region and Dunkwa in Central region. In these places there are large areas of land that are dotted with huge pits and where the Offin and Oda rivers have been heavily polluted. In addition, it is reported that, in Upper Denkyira East district in Central region, there are more than 2,000 acres of degraded lands and the River Offin has been blocked by galamsey operators. Due to the blockage, some farming communities on the banks have been flooded to the neck level, forcing some people to abandon their farms and to move to safer areas[154]. The website of the film "the Moneystone" (www.moneystonefilm.com) claims that there are about one million galamsey miners. Because they can earn more than the national average salary, galamsey mining is expected to continue to grow.

[154] "Ashanti Region: Galamsey destroying environment"; Graphic Online, 13 June 2014



Map 1 legend

- current gold producer
- gold prospects
- alluvial gold prospect
- diamond
- iron ore
- manganese
- limestone
- clam shells
- bauxite field
- diamond field

Map 2 legend

industrial mine

- manganese
- bauxite
- gold

concession status

- mining leases
- prospecting
- reconnaissance

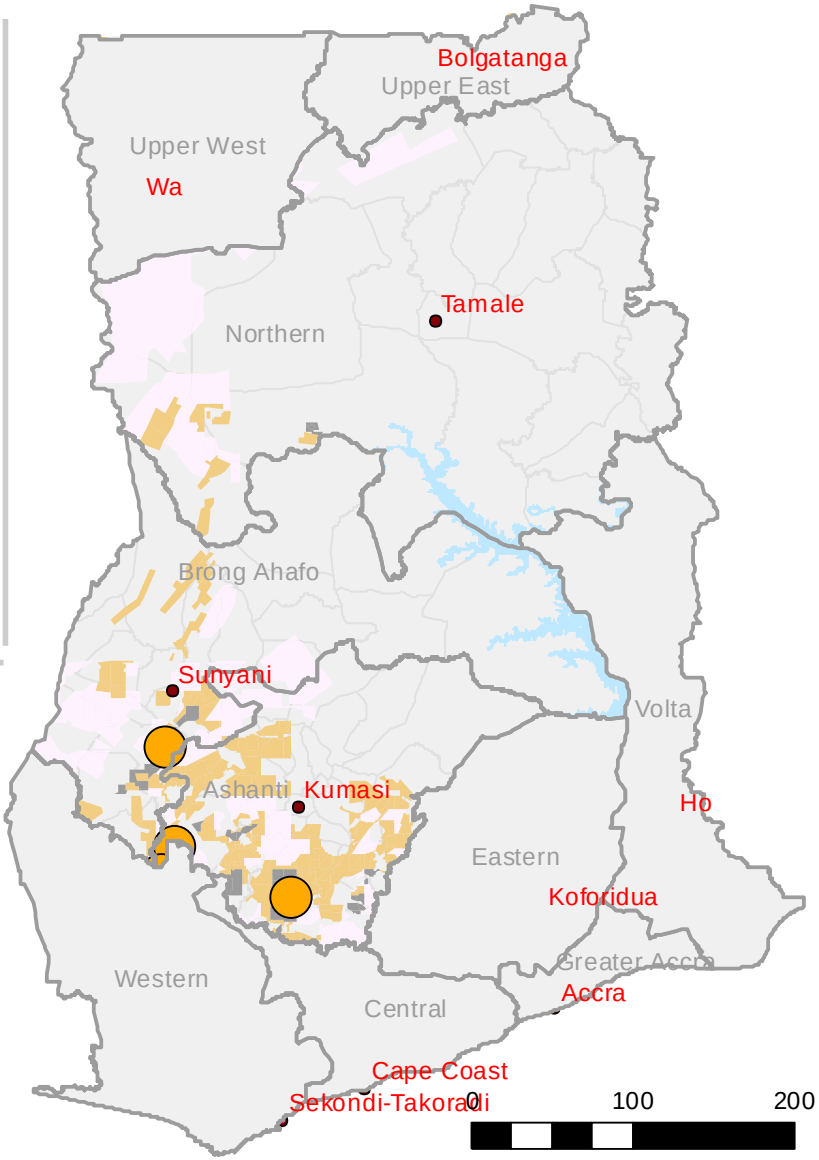


Figure 6.10 **Location of minerals, mines and mining concessions**

Source: LUPMIS and Minerals Commission, 2013

6.4.9 Oil and gas and related industries

There are thirteen oil exploration blocks, totalling about 12,500 km^2, that have been awarded to oil drilling and exploration companies by the Ghanaian government. The blocks are located in or off the coast of all coastal regions although most of the area of the (nine) blocks are at or off the coast of Western region. There is therefore an environmental concern to ensure against oil spills and to have the capacity and readiness to respond to spills in the event they occur. Presently, two blocks are producing oil, three more have discoveries, and exploration is proceeding in a further two.

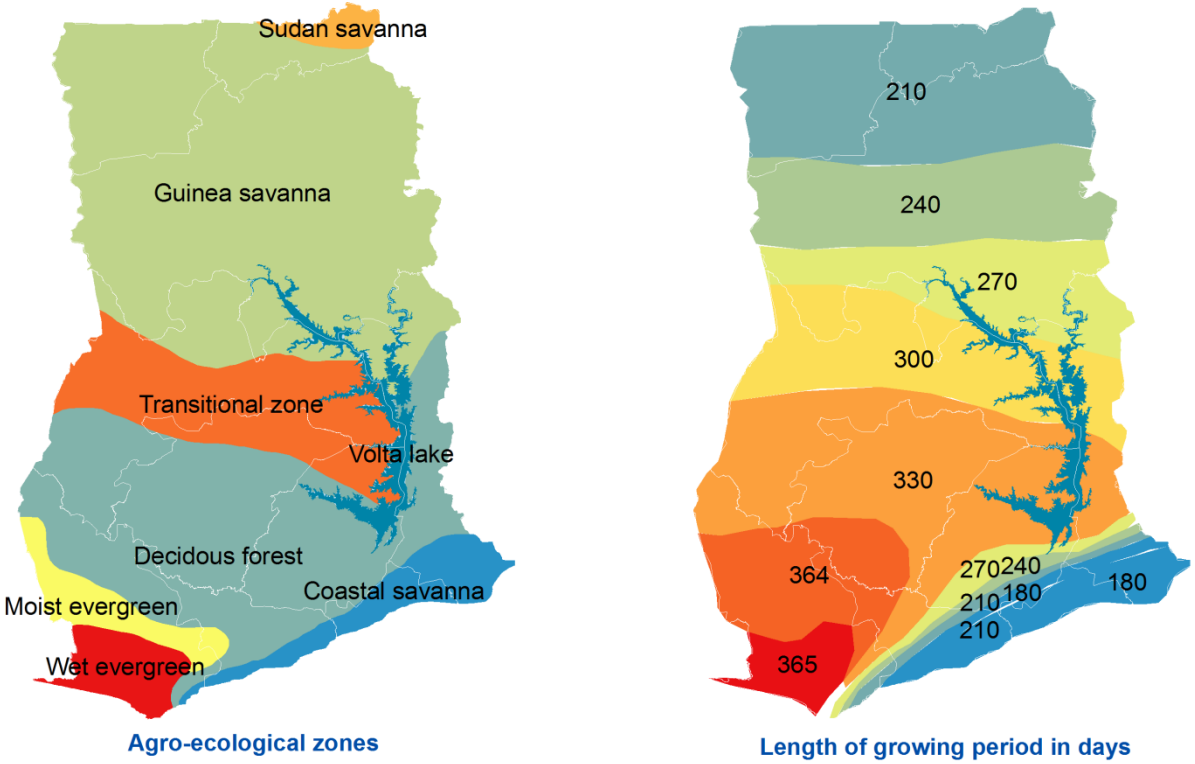
Ghana has proven reserves of about 0.66 billion barrels and estimated reserves of about 1.5 billion barrels, with a potential upside of two billion barrels. Although new discoveries have been modest, they continue to occur, which shows the country's potential as an oil producing nation. This optimism is supported by many, including GNPC's CEO, who expects to see an investment of at least $20bn in Ghana's oil industry over the next five years[155].

6.5 Ecological zones and climate

6.5.3 Agro-Ecological Zones

Ghana has seven agro-ecological zones. From wettest to driest these are: wet evergreen, moist evergreen, deciduous, transitional, Guinea savannah, Sudan savannah, and coastal savannah (Map 1 on Figure 6.11).

Figure 6.11 Agro-ecological zones and Length of growing periods



Source: NSDF Study based on LUPMIS, 2013

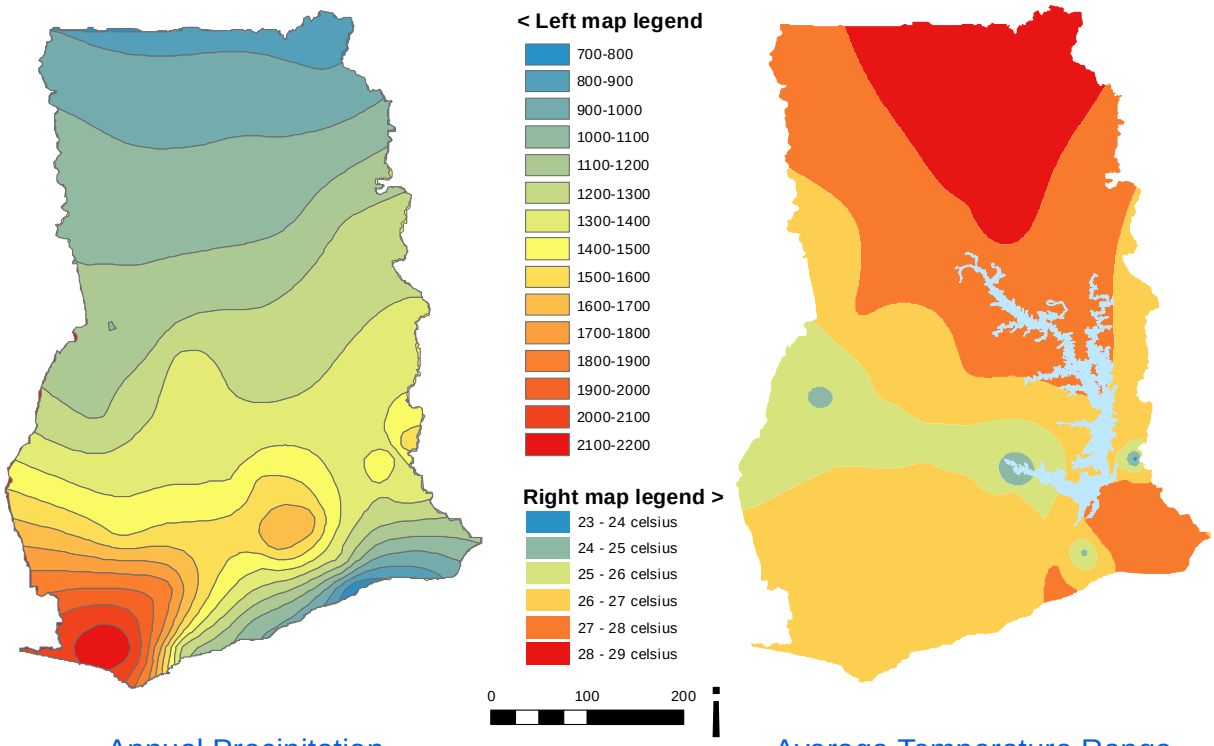
[155] Keynote address by Acting Chief Executive, Ghana National Petroleum Corporation, at Ecobank's Ghana Limited Oil & Gas Conference, 4 June 2014

6.5.4 Climate

Ghana is located on the Gulf of Guinea only a few degrees north of the Equator, giving it a warm, tropical climate. It generally has clear skies and high temperatures throughout the year. Local climate is determined by two winds or air masses that move from opposite directions. One wind, called the 'harmattan', sweeps southward from Sahara and contains hot and dry desert air. The other wind moves south-to-north from the Atlantic Ocean and carries warm and humid maritime air.

These two winds create different climatic seasons that vary from north to south as they reach areas at different times. Average relative humidity is much higher in the south, reaching nearly 100 percent, compared to the north, where it usually hovers around 65 percent. Yet when the dry harmattan season arrives, the relative humidity in the north can be as low as 12 percent. A drought period occurs when the hot and dry continental air is dominating, and a rainy season occurs when the warm and humid maritime air is coming.

Figure 6.12 Annual precipitation and Average temperature range



Source: NSDF Study based on LUPMIS data, 2013

Ghana has three main climatic zones: northern, middle and Accra plains. The northern zone lies in the southern savannah climatic belt, which corresponds to the category “Aw” in the Köppen climate classification. This zone has a single rainfall season from end-May to September and a drought season from mid-October to mid-May. The dry season consists of hot days followed by cool nights with clear skies.

The middle zone corresponds to the tropical forest in the south-west and is more dominated by the maritime air, which results in two rainy seasons during the year. One is April-July and the other September-November, which explains why the south-west has almost double the precipitation of the savannah area. Both rainy seasons are followed by a dry season.

The third climatic zone is the Accra Plains. Although Accra is situated at the coast in the south, its precipitation variability and vegetation is more like the north. This is because Accra area lies in the coastal savannah zone.

While average annual temperatures are similar throughout the country (between 26°C and 29°C), daily fluctuations are higher in the north than along the cost. The hottest months are generally February and March, the coolest are January, or August at the coast (map 2 on figure 6.12).

6.6 Natural heritage assets

Ghana boasts a wide range of important natural heritage sites and assets which are distributed across the country. These sites include 21 protected areas which comprise 7 national parks, six resource reserves, two wildlife sanctuaries, one strict nature reserve[156] and five coastal *Ramsar* wetland sites. In addition to these protected areas, there are over 200 protected forest reserves. Protected areas cover over 22,700 km^2, or 11 percent of the national land area.

While there are presently no natural heritage sites on UNESCO's World Heritage List, in 2000 two sites were submitted as candidates for inclusion: Kakum National Park and Mole National Park. Sites on the heritage list are required to be preserved from hazards and degradation and managed in a way that integrates heritage into sustainable development strategies.

This section discusses natural and cultural heritage under the following headings: natural heritage; water resources; mountains and hills.

6.6.1 Forests Resources

Ghana's forests resources are classified as either *on-reserve* or *off-reserve*. On-reserve forests are protected, off-reserve forests are not protected. On-reserve forests are further divided into *production reserves* and *protection reserves* that comprise 80 and 20 percent of the forest reserve area, respectively.

The over 200 protected forest reserves are located in the high forest zone and cover about six percent of the national land area. These reserves are under the control of the Forestry Commission. In addition, outside the high forest zone, there are another 8,000 square kilometres of savannah and woodlands that are designated for protection by local communities.

Forests provide a large number of economic, environmental and social benefits. These include: habitat for wildlife, timber for domestic use and export, non-timber products such as wild animals and plants, income from hunting (for about 6,000 people) and high-protein bush meat, source of formal jobs (for about 120,000 people) and livelihood (for about 2 million), 95 percent of all biofuels (firewood and charcoal) accounting for some 67 percent of national energy consumption and carbon sinks to mitigate climate change (Strategic National Energy Plan, 2006).

Figure 6.13 compares the maps of forest reserves in 2013 with a similar map from the NPDP (1963-1970). While the overall pattern largely remained unchanged for fifty years, it would appear that there are several reserves that have lost area or have been divided into several parts. According to the Forest Commission, Ghana

[156] A strict nature reserve is the highest category of protected area recognised by the World Commission on Protected Areas (WCPA), a body which is part of the International Union for Conservation of Nature (IUCN). These areas are supposed to be the most stringently protected natural landscapes.

had about 8.2 million hectares of forest cover some 200 years ago but only has 1.2 million hectares today, a rate of deforestation of about 65,000 hectares annually[157].

There are a few large forest reserves in Northern, Upper East and Eastern regions, but most of the others are small and located in Western and Ashanti regions. These numerous small reserves high perimeter-to-area ratios, exposing them to degradation and making them difficult to preserve. Yet, it may be possible to connect individual reserves into at a larger network rendering them easier to manage and more suitable to maintain biodiversity.

Forest development initiatives include a National Forest Plantation Development Programme (NFPDP), which started in 2010 with an aim to plant 30,000 ha per year across all districts. NSDF was unable to locate a map of the programme areas.

6.6.2 National Parks, wildlife reserves and sanctuaries

National parks comprise Mole, Kakum, Digya, Bia, Bui, Nini Suhien and Kyabobo. Together these seven parks cover over 10,000 km^2, or just over 4 percent of the national territory. Mole is by far the largest and accounts for almost half (48%) of all national park area, followed by Digya (27%) and Bui (18%), while the combined area of the other parks accounts for only seven percent. National parks are found in only four regions: Western, Northern, Brong Ahafo and Ashanti.

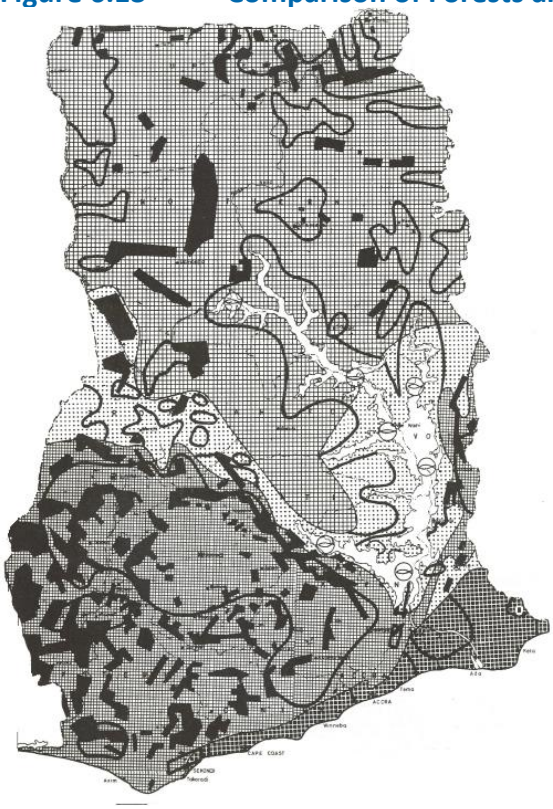
Kakum and Mole National Parks are the most developed for tourism. Kakum – with its rainforest canopy walkway and convenient location (only 30 km north of Cape Coast, three hours from Accra and two from Kumasi) – is the most popular tourist attraction. Mole, although developed for tourism, has yet to attract significant numbers of visitors due, perhaps, to its isolation and poor road infrastructure. Digya, on the western bank of Volta Lake, is also under-visited. Kyabobo, in the Northern Volta region, is newly declared and not yet open to the public, but has rich fauna and scenic beauty and may become a significant attraction once the facilities are completed.

Wildlife reserves and sanctuaries include Shai Hills, Gbele, Ankasa, Bia, Kakum and Kalakpa as well as Boabeng Fiema monkey sanctuary, Wechiau Hippo sanctuary, Paga Crocodile pond and the Bunso Arboretum. Shai Hills Resource Reserve, less than an hour from Accra, could potentially play a greater role in providing recreation and educational experiences. Accessible by vehicle and on foot, it features monkeys, bushbucks, royal antelopes, 89 bird species, and large, bat-filled caves. It is best to tour the reserve in a four-wheel drive vehicle, which must be provided.

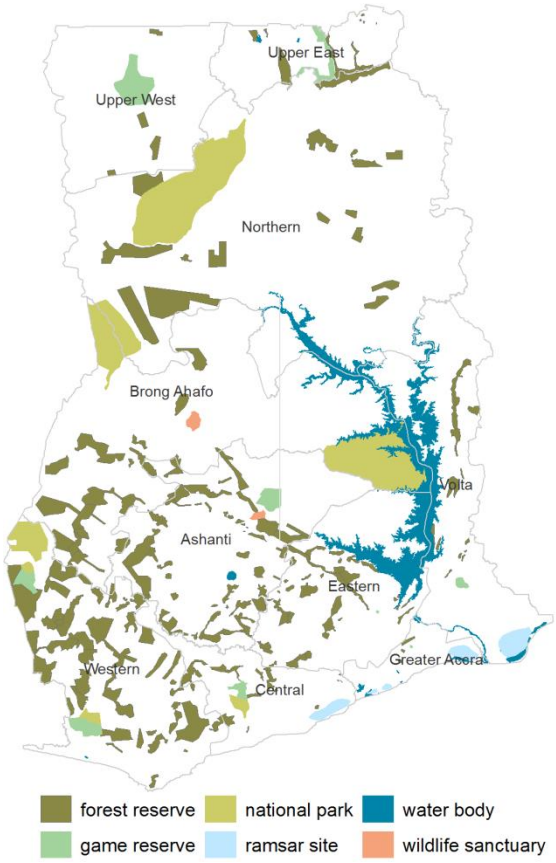
Biosphere reserves include part of Bia National Park and the Songsore Lagoon. The Bia biosphere is a 563 km^2 resource reserve. It has some of Ghana's last remnants of relatively untouched forest, complete with its full diversity of wildlife. Some of the tallest trees left in West Africa are found here. The Songsore Lagoon covers an area of 280 km^2 and is located just outside of the major town of Ada and to the west of the Volta River estuary. UNESCO approved the Songor Biosphere Reserve as part of the World Network of Biosphere Reserves.

[157] www.fcgghana.org

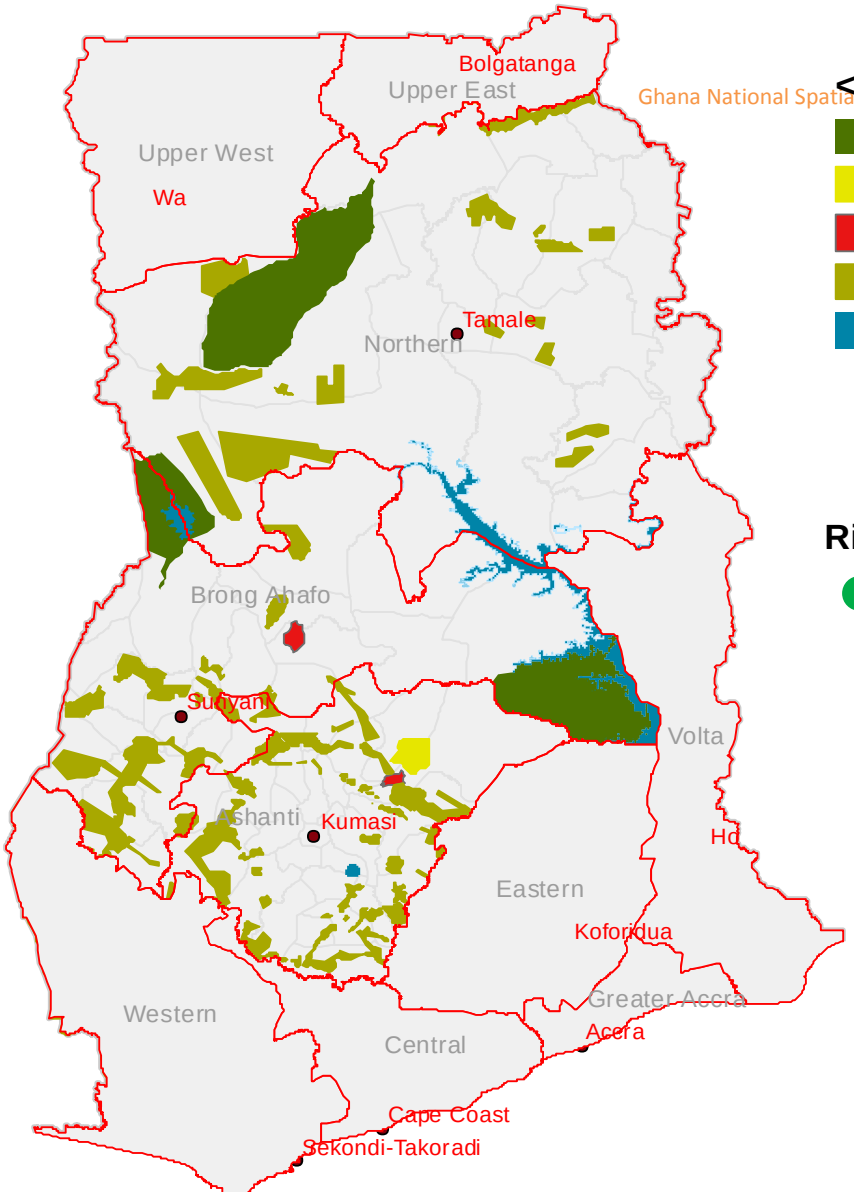
Figure 6.13 Comparison of Forests and Protected areas - 1963 and 2012



Forest Areas in 1963, NPDP



Forest Reserves and Protected Areas – 2012

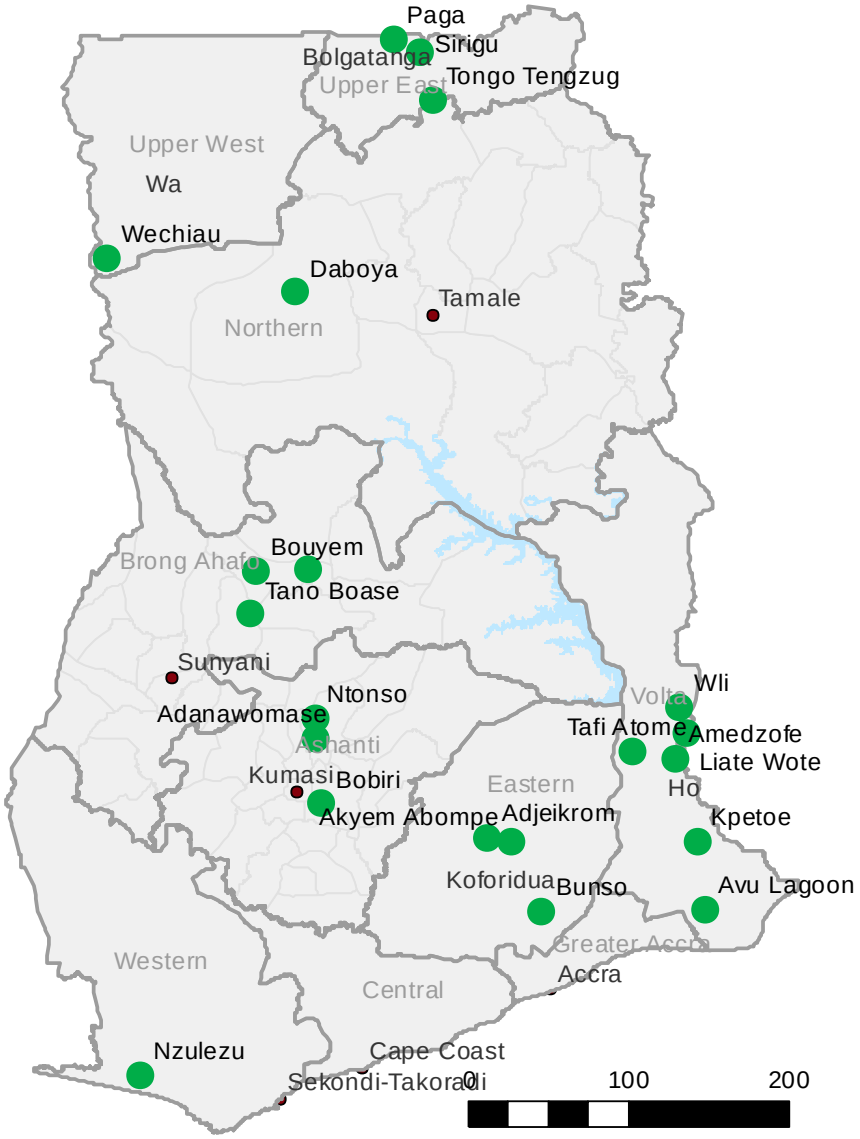


< Left map legend

- national park
- game reserve
- wildlife sanctuary
- forest reserve
- water body

Right map legend >

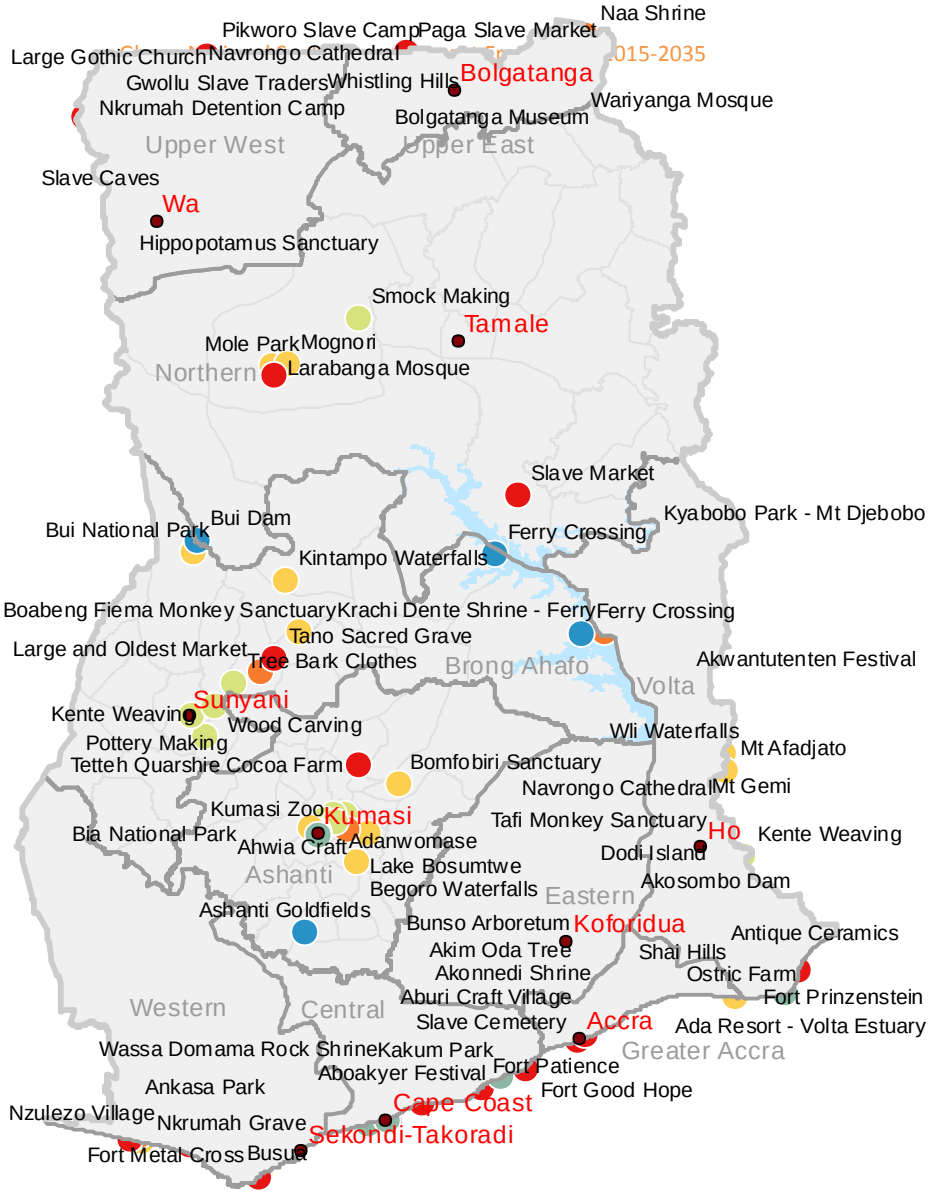
- ecotourism site



Natural features

Eco-tourism assets

Figure 6.14 Nature features and eco-tourism assets



Map 1 legend

- history
- tradition
- eco-tourism
- craft
- events
- other

Map 2 legend

international visitors in 2011

100,000
10,000
5,000
1,000

national visitors

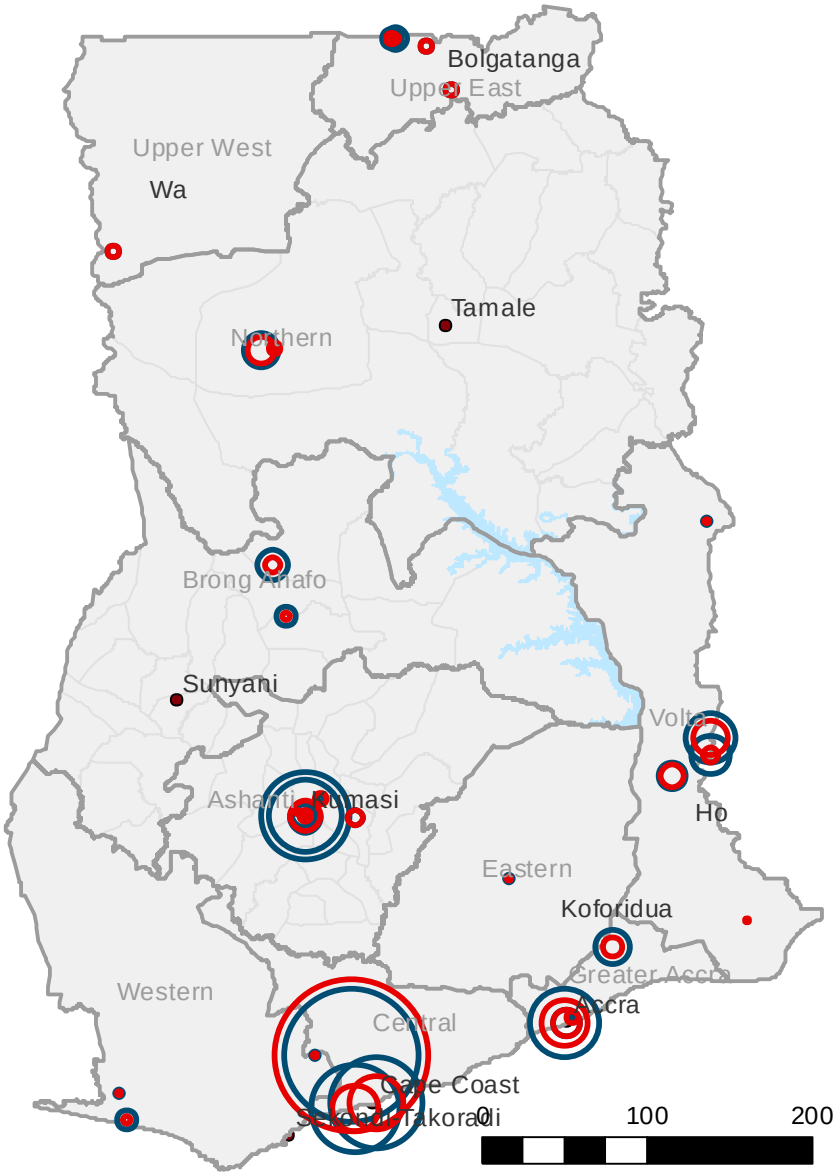


Figure 6.15 **Tourism sites and number of tourist visitors**

6.6.3 Wildlife in Ghana

Ghana has a diverse collection of wildlife species: 222 species of mammals, 128 species of reptiles and 38 species of amphibians. Its national parks, reserves and sanctuaries provide habitats for mammals, both large and small, including both forest and savannah elephants, lions, leopards, hippopotamus, spotted hyenas, civet cats, bongos, buffalos, warthogs, river hogs, waterbucks, bushbucks, kob, duikers, oribis, aardvarks, genets, hartebeests, roan antelopes, pangolin, porcupine, chimpanzees, baboons, black and white colobus, mona, the rare Diana monkey and other species of primates. There are also several species of inland and coastal crocodiles and various types of snakes including pythons according to the Game and Wildlife Commission.

6.6.4 Water-related assets

Water-related natural assets include Ramsar wetland sites, beaches, lakes, rivers and waterfalls.

Six Ramsar sites in Ghana have high significance, having been designated as "wetlands of international importance" under the International Convention on Wetlands, which Ghana signed in 1988 (Table 6.10). With a total surface area of over 1,780 km^2, these sites include the Anlo-Keta lagoon complex in Volta region, the Muni Lagoon in Central region, the Owabi in Ashanti region, and in Greater Accra, the Densu Delta, Sakumo Lagoon and Songor Lagoon. All sites have potential for tourism yet all are threatened by encroachment degradation by local communities and commercial enterprises who use mangrove for firewood and to smoke fish.

Table 6.10 Ramsar wetlands of international importance

		Description	community use	Wildlife	tourism
Anlo-Keta lagoon	VR	coastal savannah	fishing, salt mining, charcoal production and hunting	bird, fish and butterflies and endangered waterbuck	
Densu Delta	GA	delta estuary, sand dunes, mangroves, lagoons, saltpans, marsh and scrub	fishing, fuel wood, and salt production	several fish species	little tourism but bird watching point installed
Muni Lagoon	CR	coastal lagoon, sand dunes, marshland with tidal and seasonal flooding,	fishing, fuel wood, cattle and sheep grazing	small mammal species, 23,000 water birds.	educational centre for recreation and tourism.
Owabi Reservoir	AR	reed beds and marshland, surrounded by secondary woodland and plantation		herons, bitterns, various species of wintering/staging birds	educational and recreational purposes
Sakumo Lagoon	GA	coastal brackish-saline lagoon, floodplains, freshwater marsh	fishing and industrial activities	rare and endangered migratory species and several fish species.	
Songor Lagoon	GA	closed lagoon with inundated mudflats	fishing, farming and salt mining	turtles, migratory birds, including avocet, terns and green shanks	

Source: Ghana Environmental Protection Agency, 2013

Beaches may be considered as economic as well as natural resource assets. As economic resources, they provide services to and therefore have the potential to attract visitors. The economic value of beaches has been recognised internationally. For example, in the USA, beaches are the leading tourist destination – the number of beach visitors is almost twice those to national parks, 15 times those to all theme parks combined, including Disney World. One researcher calculated that beaches

and the visitor activity they generate contributes about USD 300 billion per year to the national economy[158].

Ghana is blessed with 540 km^2 of attractive coastline that has a potential to attract far more foreign and domestic visitors than it does at present. Most beaches are sandy but there are some with rocky cliffs. While there are many areas with active fishing villages and some resorts, there are still several large areas that remain undeveloped. The best beaches are, arguably, in Western region and include Brenu, Busua and Axim and some turtle nesting stretches. Nonetheless, there are also notable beaches in Accra, such as Labadi Beach, and east of Accra in Ada, Keta and Prampram. Nevertheless, coastal tourism is constrained and threatened by beach and sea pollution from poor sanitary conditions and from beach erosion, which is a result of sea level rise and also uncontrolled and illegal sand winning.

Lakes are similar to beaches in their economic and natural resource value. Ghana has three significant lakes: Lake Volta, Bui Lake and Bosomtwe. All are under-exploited assets with great tourism potential.

Lake Volta is the world's fourth largest reservoir by surface area and by water volume. Key metrics include a surface area of about 8,500 km² and a 520 km distance between its northern tip at Yape and southern end at Akosombo.

The lake provides numerous economic benefits that include electric power generation, passenger ferry and cargo transportation, fishing and aquaculture, and tourism, particularly the islands of Dodi, Dwarf and Kporve. Added to this list is a new enterprise to harvest the submerged high-value tropical hardwood that, according to its promoter, "could generate the largest source of environmentally sustainable natural tropical hardwood in the world"[159]. One Ghanaian-owned company, Underwater Forest Resources, plans to market the lumber internationally while another, Flooring Solutions Ghana, is producing hardwood floors. The removal of submerged trees will also improve navigation on the lake and increase safety.

Proposed tourist projects around the lake include eco-lodges in Akosombo and Dodi Island, a new golf course in Akuse, water sports and boat activities at the estuary of the Volta, a game reserve on Dodi Island and a planned new docking facility at the edge of the Digya national park.

Bosomtwe lake, about 30 km south-east of Kumasi, is a popular, local, recreational area with swimming, fishing and boat trips. About 8 km in diameter, the lake was formed by a meteorite impact over one million years ago. Local stakeholders have suggested that it has the potential to be developed into a major visitor attraction. This would entail improving access with a possible perimeter road, upgrading the interpretation centre and facilities in the lakeside village of Amakom, addressing the needs of the local population who number about 70,000 in about 30 villages, and addressing environmental concerns. The latter include overfishing and soil erosion as a result of increased farming on the slopes and the fluctuating lake level. For example, many villages have been submerged several times forcing the people to move up the slopes or outside the basin. Lake Bosomtwe has been nominated as a biosphere reserve under UNESCO to institutionalize sustainable management of the lake and its catchment resources.

Bui Dam Reservoir is the second largest in Ghana with a minimum and maximum surface area of 288 km^2 and 440 km^2 and an average length of about 40 km. Like

[158] The Economic Value of Beaches – a 2008 Update, James R Houston, *U.S. Army Engineer Research and Development Center*

[159] http://www.gsb.stanford.edu/news/bmag/sbsm0711/feature-harvest.html

the Akosombo dam at Lake Volta, the Bui Dam provides power generation and, potentially, an irrigation source of 30,000 hectares of fertile land in an "*Economic Free Zone*"[160].

Waterfalls are presently providing recreational opportunities for both domestic and international visitors. The most known waterfalls are Kintampo, Wli/Agumatsa and Boti. Nonetheless, there are many others that include Aflambo, Akaah, Amedzofe, Amenapa, Asenema, Atiwa, Begoro, Biakpa, Bibiri, Boti, Buka, Bupru, Fuller, Sanders or Nkrumah, Nakpanduri, Oku Abena, Oworobong, Tagbo, Tin, Tsatsudo, Wsi and Wuli waterfalls[161]. Arguably, there is potential for all three sites to be further developed.

6.6.5 Landscape, topography and slope

Landscape features such as mountains and hills play an important role as landmarks, recreational areas and rainwater water catchments. Most countries, including Ghana, prohibit or restrict development on steep slopes because of the landslide hazards, erosion, flooding and higher infrastructure costs. Many countries also restrict development for aesthetic reasons, ensuring that hills remain green and offer recreational opportunities.

Topography may be described in terms of elevation and slope. Ghana is primarily flat; only two percent of the territory is over 400 metres in elevation. Regions with areas above 400 metres, from the most to the least, include Eastern, Ashanti, Volta, Brong Ahafo and Western. The largest contiguous high-elevation area (above 400 metres) runs along Lake Volta from just north of Koforidua to the border of the Ashanti region. Some high-elevation areas are included within the boundaries of national parks. Many countries have policies that protect areas of high-elevation from development based on their relative rarity, land mark and scenic viewshed value, as well as recreational value. Experience in many nations has proven that once a viewshed is degraded, the property values around it may not increase or may even decline.

Mountains: While there is no standard definition of a mountain, the Oxford English Dictionary defines it a as "a natural elevation of the earth surface rising more or less abruptly from the surrounding level and attaining an altitude which, relatively to the adjacent elevation, is impressive or notable". The US defines a mountain as being at least 300 metres while the UK uses a threshold of least 600 metres.

Ghana has two landforms that are called “mountains”: the Odweanoma Mountain in Eastern region that features paragliding activities and the Mountain Afadja in the Volta region. At 885 metres, Mount Afadja is the highest peak in Ghana and forms part of the Agumatsa range dividing Ghana and Togo. The top of the mountain provides panoramic views of surrounding communities, forests, mountains, deep valleys, and in the distance, Lake Volta. Behind Mount Afadja is Aduadu, the highest point in Ghana.

Mount Afadja is shaped like a traditional yarn mound and is covered with luxuriant tropical forest. Its area is well-known for its biodiversity richness. Researchers have recorded over 300 species of butterflies and 33 species of mammals. Mona and spot-nosed monkeys are regular sights. Furthermore, BirdLife International has selected the site as one of the key "important bird areas" in Ghana.

[160] http://en.wikipedia.org/wiki/Bui_Dam

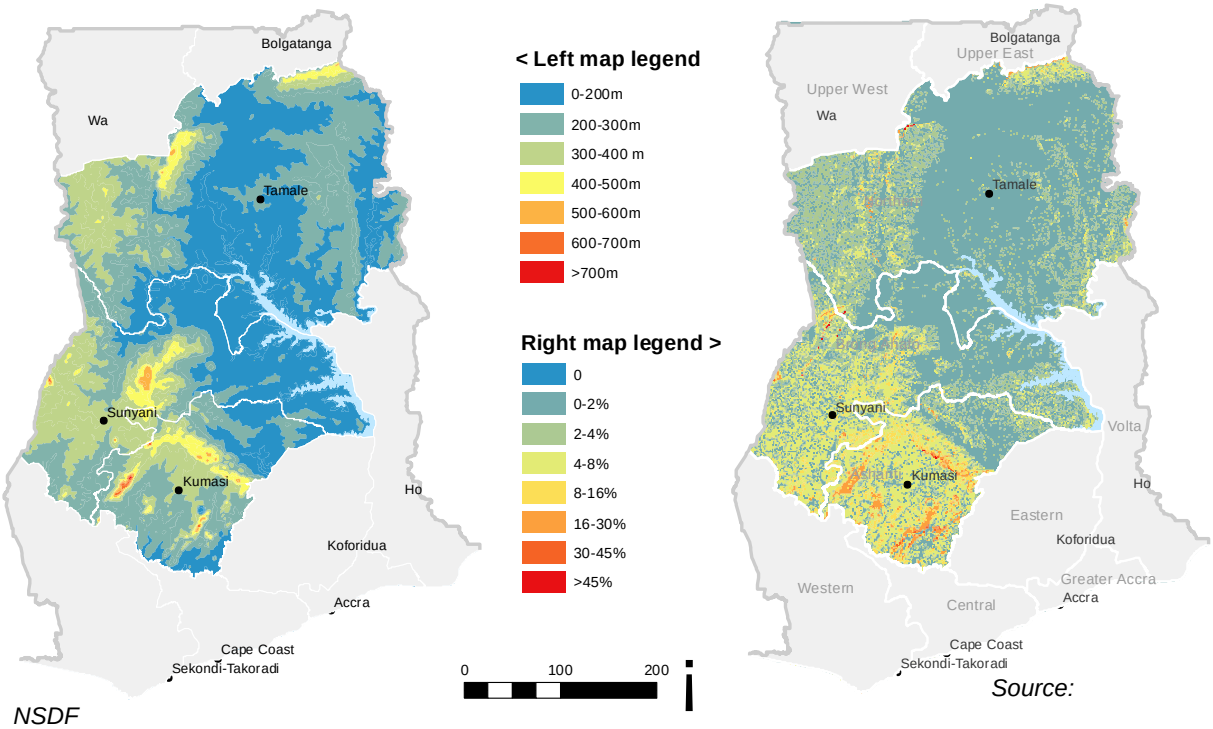
[161] http://www.ghana.photographers-resource.com/locations/Landscape/Lists/Waterfalls.htm

Hills: Only two percent of Ghana's territory is over 400 metres in elevation. Regions with areas above 400 metres, from most to least, include Eastern, Ashanti, Volta, Brong Ahafo and Western. The largest contiguous area above 400 metres runs along Lake Volta starting just north of Koforidua almost to Ashanti region. Some, although not all of these areas, are already included in national parks.

Only about six percent of the territory is sloped at 30 percent or more, which is considered to be "steeply sloping" by the LUPMIS. All regions but Upper East and Upper West have some areas at this slope, while Volta, Eastern and Ashanti have the most. Given the low share of Ghana's territory in hills and steep-slopes, and the impact of development on these areas, consideration may be given to better ensure their protection.

Slope: Only about six percent of the territory has slopes of 30 percent (or about 17 degrees) or more, which is considered to be "steeply sloping" by the LUPMIS. All regions but Upper East and Upper West have some areas at this slope, while Volta, Eastern and Ashanti have the most. Many countries have regulations that prohibit or limit development on slopes above 10 percent due to potential consequences and extra costs. Potential consequences can include increased risk of erosion and landslides, difficult access for emergency vehicles, increased transport of polluted runoff due to fewer opportunities for pollutants to settle or be filtered by vegetation, and increased potential for septic system failure. Local governments may incur extra costs for development on steep slopes that may include: higher costs for extending infrastructure, road and culvert repair and maintenance, and special emergency vehicles. Given the low share of Ghana's territory in hills and steep-slopes, and the impact of development on these areas, consideration may be given to better ensuring their protection.

Figure 6.16 Elevation and slope



Source: NSDF

Elevation Slope

Study extracted from LUPMIS elevation data, 2013

6.7 Built heritage assets

In addition to natural heritage, man-made or built heritage sites are considered as important cultural assets. Built heritage often represents and embodies important periods of history. It includes churches and mosques, forts and castles, museums and markets as well as towns, sections of towns, and streetscapes. It helps to define a sense of place and an identity for a community. It can contribute to feelings of connectedness, and community pride and confidence. Built heritage is not just about beautiful or significant historic buildings but also may include small, modest vernacular buildings and narrow alleys that reflect the social conditions and history.

Built heritage is also important to the tourism industry. In a survey of 19 African tour operators in 2012, Ghana's cultural heritage was ranked as "strong", along with Kenya's and Senegal's, compared to those of South Africa, Cameroon and Gambia[162].

Ghana's built heritage includes its forts and castles, traditional architecture, historic urban districts, colonial mansions, and the sites connected to the history of the slave trade.

The United Nations Education and Scientific and Cultural Organisation, or UNESCO, recognises properties of international significance through its UNESCO world heritage list. Ghana has two sets of heritage properties on the list: (i) Forts and Castles and (ii) the Asante Traditional Buildings. Other cultural assets on the UNESCO's tentative list are the Tenzug-Tallensi settlements, Navrongo Catholic Cathedral, Nzulezu Stilt Settlement in the Amanzuri wetland and the Trade Pilgrimage Routes of North-Western Ghana. Other traditional sites include buildings in the Northern Region, the Kassena houses in Upper East region. Another important heritage site is the Larbanga Mosque.

6.7.1 Forts and Castles.

The Forts and Castles UNESCO property includes three castles and 15 coastal forts. The castles comprise Cape Coast, St. George's d'Elmina and Christiansborg in Accra. The forts comprise Good Hope at Senya Beraku; Patience at Apam; Amsterdam at Abandzi; St. Jago at Elmina; San Sebastian at Shama; Metal Cross at Dixcove; St. Anthony at Axim; Orange at Sekondi; Groot Fredericksborg at Princesstown; William (Lighthouse) at Cape Coast; William at Anomabu; Victoria at Cape Coast; Ussher at Ushertown, Accra; James at Jamestown, Accra and Apollonia at Beyin, four forts partially in ruins (Amsterdam at Abandzi; English Fort at British Komenda; Batenstein at Butre; Prinzensten at Keta), four ruins with visible structures (Nassau at Mouri; Fredensborg at Old Ningo; Vredenburg at Dutch Komenda; Vernon at Prampram and Dorothea at Akwida) and two sites with traces of former fortifications (Frederiksborg at Amanful, Cape Coast and Augustaborg at Teshie, Accra).

The Elmina and Cape Coast castles are considered the most significant, due to their role in the history of slave trade, they also receive the most visitors. Nonetheless, there is a need to preserve all historical sites. There are proposals to create site museums at James Fort and Fort Appolonia.

6.7.2 Asante Traditional Buildings

The Asante Traditional Buildings UNESCO property are a group of traditional buildings of the Asante civilization, which reached its peak in the 18th century. The

[162] National Tourism Development Plan (2013-2027)

buildings include ten shrines and fetish houses at Abirim, Asawase, Asenemaso, Bodwease, Ejisu Besease, Adarko Jachie, Edwenase, Kentinkrono, Patakro and Saaman. Most of these are to the north-east of Kumasi.

6.7.3 Historic towns and cores

The historic towns of Jamestown in Accra and historic cores of Elmina, Cape Coast, Kumasi and Sekondi, could be developed to serve as tourist attraction if action is taken to preserve the historic features, ensure compatible and new development and upgrade the infrastructure and services. The Ministry of Tourism has initiated the Slave Route Project to preserve areas associated with the slave trade. The route covers the castles and forts and the slave routes of Yendi, Salaga, Assin and Gwolu.

6.7.4 Spatial Distribution of Tourist Sites

Natural and cultural heritage sites are located in every region and regions are generally associated with specific heritage assets. For example, Central region has the historical castles and the Kakum Forest, it receives the largest number of international visitors and hosts the Panafest, an event that attracts large number of African-Americans. Greater Accra region serves as the international gateway and has a few tourist sites in Accra and Ada along the Volta Lake. Eastern region has the Aburi Botanical gardens (near Accra), Boti Falls and the Bunso Arboretum. Western region has the Ankasa Resource Reserve, the Nzulezu stilt settlement and long stretches of undeveloped natural beaches. Volta region has the Amedzofe/ Mountain Gemi natural landscapes, Wli waterfalls, Kyabobo national park and the Tafi-Atome Monkey Sanctuary. Northern and Upper regions have the Mole National park, the Paga crocodile pond, the Salaga market and the Tongo/Tenzung hills.

6.7.5 National Tourism Development Plan (2013-2017)

The Ghana National Tourism Development Plan (NTDP) 2013-2027 identifies the existing spatial footprint of tourist attractions as comprising a prime tourism triangle (Accra, Kumasi and Cape Coast) and three secondary spurs. The spurs run from: (i) Cape Coast through Western region and include the coastal strip with beaches, the Nzulezu Stilt Settlement and Ankasa; (ii) Accra eastward to the Akosombo dam and recreational activities on the lake and to the Ramsar sites along the coast; and (iii) Kumasi northward to Tamale and Mole National Park.

The NTDP sets out a three-phased infrastructure development plan. The overall concept is that Phase I will remove growth constraints on well-established tourism destinations, phase II will open up underdeveloped tourism areas and resources, and phase III will sustain growth. More specifically:

- Phase I from 2013-2017 includes (i) extending the core tourism area to Tamale by upgrading Tamale Airport to provide international service and (ii) upgrading the eastern road corridor.

  Specifically, the corridor will be upgraded from Akosombo though Yendi to Tamale, with spurs from Tsoxor to the lakeside and to Kete Krachi and from Tamale through Salaga to Makongo on the lake, with an enhanced ferry link to Akosombo. The upgrade will reduce travel times and improve access to tourism resources that have previously been relatively inaccessible while the two new spurs will enable access to the lakeside and encourage investment. NTDP regards Lake Volta as an important tourism asset and states that “One of the most significant, in respect of potential tourism benefits, is the investment in transport and recreational facilities in and around Lake Volta, which offers a very cost-effective way to create a new attraction in itself, but also to extend and enhance the network of travel and access options throughout Ghana and to form

a transit and recreational corridor from which additional new attractions can grow".

- Phase II from 2018-2022 includes the creation of new secondary tourism spurs: from Kumasi through Bomfobiri to Makongo including a ferry crossing; Kumasi to STMA; Mole to Wa Town; and Techiman to Bui National Park and to Sunyani.
- Phase III from 2023-2027 includes reinforcing transit corridors to develop new attractions, linking spurs to create additional circuit to open up new tourist resources, developing rail lines leading to new tourist centres, and extending tourism framework to every region.

The NTDP also provides project profiles for the following sites: Elmina and surroundings, Kakum National Park, Kumasi traditional buildings and Yaa Asantewaa story, Kumasi craft villages, Mole National Park and surroundings, Volta Lake and surrounding attractions, Shai Hills Resource Reserve, Sekondi Urban Regeneration and the Eastern Region Route

The main challenges to the tourist industry is transportation and access to tourist sites. Other challenges are the lack of coordination between agencies responsible for the various tourist sites. For example, district assemblies manage the RAMSAR sites, the Ghana Museum and Monument Board under the Ministry of Chieftaincy and Culture. The Wildlife Division of the Ministry of Lands and Natural Resources is in charge of wildlife and protected areas.

6.8 Recommendations to address existing and future challenges and opportunities

This section discusses several issues and challenges that have been identified in previous sections. These include: built-up density and density change; cropland per person; land cover change in national parks and game reserves; reversing forest cover loss and degradation and increasing forest cover; fragmented protected areas; protecting existing and increasing areas under crops; and protecting wetlands.

6.8.0 Adopt a regional- and district-level approach to land cover management

Variation in land cover profiles warrants a regional and district approach to land cover management that considers the present land cover profiles, the historical trends, and the dynamics of change. Particular attentions have to be given to the dynamic land cover types (cropland and grassland), and loss of cropland, forests, and wetlands.

Forest cover: Regions with over 50 percent forest cover are Western, Central, Ashanti, Brong Ahafo, and Eastern, these regions have to focus on protecting their existing forests from degradation and exploitation. Regions with a lower share of forests are Volta and Northern, these have 25 percent and Upper East, Upper West and Greater Accra have less than ten percent. These regions will have to focus on expanding forest cover. Priority attention has to be focused on the highly-forested regions with long term forest cover loss, i.e. Western, Eastern, Central and Ashanti, and on Upper West with shorter but significant (21%) short term loss. Forest cover loss to cropland has to be watched in Western, Central and Eastern regions.

Grassland cover: Regions with more than 50 percent grassland cover—Upper East, Upper West, Northern, and Greater Accra—have to be supported to find more productive uses of their grassland. Regions with a lower share of grassland—Volta, Brong Ahafo and Eastern have 26-33 percent and Ashanti, Central, and Western

have less than 13 percent. Long term increases of grassland cover in Volta (20%) and Greater Accra will have to be further investigated, confirmed, and explained.

Crop cover: Cropland share of regional areas varies far less widely than that for grassland and forests. From a high of 32 percent in Upper East to a low of 17 percent in Greater Accra. All regions have maintained a reasonable share of crop cover. Priority attention will have to be given to Volta as the only region to lose cropland, although Greater Accra and Upper East will also have to be watched. Meanwhile, Western region's dramatic increase in crop cover (233%) has to be investigated, confirmed, explained and lessons learned.

Wetlands: Regions with high shares of wetlands owing to Lake Volta, namely, Volta, Eastern and Brong Ahafo, will have to develop plans to manage them, including for protection and development. Wetlands in the coastal zone, especially where threatened with urban development, need special protection. Large and critical decreases in coastal wetlands, namely in Central, Western, and Greater Accra regions of 40, 36 and 22 percent, respectively, with Greater Accra and Central's losses over two periods and Western's over one, will also have to be addressed. Greater Accra's wetlands is being converted into cropland. The absorption of CO_2 by wetlands may even allow these regions to tap on funds such as DEPP++, and involve local communities just as for forest areas, to ensure the means for their conservation and protection.

Built-up area: While the rate of increase of built-up or settlement cover has decreased from 1990-2000 to 2000-2010, its annual growth rate of 5.4 percent is still 1.2 percent faster than the 4.2 percent urban population growth, and is a clear indication of urban sprawl. Particular attention will have to be accorded to settlement cover of over 69 percent in four regions, namely, Ashanti, Brong Ahafo, Eastern, and Western, this is an indication of their high rate of urban development expansion and perhaps a matter of concern. It is recommended that the Government establishes improved mechanisms for monitoring urban development spreading and density as part of its permitting system, and needs to be checked with satellite photos on a regular basis as well as field inspections. While built-up area share is highest in Greater Accra (18%) it is not of itself a major concern. Loss of cropland to settlements is a matter of concern in Volta, Upper East, and Upper West; loss of forests to settlements are high in Western and Eastern regions.

Note that subsistence farmers on the fringes of sprawling settlements, once they have given up their lands away to development, become landless and migrate to the (nearest) towns and cities, take low paid, unskilled jobs and contribute to the sprawling of shanty towns and slum areas, which further creates downstream social problems, such as increase of urban poverty, crime and violence, and threatens food security, or otherwise the produce have to be transported from further locations, etc. which calls for due attention and an integrated spatial, environmental and socio- economic development approach.

6.8.1 Improve data on crop cover

MOFA data on crop cover covers only food crops, not other crops, and differs from crop cover data NSDF study derived from satellite imagery. MOFA and the Forestry Commission will have to share their data with each other and develop procedures to improve data quality. The Forestry Commission could use MOFA to "ground truth" their data and MOFA could use the satellite imagery to locate and determine the quantity of cropped areas by type of crop.

6.8.2 Built-up area density and density change

Built-up urban population density -- the number of people on a square kilometre of developed land -- is an important indicator of the land use efficiency for urban development. It also relates to the costs of providing, operating and maintaining urban infrastructure and services.

Built-up urban population density may be calculated at the national, regional and district levels by dividing the urban population by the total built-up area[163].

Nationally, in 2010, built-up area density was about 36 persons per hectare (ppha), or 3,600 persons per square kilometre (ppkm), as shown in Table 6.11 below. Average built-up area density varies across regions. Greater Accra's, is at 53 p/ha, and was about 50 percent more than the national average, while that of Ashanti, Central and Eastern are all about 10 percent more than average. The outlier is Upper West, where the built-up area population density is only 10 p/ha.

Table 6.11 Built-up area density

	2000			2010			% change per year 2000-2010		
	built-up km²	population '000	density (p/ha)	built-up km²	population '000	density (p/ha)	built-up km²	population '000	density (pop/ha)
Volta	150	566	38	251	714	28	5.2	2.4	-2.8
B. Ahafo	222	679	31	442	1,028	23	7.1	4.2	-2.7
Ashanti	*361*	*1,853*	*51*	*726*	*2,897*	*40*	*7.2*	*4.6*	*-2.5*
Upper West	84	101	12	116	114	10	3.3	1.3	-1.9
Western	180	699	39	305	1,007	33	5.4	3.7	-1.6
G Accra	443	2,548	57	689	3,629	53	4.5	3.6	-0.9
Upper East	43	144	34	62	220	36	3.8	4.3	0.5
Northern	188	484	26	276	751	27	3.9	4.5	0.5
Central	186	598	32	275	1,037	38	4.0	5.7	1.6
Eastern	178	569	32	303	1,143	38	5.5	7.2	1.7
Ghana	2,035	8,283	41	3,444	12,551	36	5.4	4.2	-1.1

Source: NSDF study based on Forestry Commission and GSS data, 2010

The annual percentage growth in built-up area between 2000 and 2010 is calculated using the growth rate formula[164]. Subtracting the annual growth rate of the built-up area from the annual growth rate of the urban population gives a rough estimate of the annual growth rate of urban development density. For example, at national level, the urban population increased annually by about 4.2 percent while the built-up area increased by about 5.4 percent, indicating that national urban development density had decreased by about 1.1 percent per year. This rate of urban development density decline is slightly more than half of the 2 percent figure for a large group of cities throughout the world for the decade 1990-2000[165].

At the regional level, built-up densities increased in four regions but declined in six, as shown in Table 6.11 and Figure 6.17. Regions with the highest rates of decline

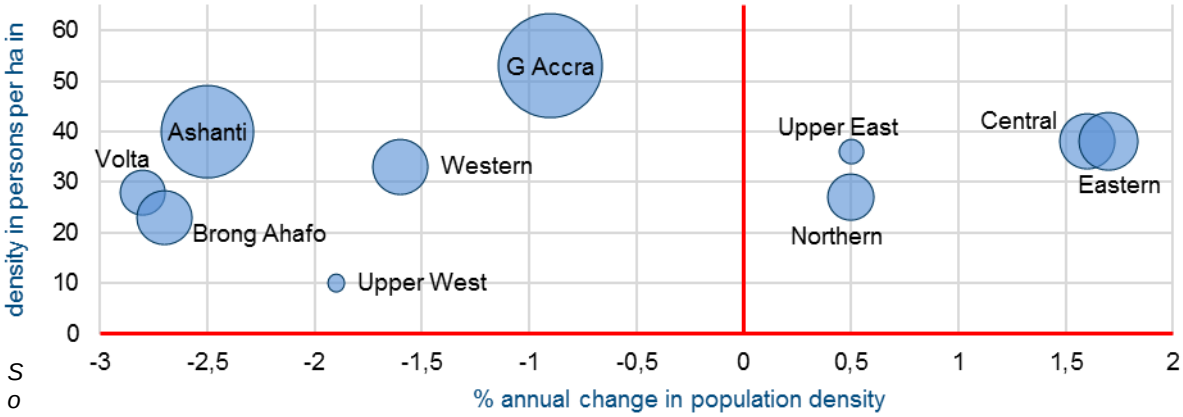
[163] The figures are considered to be rough estimates because the population enumerated as "urban" in the population census is not necessarily the same population that occupies the physical built-up area. This is because enumeration areas do not necessarily correspond to built-up areas. Some households residing in the built-up areas may not have been enumerated as "urban" while others that are not in the built-up areas may have been.

[164] ((density in 2010 / density in 2000) ^ ((1/10 years)-1) * 100)

[165] http://www.lincolninst.edu/pubs/2094_Planet-of-Cities. This study examined the average built-up area densities of a sample of 120 cities. It found that in 75 of 88 cities in developing countries and in all 32 cities in developed countries, the annual rate of density decline was about 2 percent during the period 1990-2000.

were, in order, Volta, Brong Ahafo, Ashanti, Upper West and Greater Accra. Policies to address the decline in urban population densities, which is related to urban sprawl, may, therefore give priority to understanding and controlling urban development in these regions.

Figure 6.17 Built-up area density and annual density change, 2000- 2010



Sourrce: NSDF based on Forestry Commission and GSS Population Census, 2010

6.8.3 Cropland per person

A major global concern since at least 1972 has been how to ensure sufficient food production to feed the future population[166]. According to World Watch, the world's population is increasing faster than the area of crop land, meaning that each planted hectare will need to produce more food to meet the growing demand. Globally, the amount of cropland-per-person, or per-capita-cropland, has fallen by more than half since 1960. In that year, the world had about 0.5 hectares of cropland per person (ha/p), which some experts say is the minimum area needed to produce a diverse, healthy, nutritious diet of plant and animal products such as that enjoyed by developed countries. Yet by 2010, average per-capita cropland had fallen to about 0.23 hectare, less than half of the minimum.

Per-capita-cropland varies significantly throughout the world. For example, while the United States has about 0.4 ha/p, China has only about 0.08 (ha/p) and is projected to lose 15 percent of its arable land in the next 20 years[167]. In Ghana, the average per-capita cropland stands at just over 0.2 ha/p in 2010. While the trend in the last ten years is favourable – crop cover has increased by 34 percent, or 2.9 percent per year, during which the population grew at 2.7 percent per year rate – the net cropland-to-population increase of 0.2 percent per year is a margin that many may view as insufficient to ensure food security for Ghana, given the trends toward increasing per-capita food consumption as a result of higher incomes, let alone contribute to global food security.

From a regional perspective, all other things being equal, the higher the per-capita-cropland ratio, the more food-secure is the region's population, or the higher the agricultural production surplus (Table 6.12 and Figure 6.18). In 2010, cropland-per-capita in Northern and Upper West regions was about three times the national average, while Greater Accra, Central, Ashanti and Eastern regions had below average ratios. Between 2000 and 2010, three regions saw an annual decline in this ratio – especially Volta (by -6%) but also Greater Accra (-2.4%) and Eastern (-1.4%)

[166] http://www.donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf

[167] Preparing for China's one billion; MGI; 2009

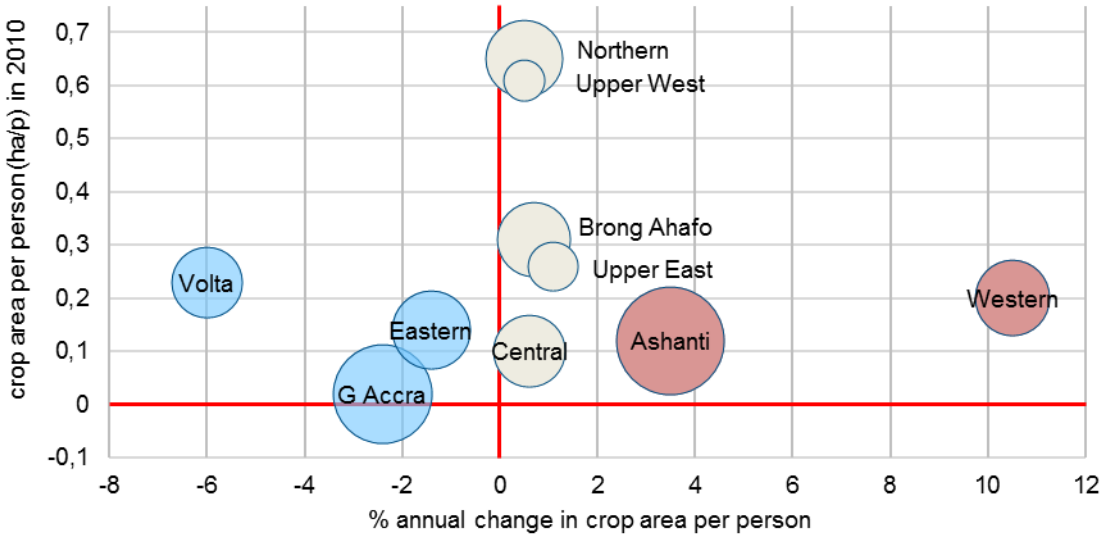
– while Western (+10%) and Ashanti (+3.5%) saw a significant rate of increase. The rate-of-change of per-capita cropland ratio matters because it is an indicator of the trend in a region's food security as well as prospects for selling agricultural products to other regions.

Table 6.12 Change in population and crop cover 2000-2010

	2000			2010			% change per year		
	crop area km²	pop '000	ha/pax	crop area km²	pop '000	ha/pax	crop area km²	pop '000	ha/pax
G Accra	581	2,906	0.02	627	4,010	0.02	0.8	3.3	-2.4
Central	1,451	1,594	0.09	2,137	2,202	0.10	3.9	3.3	0.6
Western	1,442	1,925	0.07	4,810	2,376	0.20	12.8	2.1	10.5
Eastern	3,455	2,107	0.16	3,734	2,633	0.14	0.8	2.3	-1.4
Ashanti	3,029	3,613	0.08	5,631	4,780	0.12	6.4	2.8	3.5
Volta	7,012	1,635	0.43	4,889	2,118	0.23	-3.5	2.6	-6.0
Brong Ahafo	5,242	1,815	0.29	7,172	2,311	0.31	3.2	2.4	0.7
Northern	11,219	1,821	0.62	16,028	2,479	0.65	3.6	3.1	0.5
Upper West	3,351	577	0.58	4,274	702	0.61	2.5	2.0	0.5
Upper East	2,173	920	0.24	2,768	1,047	0.26	2.5	1.3	1.1
Ghana	38,956	18,913	0.21	52,071	24,658	0.21	2.9	2.7	0.2

Source: NSDF based on Forestry Commission, 2010

Figure 6.18 Change in population and crop cover 2000-2010



Source: NSDF Study based on Forestry Commission 2013.

6.8.4 Land cover change in National Parks and Game Reserves

Because the Medium-Term National Development Framework includes a policy to protect and preserve natural reserves, NSDF analyses the spatial distribution and land cover of these assets.

Table 6.13 quantifies, for each of the fifteen national parks and game reserves, their main land cover types[168] in 2010 and the land cover change between 1990 and

[168] The land cover types of "wetlands" and "other" are not included because there areas are negligible.

2010. Grassland accounted for more than half of the land cover, while only 38 percent was under forest cover, with the balance of 6 percent under crops, a finding that may warrant further study. Settlement cover was found to be negligible. While six protected areas had over 90 percent forest cover, forest cover in the three largest parks did not exceed 60 percent (Digya) and was less than a quarter in Mole and Bui.

Table 6.13 Land cover and land cover change in national parks and game reserves

	area (km^2)	land cover 2010				% change 1990 - 2010				% distribution 2010			
		crops	forest	grass	built-up	crops	forest	grass	built-up	crops	forest	grass	built-up
Mole NP	4,899	236	1,131	3,529	1	110	35	-11	414	5	23	72	0.0
Digya NP	2,768	55	1,667	999	0	-80	33	-18	238	2	60	36	0.0
Bui NP	1,855	115	459	1,270	0	558	23	-13		6	25	68	0.0
Gbele GR	901	41	169	682	2	-55	66	-4	90	5	19	76	0.2
Kogyae NR	336	158	44	133	1	342	-53	-36	165	47	13	40	0.2
Ankasa GR	326	5	320	2	0	3,825	-2			1	98	0	0.0
Bia GR	261		248	1	0	192	-2	-73	40	5	95	0	0.1
Kakum NP	175	8	162	5	0	1,387	-7	12,650	1,300	5	92	3	0.1
Boabeng MS	152	8	108	35	1	-63	117	-57	304	5	71	23	0.7
Nini-Shuien NP	148	7	140	1		72,00	-5			5	95	0	
Kakum GR	143	2	138	2	0	1,671	-3	18,700		2	97	1	0.0
Bia NP	80	2	78	0	0	413	-2	-92		3	97	0	0.0
Kalakpa GR	78	4	3	66		960	546	-15		5	4	84	
Bomfobiri WS	77	53	11	14		1,364	-66	-67		68	14	18	
Shai Hills RR	7	0		7		-99	100	22		0		100	
ALL	12,207	707	4,678	6,744	6	26	21	-13	180	6	38	55	0.0

Source: NSDF Study based on Forestry Commission 2010

Land cover change in these parks is generally found to be in a positive direction, with grassland decreasing (-13%) and forest cover increasing (21%). However, increases in crop and built-up cover, by 26 and 180 percent respectively, may indicate a lack of land use control that needs to be addressed. Further, the land use change in several parks may be a matter of concern to be studied in the field. For example, eleven parks have gained crop cover, eight parks have lost forest cover, three have gained grass cover and seven have gained built-up cover.

6.8.5 Address rural settlements in forest reserves

Rural settlements that are located in and near forest reserves present a threat if communities degrade and exploit forest resources, but an opportunity if they are encouraged and supported to sustainably manage these resources and police encroachments. NSDF finds about 1,170 rural settlements, with an estimated population of about 528,000, are located within the boundaries of 297 forest reserves. Many of these settlements are or may not be approved by local authorities, who will have to undertake a systematic assessment.

Table 6.14 Rural settlements in forest reserves

Table A1.1	number of settlements	estimated population	average settlement population
Greater Accra	335	130,477	389
Central	84	60,381	719
Western	51	26,386	517
Eastern	186	76,087	409
Ashanti	168	63,382	377
Volta	146	72,618	497
Brong Ahafo	86	33,919	394
Northern	80	40,153	502
Upper West	10	5,456	546
Upper East	27	19,330	716
Total	1173	528,189	450

Source: NSDF analysis of Forest Commission satellite imagery

6.8.6 Support mining of bulking minerals through infrastructure

The economic feasibility of mining heavy minerals largely depends on the transport costs. Transportation represents a large part of the total cost of mining. While Ghana has significant mineral deposits, a number of these have remained unexploited owing to inadequate transport infrastructure.

Some existing mines have become less productive due to deterioration of infrastructure. A clear example is encountered in the Nsuta mine which is affected by the deterioration of the rail connection to Takoradi port.

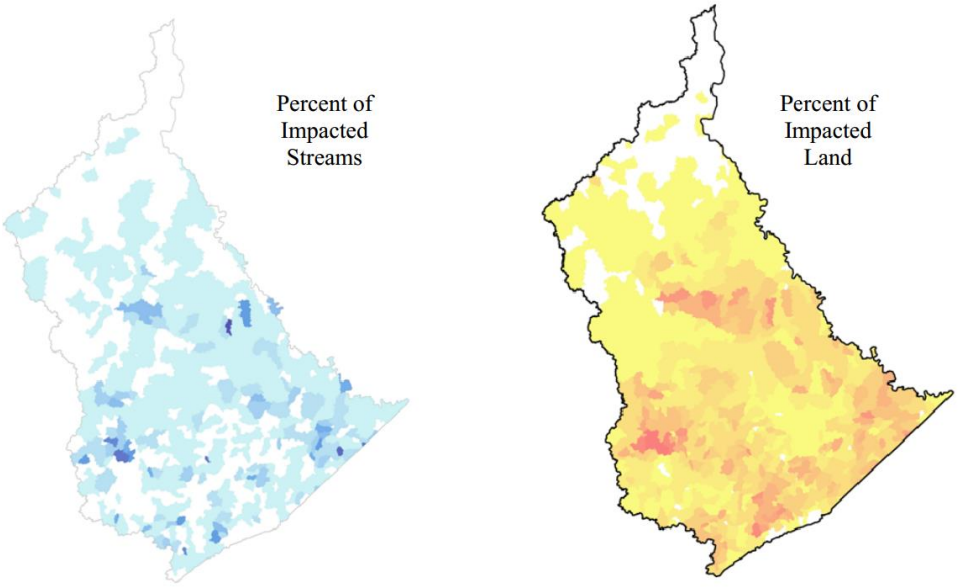
NSDF supports the Minerals Commission belief that investment in improved transport, including rail and barges on Lake Volta, as well as the new electric power from Bui dam would render these mines economically viable.

Improve the economics of mining of the Sheini iron deposits by improving transport to the coastal ports, establishing a plant to upgrade the ore on site, providing lower-cost power from the Nigerian gas pipeline or other sources, and preparing a long-term iron-ore development plan between Ghana and Togo.

6.8.7 Address the environmental impact of mining

NSDF acknowledges the widespread stakeholder concern about environmental impacts of mining but underlines that data on the location and severity of these impacts is lacking. The only locational data obtained points to particular problems at Tontokrom in Ashanti region, Dunkwa in Central region and in Upper Denkyira East district in Central region. NSDF study recommends that government improves its data collection on mining impact and undertake a GIS based mining impact study. Figure 6.19 provides an example of the results of such a study in Kentucky, USA. The study located and prioritised impacts for preparing a mitigation strategy.

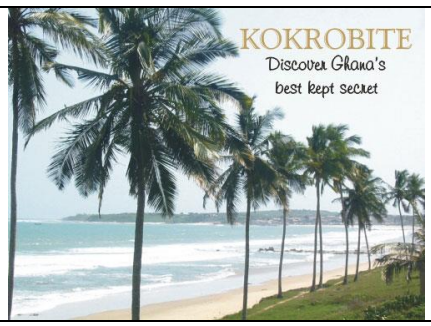
Figure 6.19 Example of results from a GIS mining impact study



Source: Spatial Analysis of Coal Mining Impacts on Eastern Kentucky Watersheds; Downstream Strategies - GIS Solution

6.8.8 Protect and develop water-related natural resource assets

Prepare a comprehensive inventory and database of coastal resources, including beaches, wetlands and villages and prepare protection and development plans. Resources noted for their scenic values will have to be protected and developed to enable visitors to access and enjoy these features. Notable resources in beaches in Western region Brenu, Busua and Axim; in Labadi Beach and east of Accra in Ada; in Keta and Prampram, Lake Volta, Bui Lake and Bosomtwe; and the waterfalls.



6.8.9 Protect landscapes with high elevation and steep slope

NSDF recommends a policy that values the natural landscape. Including views of and from areas of high elevation.

Development must be prohibited or restricted on steep slopes because of the landslide hazards, erosion, floods and higher infrastructure costs.

Development on areas of high elevation will have to be prohibited or restricted for aesthetic reasons, recreational opportunities, and conservation of landmarks, scenic-viewshed value, and recreational value. Many nations have found that once a viewshed is degraded, the property values around it may not increase or may even decline. Consideration has to be given to setting an elevation above which development restrictions would apply, for example, on the two percent of the territory that is above 400 metres in elevation, which are found mostly in Eastern,

Ashanti, Volta, Brong Ahafo and Western regions, and along Lake Volta from just north of Koforidua to the border of the Ashanti Region.

Protected mountains would rather include the Odweanoma Mountain in Eastern region and the Mountain Afadja in Volta region. Because the mountain top provides panoramic views of surrounding communities, forests, mountains, deep valleys, and, in distance, Lake Volta, development that is visible from high elevations should also be subjected to appropriate restrictions.

Volume I

Chapter 7

Social Development

7 Social Development

The Draft Ghana Shared Growth and Development Agenda II (2014-2017) addresses social development under the chapter 'human development, productivity and employment'. This chapter addresses several key focus areas that include the sectors of education, health, and sports, population subgroups, namely, children, youth, aged, the poor and disabled, as well as the themes of development and protection, population management and migration; human resource development, social policy and social protection.

NSDF considers the aspects of these focus areas that have spatial characteristics that may be addressed by spatial planning at the national scale, including education, health, housing, basic services, poverty, gender and social welfare. It also considers the Savannah Accelerated Development Authority area, which was established to address the regional disparities between the north and the south.

7.1 Education

7.1.1 Introduction

Education empowers both the individual and society. It enables the individual to engage in civic responsibilities, improve their health and economic well-being, amongst others. A well-educated society has higher economic productivity, innovation and competitiveness.

Since the establishment of the “castle schools” in the colonial era forts, formal education has improved with the introduction of several pre- and post-colonial policies and reforms. These include the Education Ordinance Act, Accelerated Development Plan for Education, Education Act of 1961, Educational Development Plan of 1969, Dzobo Committee educational reforms and the educational reforms that introduced the FCUBE policy and the 2008 Education Act.

The Government of Ghana’s vision under the Ghana's Draft Ghana Shared Growth and Development Agenda I (2008-2013) is to “achieve a knowledge-based and innovative corps of men and women who are able to transform Ghana’s economy and compete effectively in a globalized world”. Creating this knowledge base economy requires a highly skilled and educated workforce. Nevertheless, in 2010, only 2.5 percent of the workforce had a tertiary level education (GSS, 2010). Creating an innovative workforce will thus require a huge investment in education, particularly at the tertiary level.

This section examines the existing spatial patterns and trends in the availability of, access to, and the future demand for educational facilities.

A major limitation to understanding spatial patterns and distribution of facilities is the absence of data on the point locations of educational facilities. Information on point locations makes it possible to determine the size of the population within a given distance of the facility. In the absence of such data, analysis must be based on general regional and district trends. In the case of tertiary education, settlements with tertiary education facilities are used as proxy to indicate the location of a facility.

7.1.2 Policy and Institutional Framework

The Government of Ghana Education Strategic Plan 2010-2020 (MOE, 2012) includes the following key strategic policy goals:

- **Basic education:** making kindergarten and basic education available to all regardless of gender and socio-economic status;

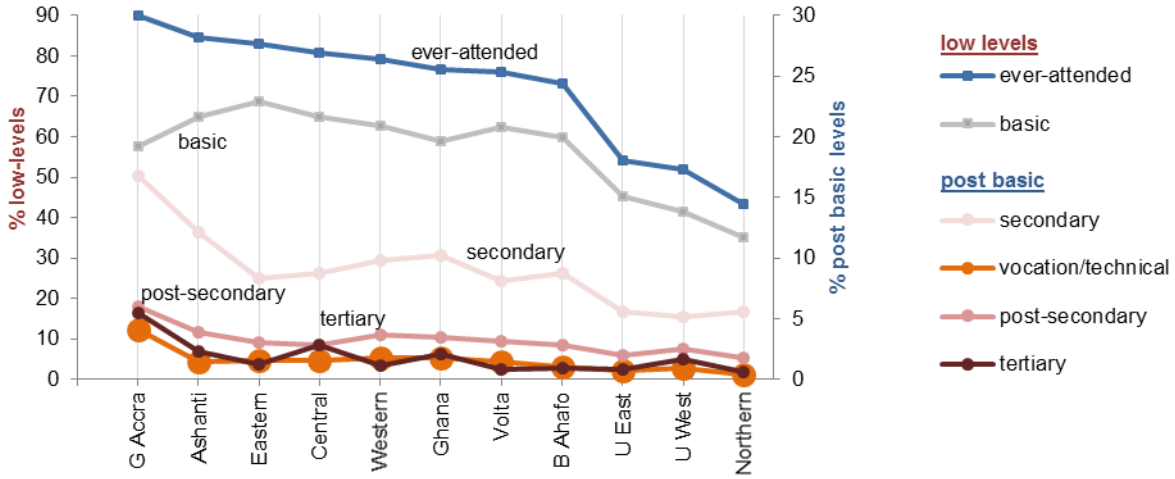
- **Post basic education:** equitable post-basic education for all who are eligible, i.e. access to quality senior high schools; opportunities for relevant education and training through technical institutes and apprenticeships;
- **Non-formal education:** opportunities for adults and out-of-school youth to access education through complementary schemes, technical and vocational skills development and local apprenticeships;
- **Tertiary education:** equitable tertiary education for all who are eligible; emphasis on science, technology and national needs; expanded to include open universities and new universities;
- **Education management:** improvement of planning and delivery of education by devolution to districts while retaining responsibility for norms, standards and systemic accountability at the national level.

7.1.3 Educational trends and present status

Policies and reforms have contributed to an increase in educational attainment. From 1960 to 2010, the population that had attended school increased from 27 to over 76 percent. The gap in male and female educational attainment levels also declined during the same period. Nonetheless, in 2010, about 23 percent of the population had never attended school, 60 percent had only a basic education, while only 20 percent had reached a secondary level or higher.

In general, people in the southern part of Ghana are better educated than those in the northern part[169]. In the northern part, less than 55 percent of the population had ever-attended school, while more than 70 had attended in the other regions. The same pattern holds for basic, secondary and higher education levels.

Figure 7.1 Educational attainment by region, 2010



Source: NSDF Study 2014 based on Ghana Statistical Service, 2010 Population and Housing Survey

Post basic education is particularly important given its strength at driving development. In general, Greater Accra, Ashanti and Central regions have higher post-basic levels than other regions. Within the regions, several districts—generally the most urbanised, have better educated populations than others.

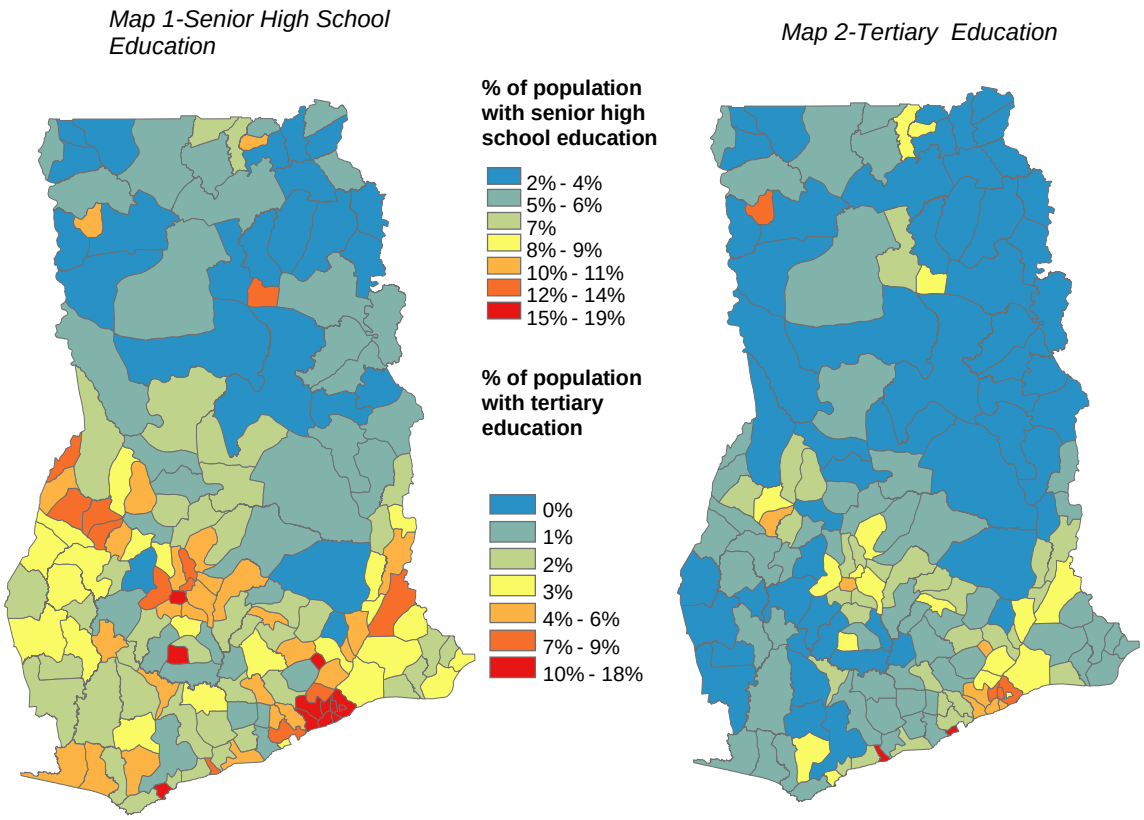
Take senior high-school, for example. In most districts in Greater Accra, KMA in Ashanti region, and STMA in Western region, about 20 percent of residents have graduated senior high school, while in 22 districts, mainly in the north, less than 4 percent have, or have taken tertiary education, where Cape Coast, Accra

[169] The Northern part of the country refers to the Northern, Upper East and the Upper West regions.

Metropolitan, Kumasi and Wa have rates of 7 percent or more while most districts have rates of less than 1 percent.

In both north and south, districts with regional capitals generally have higher post-basic education rates than others, including at the tertiary levels.

Figure 7.2 Higher-level educational attainment by district, 2010



Source: NSDF Study 2014 based on MOE data, 2010

Urban areas have proportionally more educated people, perhaps because their populations value education more highly than those in rural areas, and perhaps because they have a higher concentration of educational facilities. The north-south divide in educational attainment is indicative of past policies and the late development of an education system in the northern part of the country.

7.1.4 Tertiary Education

Tertiary institutions include universities, polytechnics and colleges. These institutions produce people with the skills and research capacity that are essential for development. For example, East Asian countries, as South Korea and Malaysia, have transformed their economies by laying a strong foundation in higher education and research.

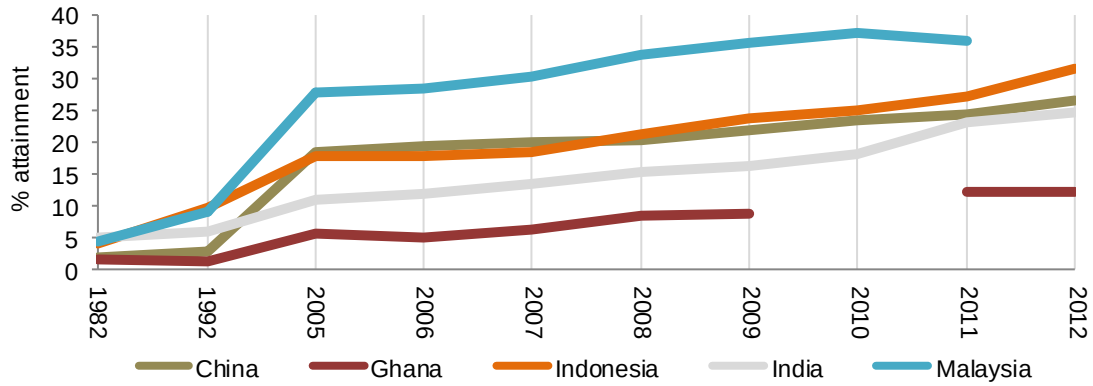
High demand for education has contributed to the growth of tertiary institutions. Tertiary enrolment rates have grown to over 280,000 in all institutions of higher learning of which 128,000 are in the nine public universities.

The numbers and types of institutions are increasing to meet demand. Until the 1990s, the only tertiary institutions were universities, all of which were publicly

owned. Tertiary institutions now include private institutions such as polytechnics, colleges of education, nursing training colleges and other university colleges.

Notwithstanding the growth, tertiary enrolment has grown slower and remains lower than in most middle income countries (Figure 7.3). In 1982, for example, Ghana, just like China, Indonesia, India, and Malaysia, had enrolment rates of less than 5 percent. By 2012, these rates rose above 25 percent in all of these countries except Ghana, where rates rose to only 10 percent.

Figure 7.3 International comparison of tertiary education in selected countries

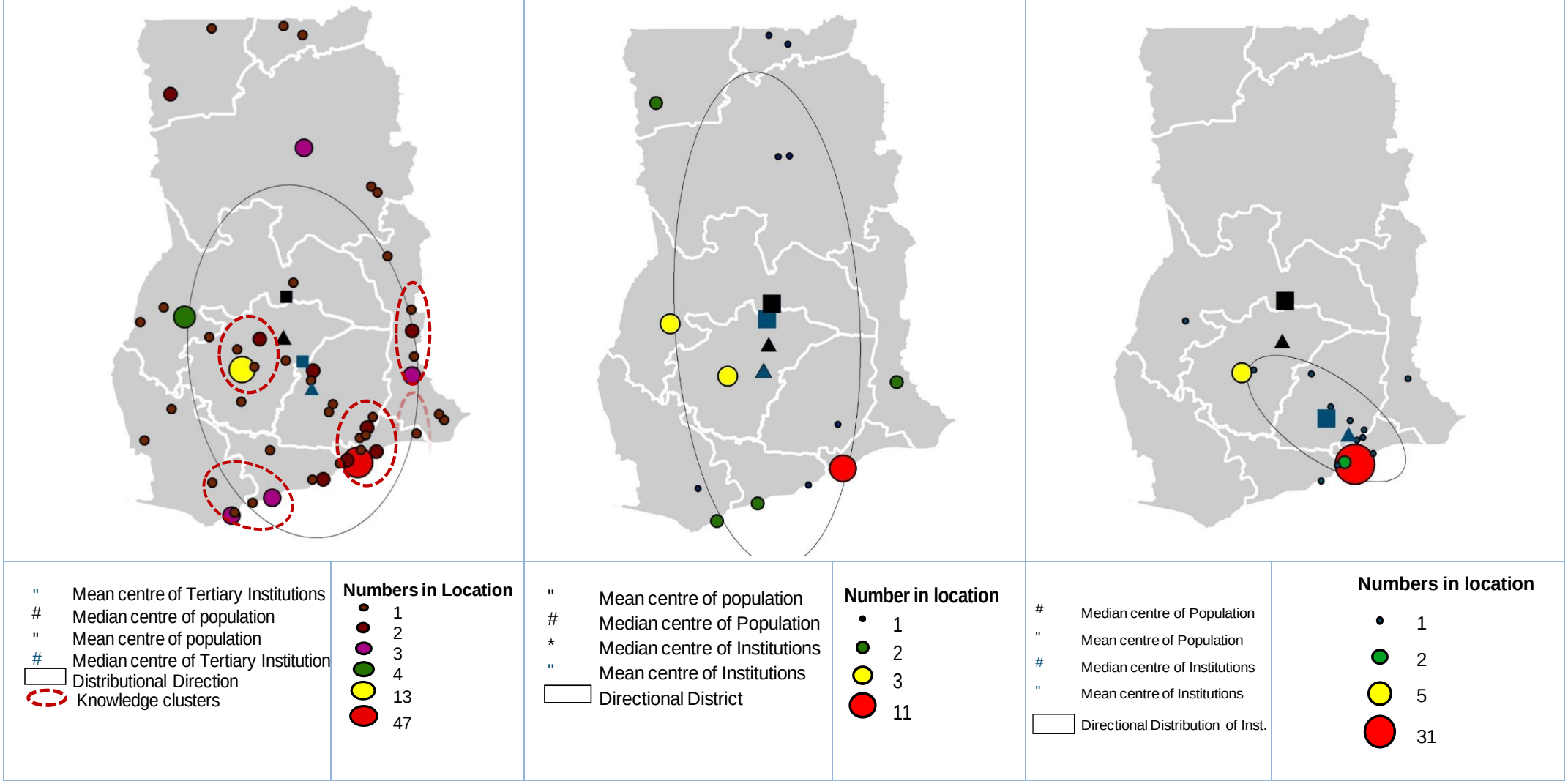


Source: NSDF Study 2014 based on World Bank Data

Spatial distribution of tertiary institutions

There are 133 tertiary institutions: 9 public universities, 10 polytechnics, 41 colleges of education, 8 public specialised institutions, 51 private tertiary institutions and 3 colleges of agriculture. However, as shown in Figures 7.4 and 7.5 institutions are unevenly distributed.

Map 1 - All tertiary institutions	Map 2 - Public tertiary institutions	Map 3 - Private tertiary institutions



Map 1 – Location of colleges of education	Map 2 – Location of nursing training colleges	Map 3 – Location of special education facilities

Figure 7.4 Location of tertiary institutions: all, public and private

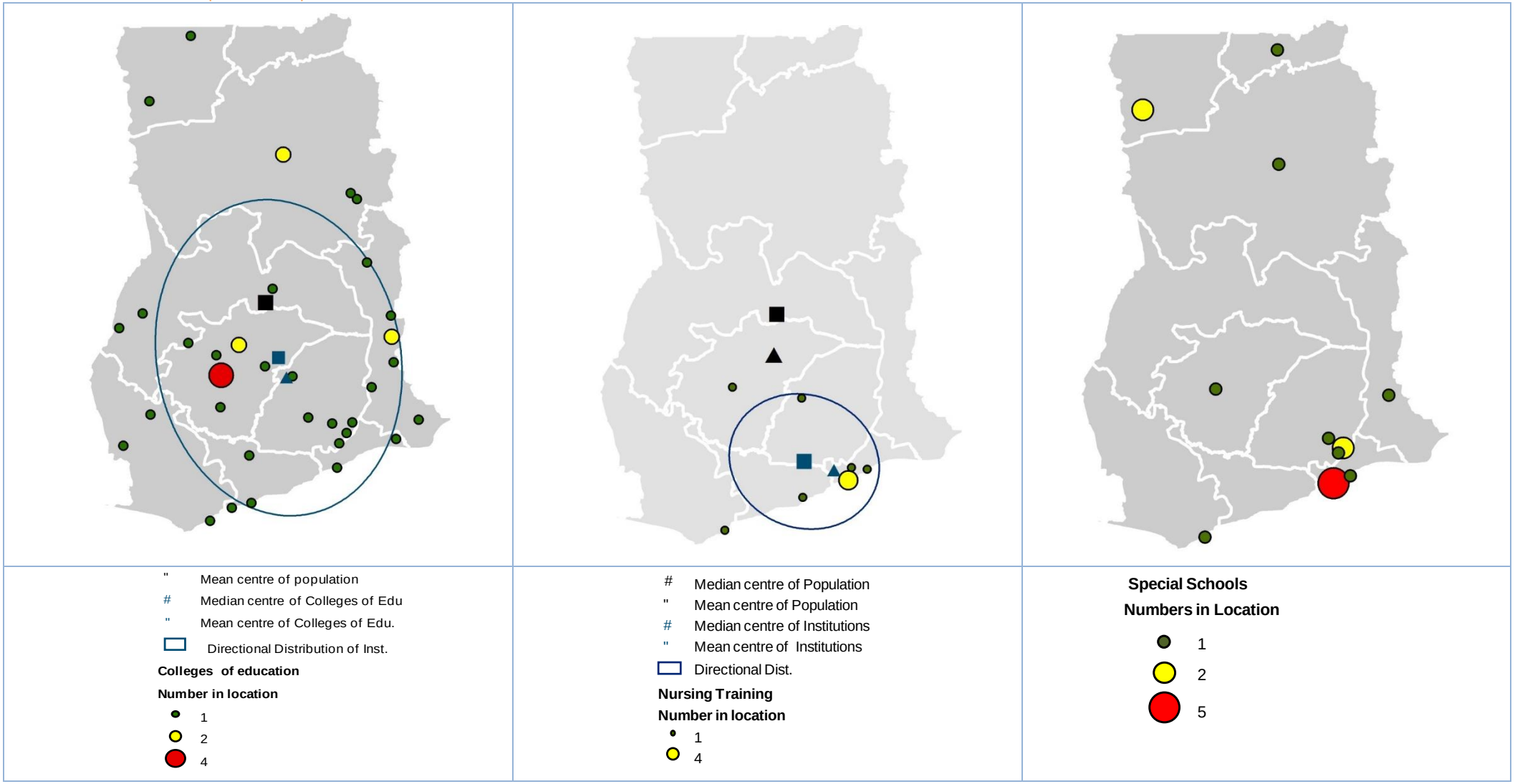


Figure 7.5 Location of tertiary institutions: colleges, nurse training and special schools

The southern part of the country has more settlements with tertiary institutions, and more with multiple numbers of institutions (map 1 on Figure 7.4). Accra and Kumasi, for instance, have 47 and 13 institutions, respectively, while the Northern and Upper regions, together, have less than 12 tertiary institutions.

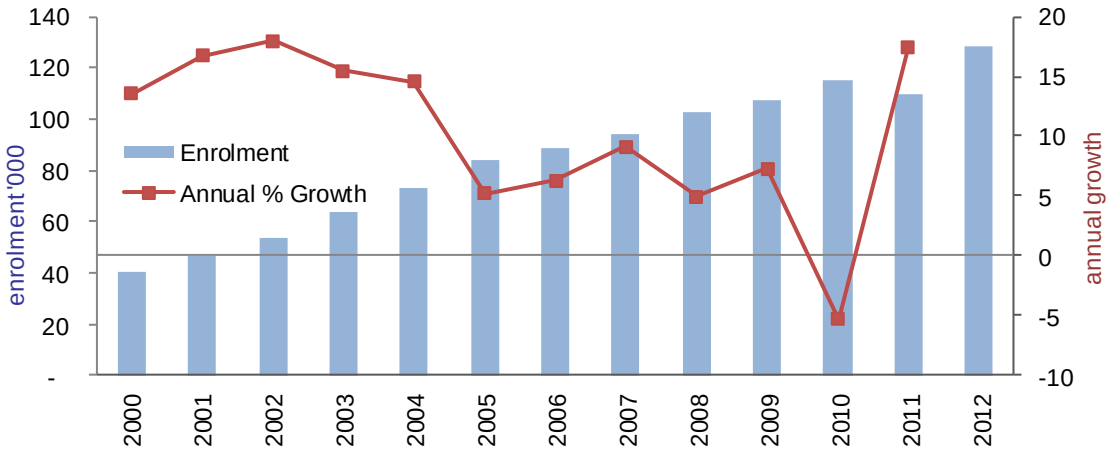
Locations can also be grouped into "knowledge clusters" of institutions in urban settlements that are closer each other. Four main clusters are apparent. In order of numbers of institutions, these are Accra, Kumasi, STMA-Cape Coast, and Ho-Hohoe. In addition, smaller clusters of institutions include Tamale, Bolgatanga-Navrongo and Wa.

Clusters provide an opportunity to strengthen inter-linkages between tertiary institutions (particularly universities) and industries. Formation of “knowledge clusters” in urbanized areas suggests a relationship between education and economic development. As such, promoting development of clusters and linking them to industry would further strengthen the economy of the country. In Northern Ghana, for instance, deliberate measures need to be instituted to create these clusters that will drive growth.

Public Universities, Polytechnics and Specialized public institutions

Universities are knowledge hubs; they create spaces to share ideas and are centres of innovation. As shown in Figure 7.6, public university enrolment has increased between 2001 and 2012 from about 40,000 students to over 120,000 students[170].

Figure 7.6 Public university enrolment



Source: NSDF Study 2014 based on National Council for Tertiary Education, 2013

The increase in enrolment in the same intuitions calls into question the capacity of the infrastructure and facilities to handle this increase.

In addition to the public universities, there are eight specialized public institutions located in Greater Accra region and a polytechnic institution in each of the ten regions. Map 2 on Figure 7.4 shows the distribution of public institutions offering degree programs (universities, polytechnics and public specialized institutions).

[170] These data represent 7 of the 9 public universities. The two new public universities: University of Energy and the University of Health and Allied Sciences began operations in 2012.

Public institutions are fairly well distributed in the country with two or more institutions in each region. Greater Accra has the highest share of public tertiary institutions as all eight public specialized institutions are located in the region. In the northern regions, the satellite campuses of the University of Development Studies in Wa, Nyankpala and Navrongo provide access to higher learning.

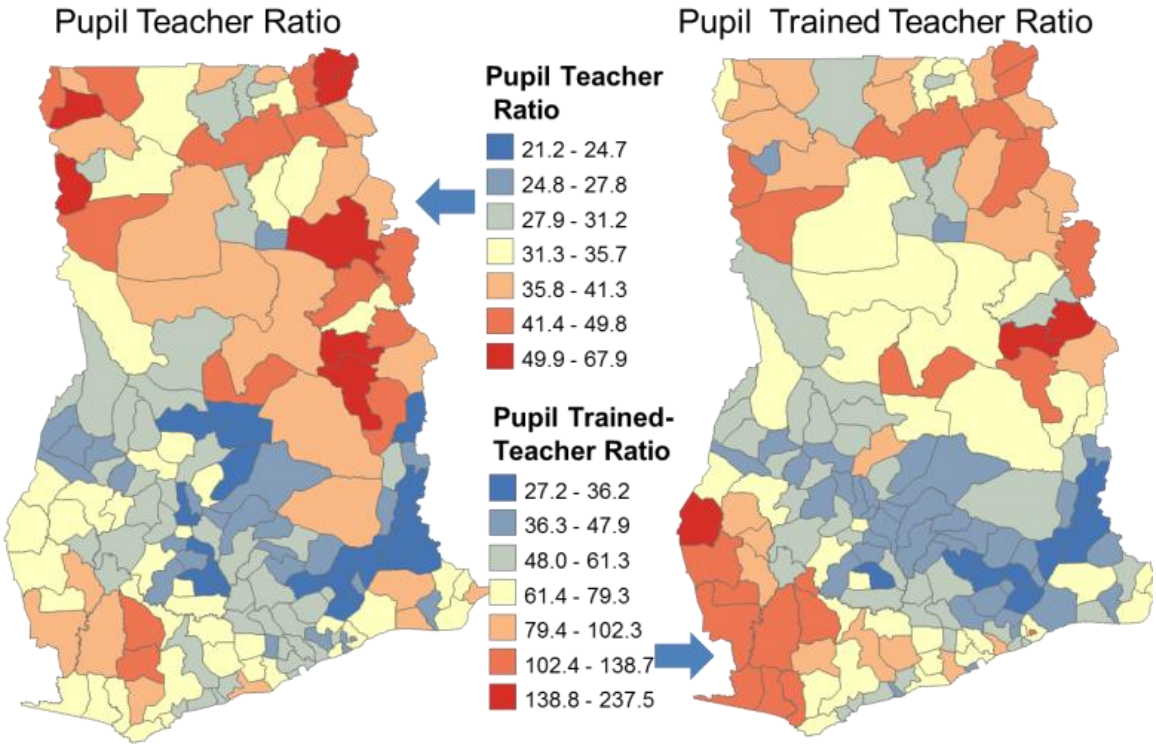
Private Universities and University Colleges

There are three chartered private universities and 51 private university colleges. Private universities have recently developed to meet the growing demand for tertiary education. Map 3 on Figure 7.4 shows the location of these institutions. Private universities are drawn to areas with existing clusters of institutions, areas with favourable economic conditions and areas with high populations. They are largely concentrated in Eastern, Greater Accra and Ashanti regions. There are no private universities in the three Northern regions. To derive the social benefits of private institutions and to bridge the north-south divide in education gaps, Government or regions could use land grants as bait to attract private investors.

Colleges of Education

Teacher training institutions are essential in supplying teachers for basic and secondary schools. Ghana's educational standards require a maximum student-teacher ratio of 35 to 1. Yet there are many districts with ratios that exceed the standard; for example, the Bia district in Western region and Bawku in the Upper East, with ratios of over 100 to 1 (Figure 7.7).

Figure 7.7 Pupil teacher ratio in primary schools



Source: NSDF Study 2014 based on MOE data, 2012

The distribution of colleges of education partly account for the low student-teacher ratios in the south (map 1 on Figure 7.7). There are clusters of colleges in Eastern, Ashanti and Western regions but no colleges in Upper East.

Nursing Training

Nursing training is essential for an effective health care system. Presently, there are eleven nursing training facilities in the coastal regions, namely, Greater Accra, Central and Western, and others in Eastern and Ashanti (map 2 on Figure 7.5). There are no nursing training institutions in the three northern regions.

Spatial strategies for developing tertiary education

Strategically located colleges and universities could strengthen local economies and help bridge the education and economic gap between the north and south. This is recognised by the Ministry of Education and the Ministry of Environment and Science. Nevertheless, science and technology education remains at a low level.

Land grant colleges

Private universities have strengthened the tertiary education system but have not helped to bridge the north-south gap nor provided science and technology education. This may be due to the higher costs of science and technology curricula compared to general education, business or humanities. These costs include specialised teachers, laboratories and equipment, as well as land acquisition.

One way to encourage private provision of science and technology courses is for the government to provide subsidies such as land grants. The land grant system was used in the USA in the 1860's to encourage states to establish colleges that offer

agriculture and mechanical training in addition to general studies. Government land was granted to states to raise funds to finance these colleges.

Knowledge clusters and hubs

Developing knowledge clusters and knowledge hubs could strengthen tertiary education in the country. Knowledge clusters and hubs encourage collaboration between industries and academic research which in turn promotes innovation and technological progress. Using knowledge hubs, Singapore and Malaysia have become regional centres of higher learning[171].

Science-based specialisations

NSDF has developed a concept for science-based regional specialisations that could provide a basis for developing existing and attracting new universities (Figure 7.8). The concept is based on existing regional specialisations and on the particular regional development challenges or opportunities. Three examples are discussed below.

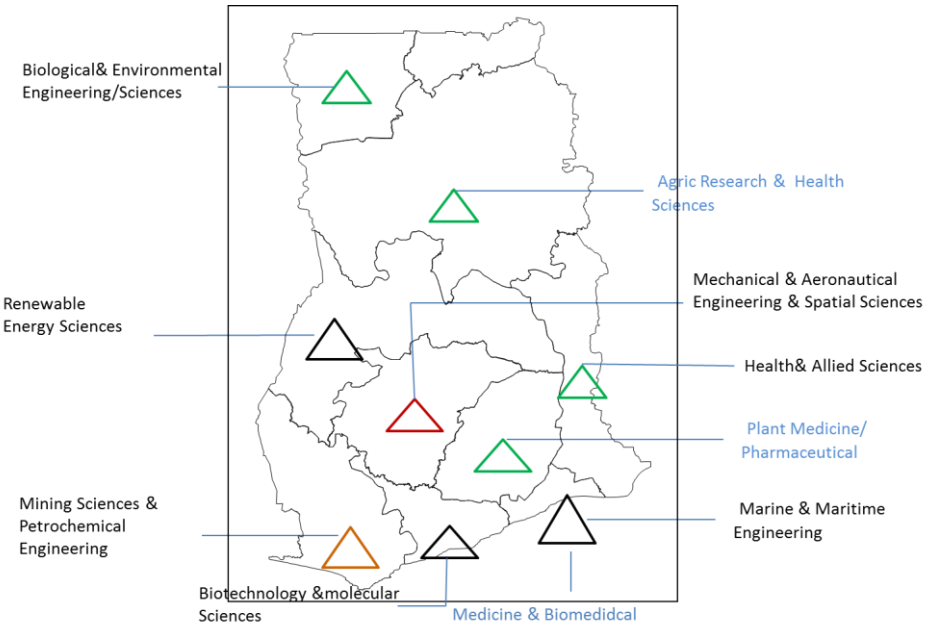
Ashanti region is the home of the University of Science and Technology as well as Suame magazine. Suame magazine is a cluster of informal workshops that specialise in metal processing, vehicle repair and vehicle assembly. The workers have high levels of practical experience but low management and R&D skills. Collaboration between the research-oriented university and the practice-focused workshops could lead to new and better products and more efficient processes as well as practical research with more concrete impacts.

Northern regions have abundant land but poor sanitation. Institutions and faculties dedicated to agricultural research and biological and environmental engineering could strengthen the synergies between agriculture and waste management that would in turn promote education while ensuring sustainable environmental practices.

Western region is home to the Tarkwa School of Mines and many mining firms. The discovery and extraction of crude oil in the region, creates more opportunities to develop the education of mining and petrochemical sciences and link education to industry.

[171] Due to similar historical precedents, Malaysia is often used as a benchmark for measuring Ghana's development.

Figure 7.8 Science-based regional academic-industry hubs



Source: NSDF Study 2014

All eight public, specialized institutions are in the Greater Accra region. These are the Ghana Institute of Journalism, National Film and Television Institute, Institute of Local Government, Kofi Annan Peace Keeping Centre, the Ghana Maritime University, Ghana Institute of languages, the Ghana School of Surveying and Mapping. Consideration may be given to relocating one or more of these institutions and establishing satellite institutions in other regions as well.

7.1.5 Secondary education

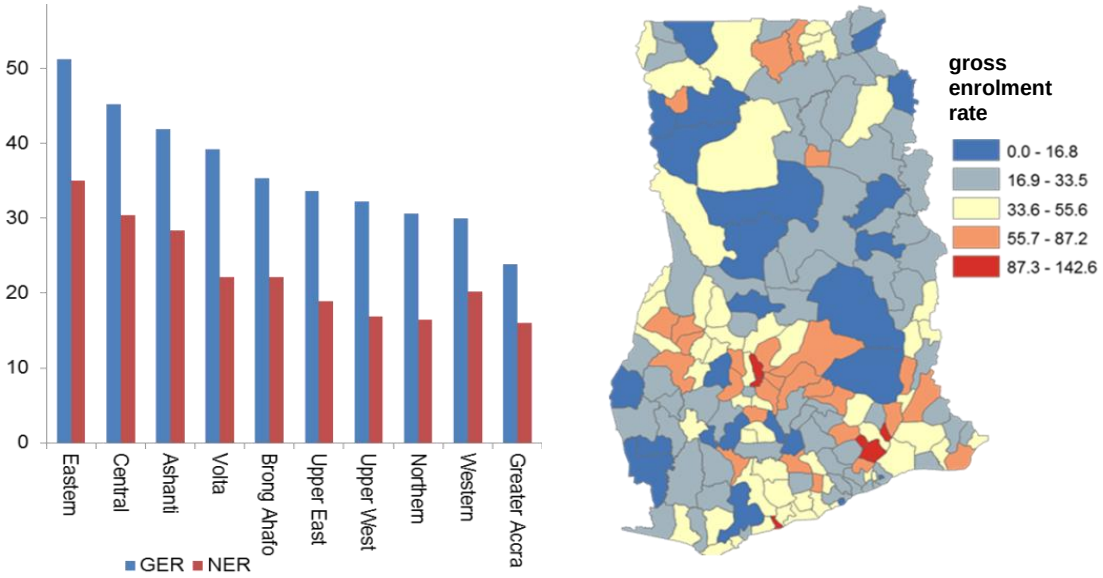
Strengthening post-basic education is key to creating a more competitive workforce. The types of institutions include senior high schools, technical and vocational schools.

Senior high school

A caveat in analysing senior high school enrolment and location is that most secondary schools in Ghana are boarding schools. As most students travel across the country to attend schools, the presence of a school facility in a community might not be a good indicator of local access. Nevertheless, lower income students tend to attend day schools within their communities or districts, wherefore location then plays a key role.

Gross enrolment rates in senior high schools are low but rising; between 2005 and 2012, they increased from 25 to almost 37 percent. Gross and net enrolment ratios vary across districts and regions.

Figure 7.9 Senior high school gross and net enrolment rates, 2012



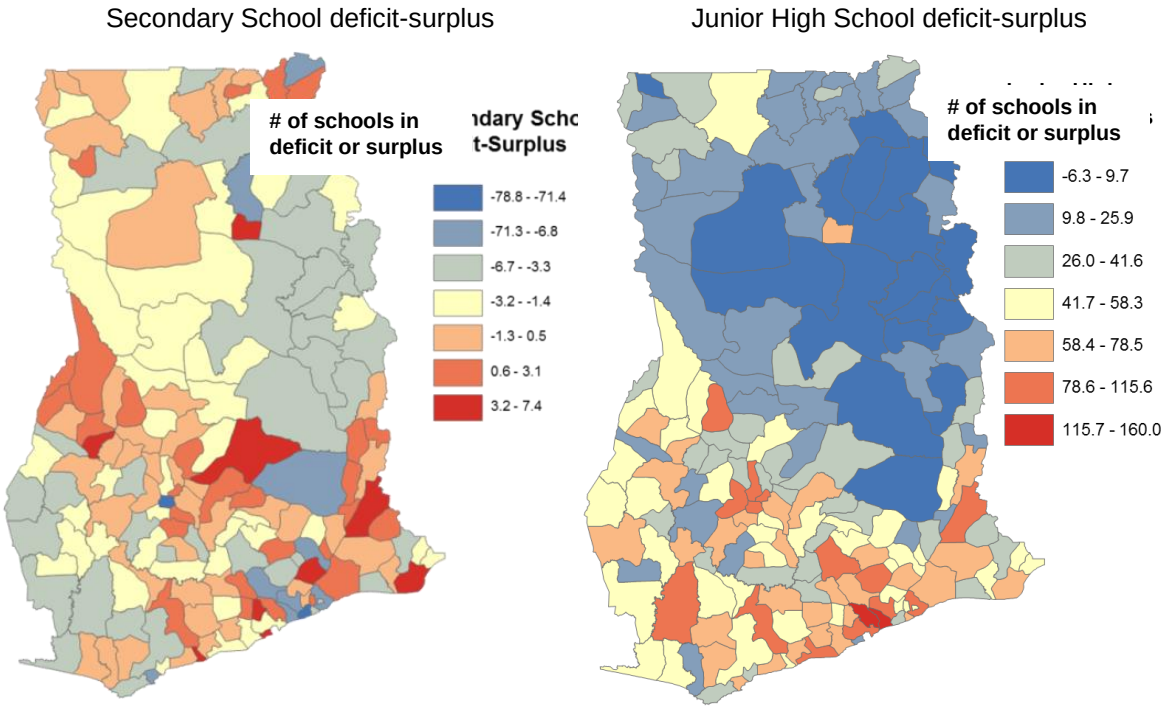
Source: NSDF Study 2014 based on MOE, EMIS data

Gross enrolment rates are lower in the Northeast and Southwest (figure 7.9). Districts with the highest enrolment rates are Cape Coast in Central region; New Juaben and Akwapim North in the Eastern region; and Sekyere South and Kwabre East districts in Ashanti region. Cape Coast's high rate is due to the concentration of leading secondary institutions and the tendency of parents, particularly those in Greater Accra region, to send their wards there.

Assessing Adequacy of Secondary School Facilities

TCPD planning guidelines set a maximum population threshold of 20,000 per senior high school. Dividing the district population with this number gives the minimum number of schools needed in each district. Comparing this to the actual number of schools provides an indicator of the number of schools in deficit or surplus (Figure 7.10). Some districts have slightly more schools than required by the planning guidelines. These include Cape Coast in Central, New Juaben in Eastern, and Tamale in Northern region.

Figure 7.10 Secondary and Junior High School deficits and surplus



Source: NSDF Study 2014 based on EMIS data and TCPD planning guidelines

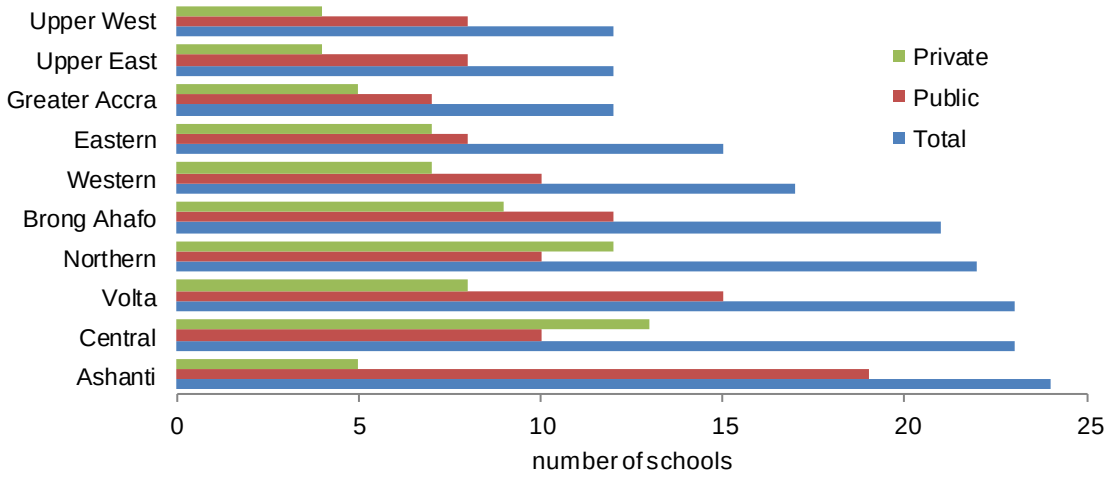
While some districts have surplus, others have deficits. Districts with the highest deficits are in Greater Accra region, the northern section of the Volta Region and Northern Ghana.

Technical and vocational training Institutions

Technical and vocational training, or TVET, provides an alternative to mainstream senior high school education. TVET institutes prepare graduates for industry and offer opportunities for further studies in polytechnics. In Ghana, the TVET system was created to increase productivity in the skilled workforce and create opportunities for low income groups and women. TVET institutes are provided and operated by the Ghana Education Service, the Gratis Foundation, the National Vocational Technical Institute, and social welfare centres, amongst others.

In general, TVET enrolment is low and decreasing across the country; from 2011 to 2012, full-time enrolment decreased from about 62,300 to 61,500 students. Figure 7.11 shows the distribution of TVET across the regions. Ashanti and Central regions have the largest share of TVET schools while Greater Accra and Upper East and Upper West regions have the least.

Figure 7.11 Distribution of TVET Schools



Source: NSDF Study 2014 based on Ministry of Education data

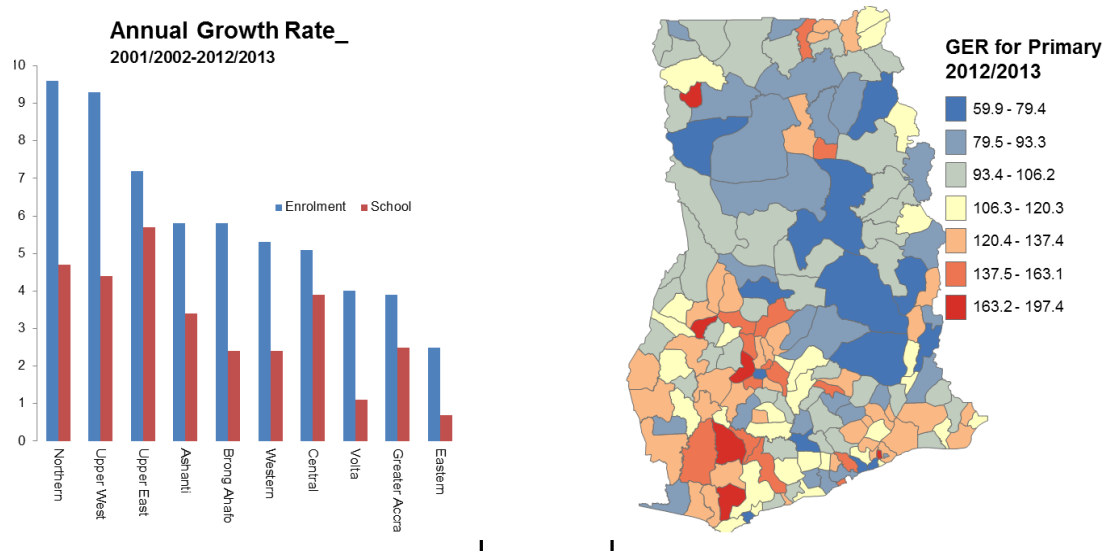
7.1.6 Basic Education

Primary

Primary school gross enrolment rates have increased from 80 to 105 percent and net enrolment rates from 59 to 84 percent between 2001 and 2012. Several policies have contributed to this progress, including the Free Compulsory Universal Basic Education (FCUBE) policy and the capitation grant.

School enrolment and the number of schools have increased in all regions (Figure 7.12). While the three northern regions have the lowest primary enrolment rates, they also recorded the highest annual growth rates in both enrolment and in the number of school facilities.

Figure 7.12 Growth rate of primary schools/enrolment by region/district



Source: NSDF Study 2014 based on TCPD planning standards and data of the Ministry of Education, 2013

There are significant regional and district variations in access to primary education as detailed below:

Enrolment rates are higher in the south than the north: Districts along the Volta Lake and most part of the north have lower numbers of children enrolled in school. Notable exceptions in the north are the metropolitan districts of Wa, Tamale and Bolgatanga where enrolment rates are comparable to enrolment rates in the South.

Enrolment rates are higher in urban areas than rural areas: A higher enrolment rate in more urbanize districts, even in northern Ghana, is indicative of urban-rural gaps in accessing education. In northern Ghana, where enrolment rates are lower, 70 percent of the population reside in rural communities.

In Greater Accra and Ashanti regions, primary enrolment rates are higher in the suburban districts than the metropolitan districts. This differs from the patter in other regions, where the larger settlements have relatively higher enrolment levels than the rest of the region.

Several districts in the Western Region have high enrolment rates: For example, Wassa Amenfi and Tarkwa Nsuaem have higher enrolment rates than the rest of the country. However the low secondary enrolment rates in Western region shows the adverse consequences of over-age classes. Gross Enrolment Rates (GER) higher than 100 percent reveal over-age pupils in school. The higher the GER above 100 percent, the higher the number of over-age children. Research on education reveals that over-age pupils are more likely to drop out of school than age appropriate pupils.

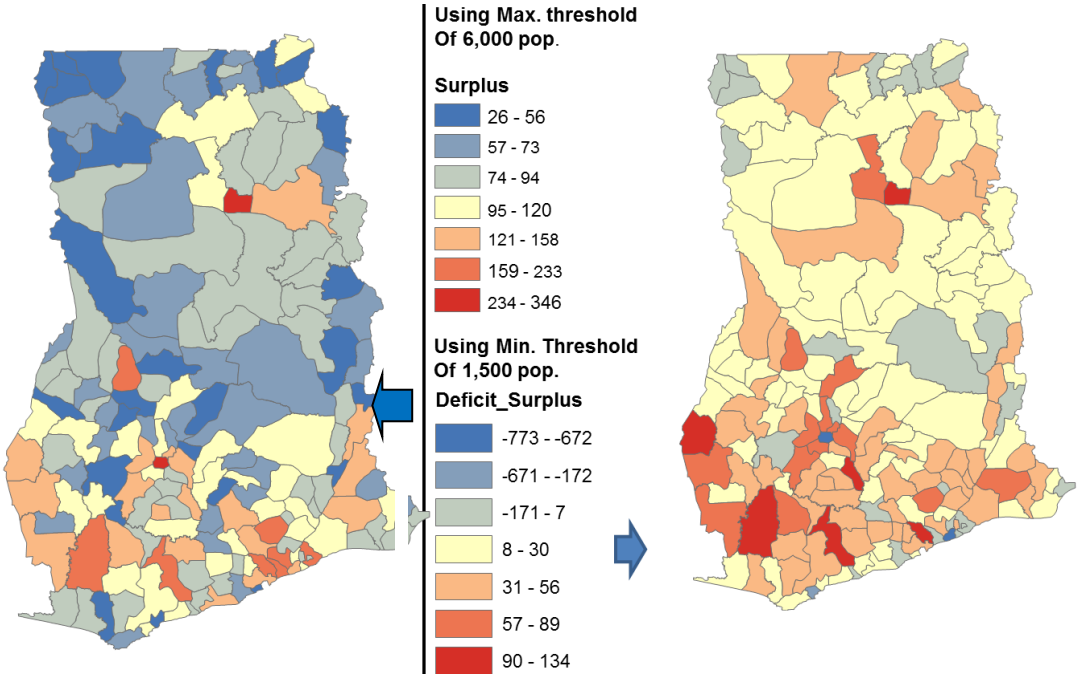
Adequacy of primary school provision

Of the almost 20,000 primary schools across the country, 77 percent are private schools, of which most are in Greater Accra and Ashanti.

NSDF uses two methods to assess the adequacy of school provision; one is based on TCPD planning guidelines and one uses the Ministry of Education's enrolment method, which assesses school-adequacy based on enrolment rates.

TCPD standards set requires a minimum of 1,500 and a maximum of 6,000 people in a community to justify the provision of a primary school. Using a maximum threshold reveals a surplus in all districts (Figure 7.13); this seems inappropriate to analyse school adequacy particularly in the Northern section of the country where populations are largely rural and scattered. Using the minimum threshold of 1500 inhabitants, deficits are revealed in Garu Tempane, Krachi East, Wa West and a few others.

Figure 7.13 Primary school deficits and surpluses based in TCPD guidelines



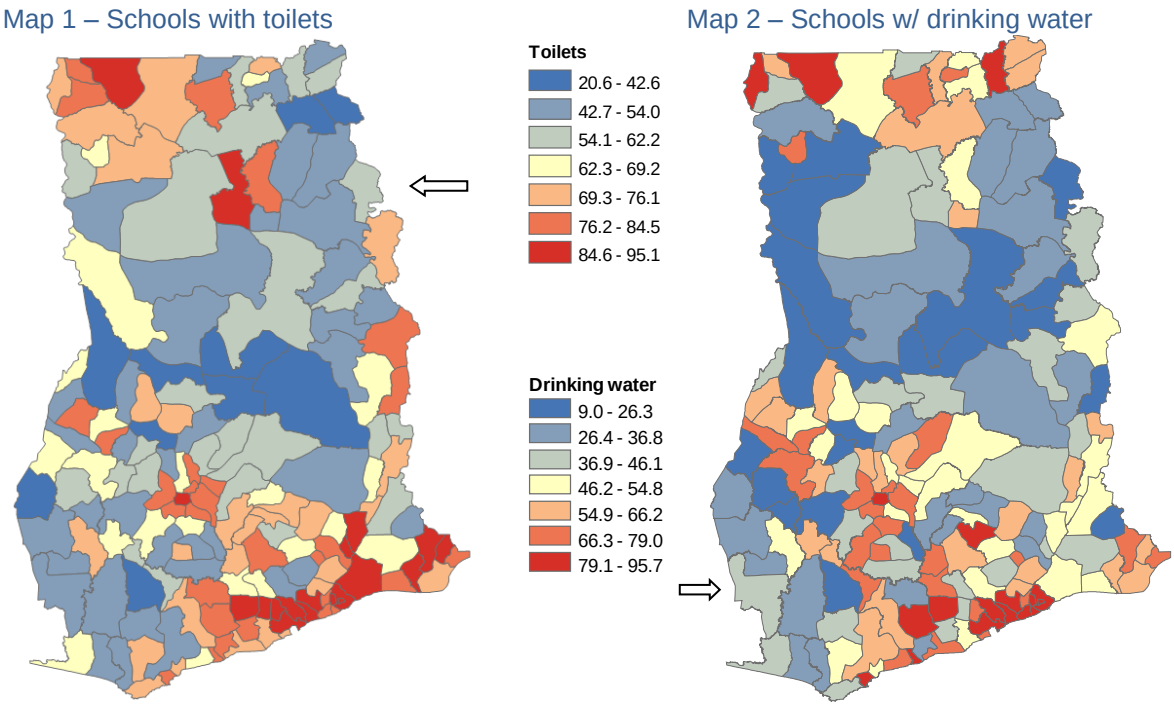
Source: NSDF Study 2014 based on TCPD planning standards and Ministry of Education, 2012

The enrolment method sets a standard of 240 pupils per school (for the six-year primary education program classroom) and 40 pupils per classroom. Deriving the number of schools required from these standards and comparing this to the number of schools available, NSDF finds a deficit of 122 schools in Upper East and two schools in Upper West regions. Using a similar method for the classrooms, there is a deficit of 930 in Northern region and 1,030 in Upper East region.

Adequacy of primary school quality

Another challenge to primary education is the quality of school facilities, including water and sanitation. According to TCPD planning guidelines, all schools should have access to adequate water and sanitation. Nonetheless, NSDF finds that no districts meet these guidelines completely (Figure 7.14) and some districts even have only 20 percent of the schools with toilet facilities and 9 percent with drinking water. In most of Northern region and in northern parts of Volta and Brong Ahafo, less than 50 percent of schools have toilet facilities while less than 26 percent have drinking water facilities. Districts with better quality schools include those that are clustered along the coast (except in Western region) and those that are more urbanized in Ashanti and Brong Ahafo.

Figure 7.14 Primary schools in district with toilets & drinking water (%)



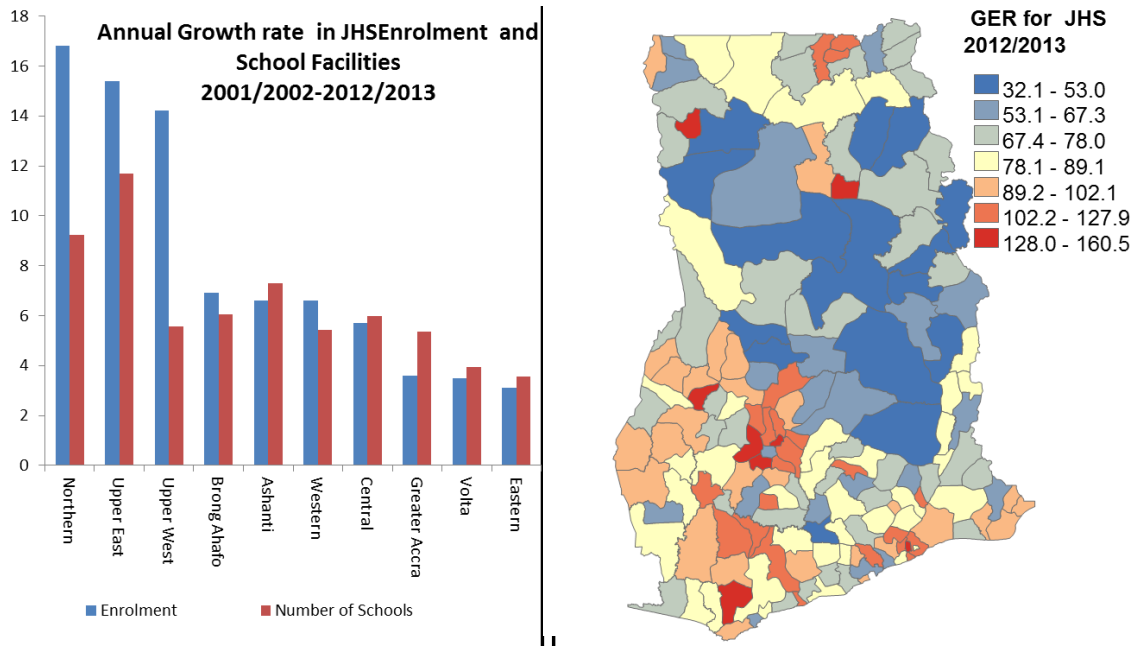
Source: NSDF Study 2014 based on Ministry of Education, EMIS data, 2012

7.1.7 Junior High School (JHS)

Junior high is the upper level of the basic school system. The junior high school level was introduced in 1987 to strengthen technical and vocational education in addition to general education at the basic level. Although many junior high and primary schools occupy the same site, enrolment rates in junior high schools are considerably lower than in primary schools.

The chart on Figure 7.15 shows the annual growth rate of enrolment and schools by region between 2001 and 2012; the map shows the gross enrolment rates of districts in 2012. Between 2001 and 2012, GERs increased by over 6 percent annually from 64 to 82 percent.

Figure 7.15 Annual growth in JHS enrolment and schools



Source: NSDF Study 2014 based on Ministry of Education, EMIS Data, 2012

Enrolment is increasing most rapidly in the three northern regions with the lowest rates. Enrolment growth rates also exceed school growth rates in Brong Ahafo and Western regions. Where enrolment increases faster than the number of schools, additional schools may be needed.

At the district level, gross enrolment rates are similar to those at the primary school level. Lagging districts include those along the Volta Lake and the Northern section of the country. The metropolitan districts of Tamale and Wa are exceptions in the North.

More primary students go on to secondary school in the suburban districts of metropolitan areas—Atwima Nwabiagya, Atwima Kwanwoma and Kwabre East in Ashanti region; Adenta district in Greater Accra region—than they do elsewhere. In Western region, primary gross enrolment rates are higher than the average but junior secondary school enrolment rates are lower.

Adequacy of junior high school provision

There are just under 12,500 junior high schools in the country. TCPD planning guidelines set a minimum and maximum population thresholds of 5,000 and 10,000 for the provision of a facility. Using the maximum population threshold of 10,000 reveals deficits in areas along the Volta Lake and in most sections of Northern region.

7.1.8 Special Education

Young people with physical and mental challenges require special education. In Ghana, special education started with the Akropong School for the blind in 1945 and the Wa school for the blind in 1948. In the 1960s, a school for the deaf and a specialist training school for the deaf were also established. While the Disability Act underscores the need for more special education facilities, these remain limited.

In 2012, there were 6,180 students enrolled in 36 special schools. Table 7.16 below provides information on special education enrolment.

Figure 7.16 Special education enrolment

Type of Special School	Number of Schools	Enrolment
Education for the hearing impaired	14	4,069
Education for the visually impaired	6	660
Education for the mentally disabled	11	831
Integrated Senior High Schools	10	620
Total	36	6,180

Source: Based on Ministry of Education, EMIS data

Map 3 on Figure 7.5 shows the location of 17 special education facilities. There is a cluster of ten special education facilities in Greater Accra and Eastern regions. These include schools for the deaf and blind in Akropong and a number of facilities in Greater Accra region for children with emotional and intellectual needs. Four special education schools exist in the three Northern regions: a school for the deaf in Tamale, Wa and Bolgatanga and a school for the blind in Upper West region. There are no special education facilities in Brong Ahafo and Central regions.

The 2010 census survey revealed that about three percent of the population had some form of disability. Of these disabilities, about 40 percent were related to sight while the rest were due to physical challenges (25%), emotional disabilities (18%), intellectual or mental disabilities (15%), hearing problems (15%) and other physical challenges (10%). People with physical disabilities, particularly sight-related, are less likely to go to school and the inadequacy of school facilities contributes to this disparity.

Although over 30 percent of the disabled have a speech or intellectual disability, only Greater Accra has special schools for these people. The two schools for the blind in Akropong and Wa are inadequate to cater for the total population of blind persons. Although the deaf have the highest illiteracy rates, there are only four schools for the deaf located in Akropong, Takoradi, Wa and Mampong.

7.1.9 Non Formal Education:

Informal Apprenticeship Programmes

People who cannot afford to attend fee-charging schools may do the apprenticeship with a mechanic, blacksmith or other craftsmen in an informal arrangement. Informal apprenticeships provide training that is similar to TVET courses but are not formally recognized. Most skilled craftsmen are products of the informal apprenticeship program, and it would seem that most settlements have informal apprenticeship opportunities. Thus government support to informal apprenticeship providers could contribute to skill development in the country.

7.2 Health

A good healthcare system promotes productivity and socio-economic development. The development of the health sector has been a cornerstone to national development, attracting a sizeable amount of national and international assistance. The Ministry of Health (MOH) vision for the health sector is, in part, to 'create wealth through health'. A major policy goal is to “ensure a healthy and productive population that reproduces itself safely”. More specific objectives of the Ministry are to:

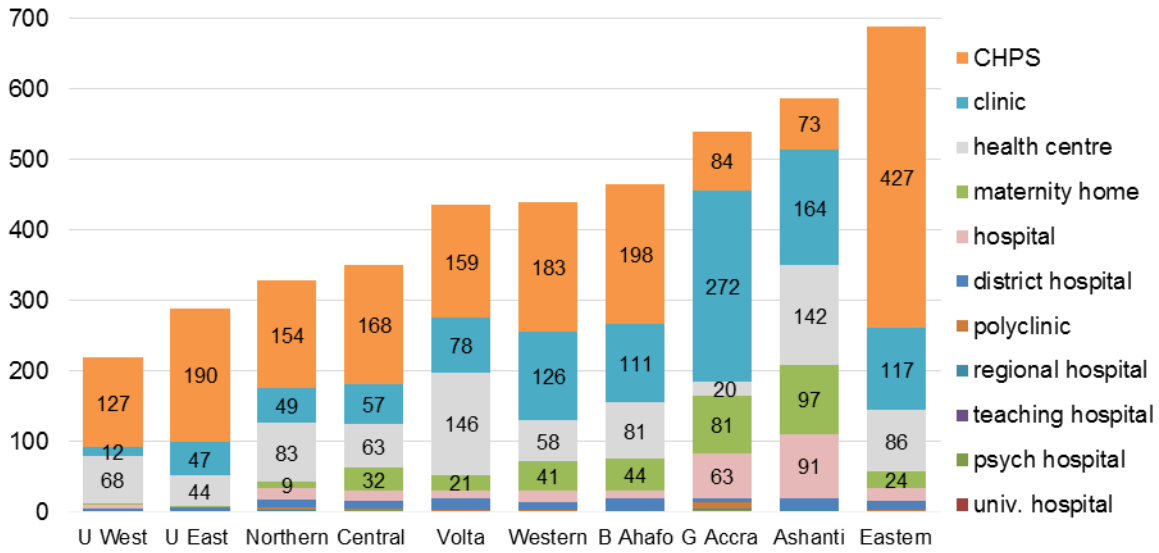
- ensure that people live long, healthy and productive lives and reproduce without an increased risk of injury or death;
- reduce excessive risk and burden of morbidity, mortality and disability especially in the poor and the marginalized groups;
- reduce inequalities in access to health, populations, nutrition services and health outcomes.

Adequate healthcare facilities and health personnel is required to attain these objectives.

7.2.1 Healthcare Facilities

In 2014, Ghana had 4,345 health care facilities that were spread over the ten regions, districts and urban and rural areas in accordance with their functions (Figure 7.17).

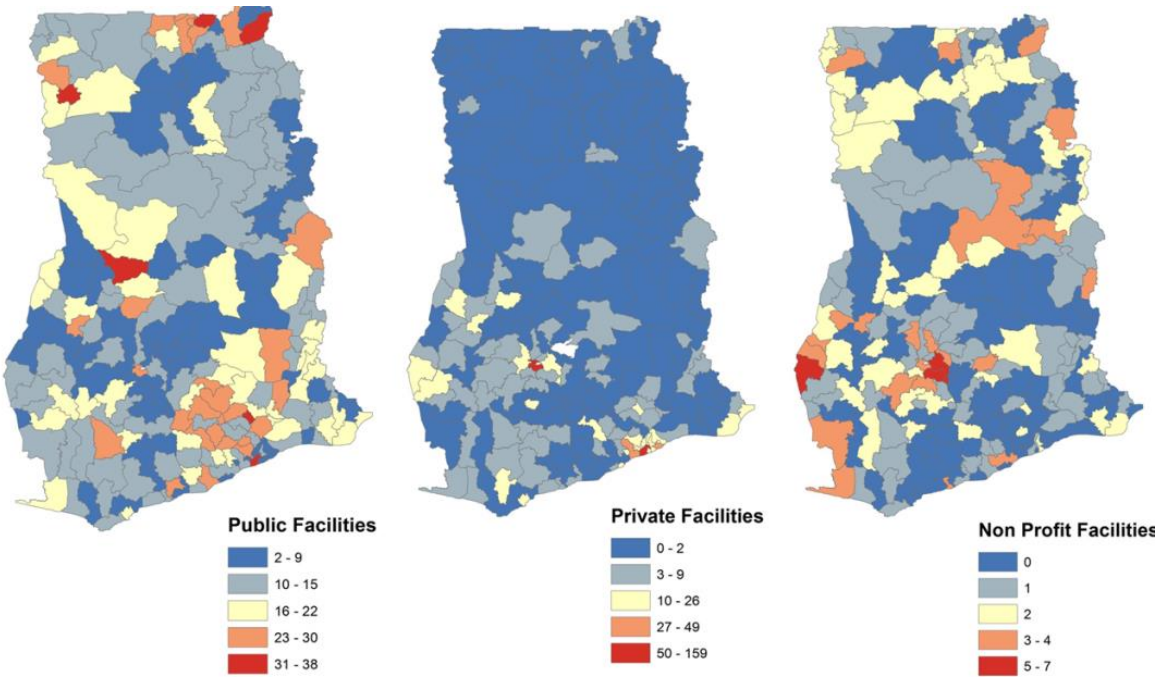
Figure 7.17 Health care facilities by region by type in 2014



Source: NSDF Study 2014 based on Ghana Health Service, DHIS data

Healthcare is provided by public and private providers. Public health care services are delivered through a three-tier system (primary, secondary, tertiary) and organized at five levels (community, sub-district, district, regional and national). Private health care providers include *for-profit* centres and *not-for-profit* centres, many of which are managed by religious groups, the largest being the Christian Health Association of Ghana (CHAG). Figure 7.18 shows the distribution of public, for profit and non-profit health centres in the country.

Figure 7.18 Number of health facilities in districts



Source: NSDF Study 2014 based on MOH data

Public and non-profit facilities are dispersed across the country while private facilities are more concentrated in the major urban centres of Accra and Kumasi.

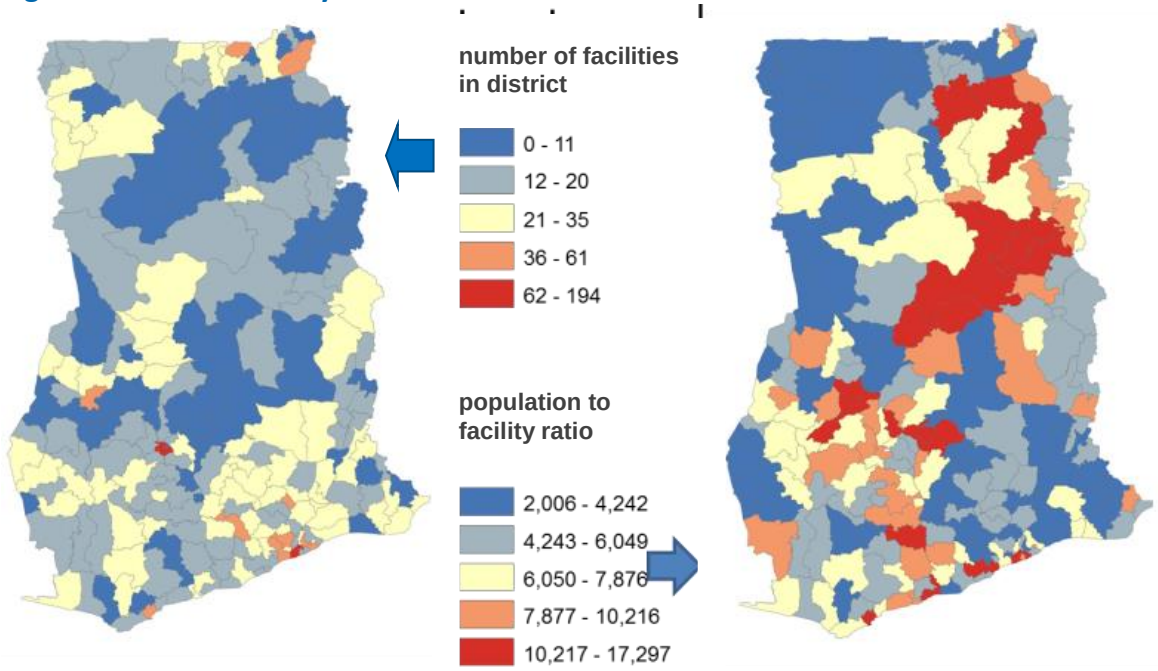
Primary Health Care Services

Primary health care includes curative, preventive and reproductive health services at the community and sub-district levels. These facilities can be grouped by the catchment areas they serve:

- clinics serve population ranges of 5,000 persons in villages and urban areas;
- health centres serve a maximum population of 25,000;
- polyclinics serve metropolitan areas;
- CHPS serve the community level.

Figure 7.19 shows the distribution of primary care facilities and the population-to-facility ratio in 216 districts.

Figure 7.19 Primary health care facilities and service levels



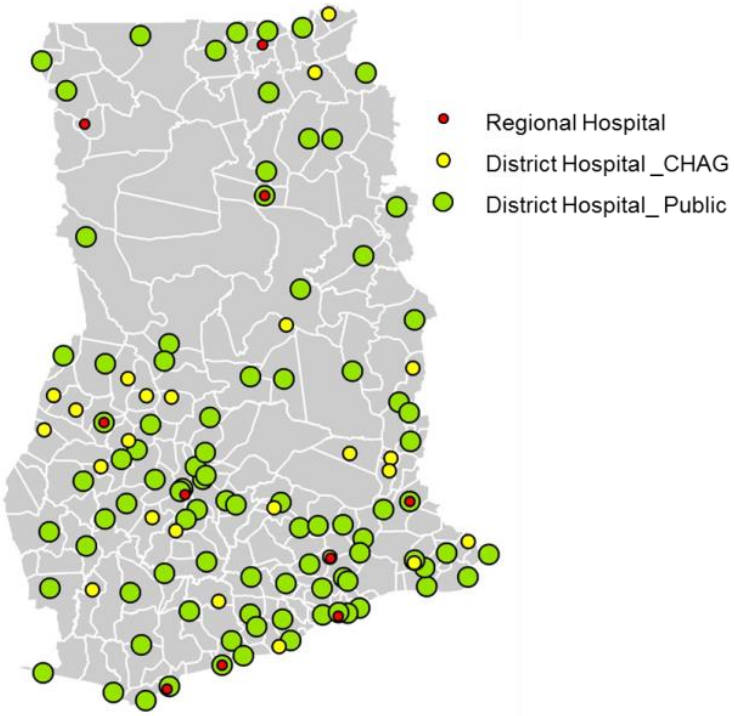
Source: NSDF Study 2013 based on Ghana Health Service, DHIS. 2013

Primary health care facilities are distributed across the country, with concentrations in Accra and Kumasi. There are less than 20 primary health care centres in most districts in Northern region.

Secondary Health Care Services

Secondary health care facilities—these include regional and district hospitals—are meant to receive referrals from primary health care centres. District hospitals are meant to get referrals from primary care while regional hospitals are meant to get those from districts. Nevertheless, regional hospitals tend to be referral centres for polyclinics. Figure 7.20 shows the distribution of district and regional hospitals.

Figure 7.20 Location of district and regional hospitals



Source: NSDF Study 2014 based on Ghana Health Services, DHIS

District hospitals: There are 115 district hospitals in 114 (out of 216) districts. Of these, 90 district hospitals are government-owned, 24 are non-profits and one is a quasi-government hospital.

TCPD planning guidelines set minimum and maximum service levels of 80,000 and 200,000 people per hospital. Yet only 67 percent of districts have populations within this range. Of the 114 districts with hospitals, 6 percent have populations above the maximum threshold and 27 percent have populations below the minimum.

In theory, districts that exceed the threshold population need an additional facility, or even more given anticipated population growth in the next two decades. However, most districts that exceed the threshold—including the metropolitan areas of Accra, Kumasi, Tema, Tamale and the municipalities of Asokore Mampong, Weija and New Juaben—have a network of private hospital facilities that complements the role of the district hospitals.

Hospitals in districts with less than the minimum population may be scaled down to reflect the catchment population or, depending on distance, the hospital could serve the population of neighbouring districts without a facility.

Of the 102 districts that lack a district hospitals, some 51 percent have less than 80,000 residents and therefore, using the guidelines, might not be entitled to one. Inasmuch as district hospitals serve as referral centres, decision to locate them have to be not only based on population thresholds but also on distance to the nearest neighbour with adequate facilities.

Regional hospitals. All ten regions have regional hospitals that are publicly owned and located in the main metropolitan area or in a major municipality. TCPD planning guidelines set a minimum population of 600,000 and a maximum population of 1 million for a regional hospital. Nevertheless, all regions, except Upper West, have

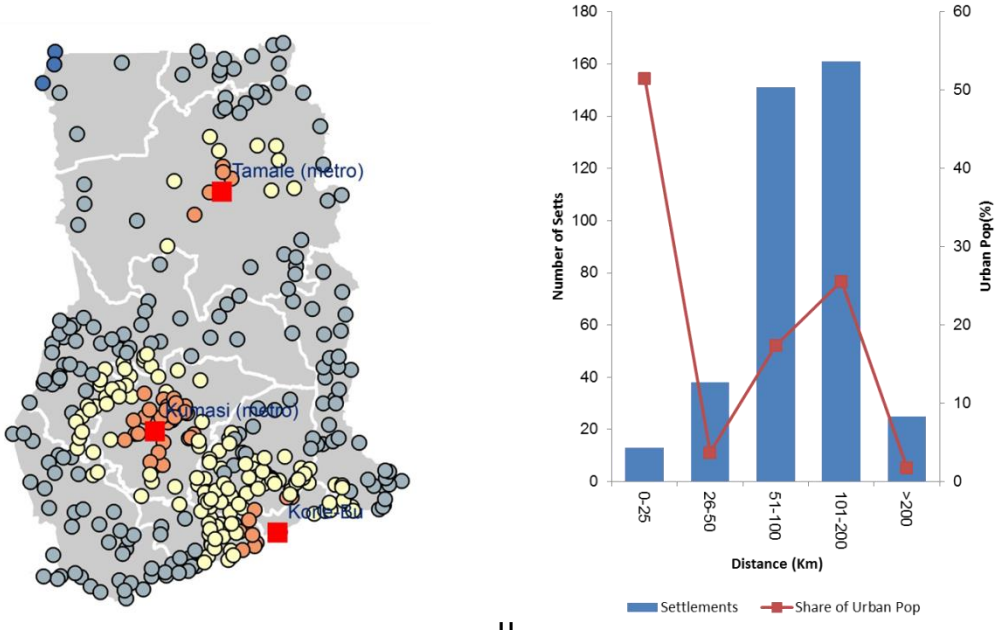
populations that exceed the maximum threshold. Following the guidelines, all regions would need at least two regional hospitals, particularly the most populous ones like Ashanti and Greater Accra, to serve their inhabitants. Should the planning guidelines be followed, the regions will need additional facilities to cater for their estimated populations in 2035.

Tertiary Health care services

University hospitals are at the apex of the health care system. Handling the most complex cases, they also provide research, education and specialized health care. Based on TCPD planning guidelines, a University hospital should serve a population of one million persons.

There are three University hospitals in the country at Korle Bu, Okomfo Anokye and Tamale (Figure 7.21) that serve Ghana's population, or about 8 million per hospital. These are reasonably located; about 51 percent of the urban population is within 25 km of the Korle Bu, Okomfo Anokye and the Tamale teaching hospitals[172]. Still, many people who live in Upper West, Volta and Western regions will need to travel 200 km or more to the nearest teaching hospital.

Figure 7.21 Teaching Hospitals and distance to urban settlements



Source: NSDF Study 2014 based on MOH, 2013

In 2035, an estimated 8.7 million people would be living in urban centres within 25 kilometres to a teaching hospital. The potential strain on health care facilities calls for the need to develop more tertiary healthcare facilities. The National Infrastructure Plan proposes the establishment of an additional teaching hospital in the Volta Region to support the School of Allied and Health Sciences. More teaching hospitals would need to be constructed within the 20 year NSDF timeframe.

[172] NSDF analysis of straight line distance between urban settlement and nearest facility.

7.3 Housing

7.3.1 Overview of Housing

Housing Policy

The National Housing Policy provides a framework for addressing the housing challenges. The policy aims at creating viable and sustainable communities through the provision of "adequate, decent and affordable housing that is accessible and sustainable to satisfy the needs of Ghanaians". More specific objectives of the policy are to:

- accelerate upgrading of existing housing stock;
- provide good basic services such as drinking water and sanitation;
- support affordable housing programmes for the poor;
- promote private sector development of housing including for rent;
- promote orderly and consolidated urban growth;
- increase residential density by increasing the allowable gross floor area.

The government acknowledges a present housing deficiency of 1.5 million units and is concerned about meeting the future demand for housing. For this reason, the government intends to create enabling environment to encourage and support private investment in housing.

Housing in Ghana has the following characteristics:

- most houses are single storey
- most households inhabit single rooms
- households are increasing faster than rooms
- trend towards more rental compared to owner occupancy type
- predominance of compound housing
- increasing development of gated communities for higher income groups
- slums in major cities

Providing "adequate, decent and affordable housing that is accessible and sustainable" requires efforts to match the supply of housing to the demand of housing. Currently, homes provided by commercial real estate range from USD 30,000 to 500,000, far exceeding the average annual household income of GH₵ 1,217 (GLSS)[173]. To create safe and liveable cities, creative ways of funding affordable housing would need to be introduced to meet the housing demands by 2033.

7.3.2 Housing Conditions

Housing stock and room occupancy

Nationally, almost 50 percent of households live in one room dwellings and another 25 percent in two room dwellings, but regions vary significantly by the size of their dwellings (Figure 7.22). In general, households in the North live in larger dwelling units. Single room occupancy is more pronounced in the South than in the North, and more prevalent in Ashanti and Central regions. It would appear that households in less urbanised regions have larger dwelling units.

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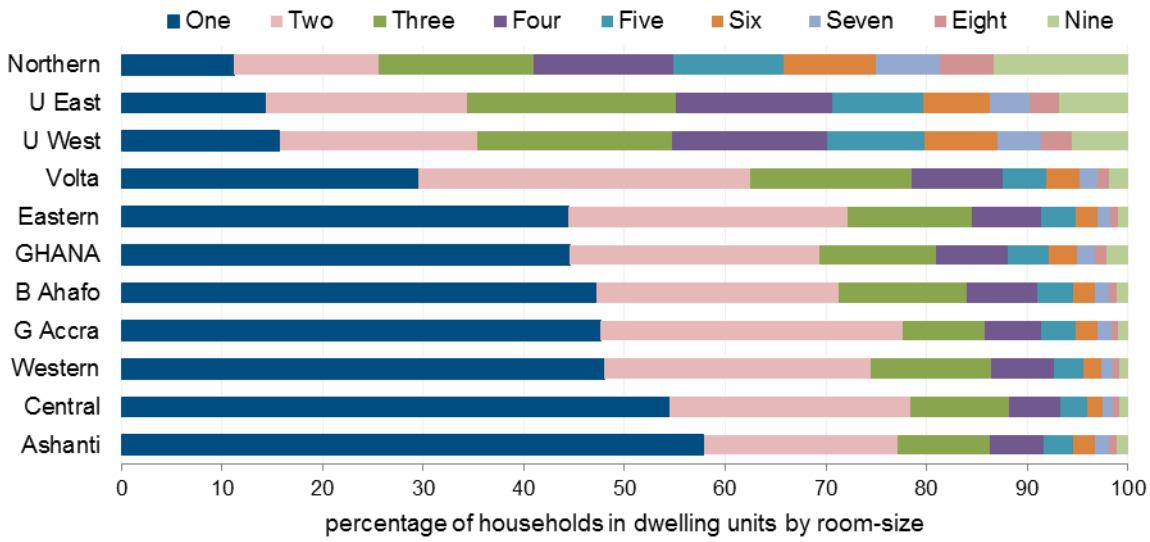
Figure 7.22 Percent households by dwelling unit rooms

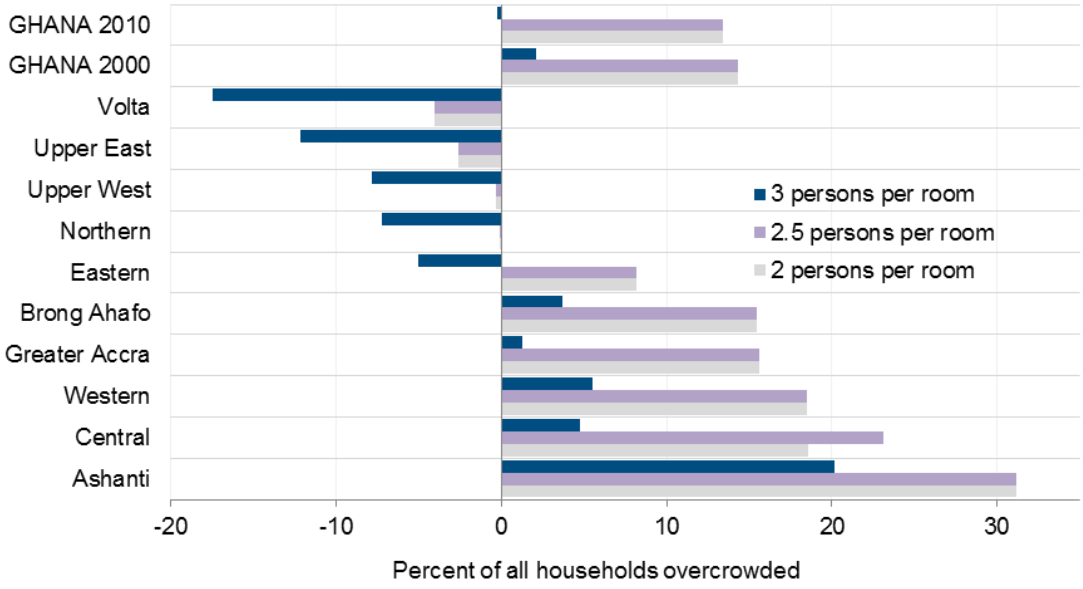


Source: NSDF Study based on GSS Population Census 2010

Household overcrowding

While overcrowded housing conditions is an important indicator of development, it is difficult to estimate it due to the lack of data; data is available at the national level for 2000 and 2010 and by region for 2000 only[174]. Nevertheless, Figure 7.23 shows the percentage of households that occupy one room unit that can be considered as overcrowded. Three overcrowding ratios are considered: 2, 2.5 and 3 persons per room (ppr). At 2 and 2.5 ppr, some 14 and 13 percent of households were overcrowded in 2000 and 2010 respectively. At 3 ppr, only 2 percent were overcrowded in 2000 and none in 2010. The slight improvement in the percentage of overcrowded is due to a decrease in household size and not to an increase in the number of larger dwelling units. Overcrowding in 2000 was most problematic in Ashanti, Central and Western regions, reaching over 30 percent in Ashanti. The three northern regions registered no overcrowding at any ppr ratio.

Figure 7.23 Household overcrowding in 1 room dwellings by region



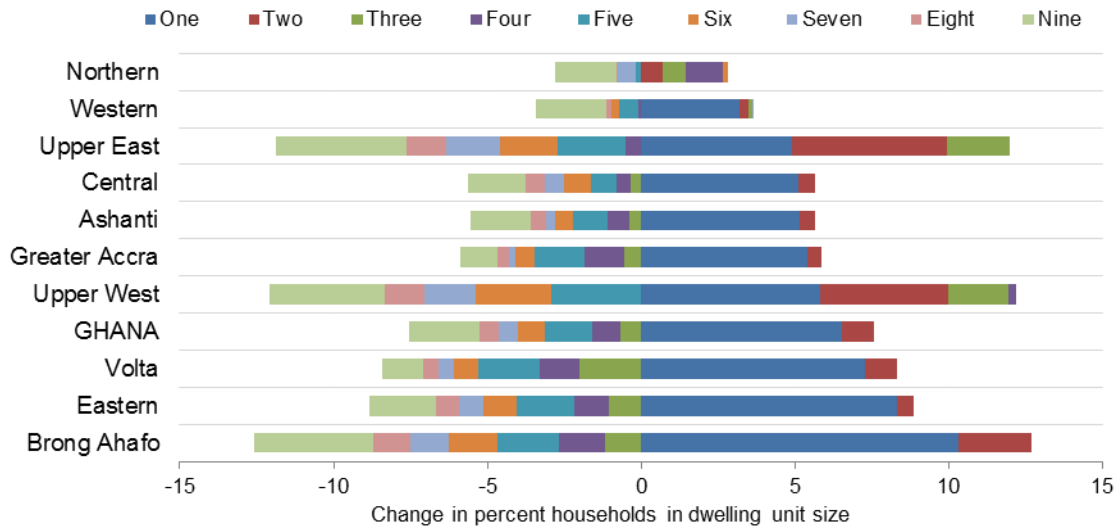
Source: NSDF Study 2014 based on GSS Population Census 2000 and 2010

[174] Data on the household sizes by region was not available to perform an analysis.

Trend in dwelling unit size

In general, the production of housing is not keeping pace with the formation of households between 2000 and 2010 (Figure 7.24). For example, at the national level, the percentage of households living in single rooms increased by about 7 percent. In Volta, Eastern and Brong Ahafo, the increase ranged between 7 and 10 percent.

Figure 7.24 Change in percentage of households in dwelling unit size from 2000-2010

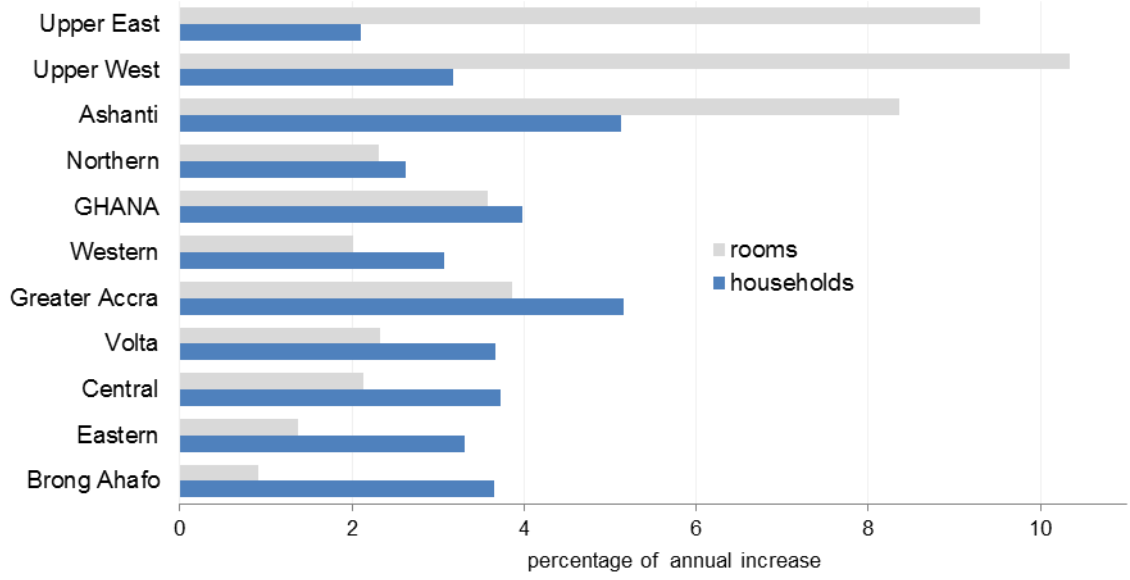


Source: NSDF Study 2014 based on GSS Population Census 2000 and 2010

7.3.3 Household formation rate

Nationally, the construction of rooms did not keep pace with the increase in the number of households between 2000 and 2010 (Figure 7.25). Only in Upper East, Upper West and Ashanti regions did room construction match or exceed the household formation growth rate.

Figure 7.25 households annual increase Percentage + rooms from 2000-2010



Source: NSDF Study 2014 based on GSS Population Census 2000 and 2010

7.3.4 Type of dwelling units

The type of dwelling is important to spatial planning because different types consume different quantities of land and because a dwelling type is associated with specific qualities of environment and standard of living. On the whole, detached houses need more land than semi-detached, which need more land than multiple unit types such as flats and compounds. Compound houses may be considered as the most basic formal housing type, while informal housing—which includes huts, tents, improvised, and un-completed buildings—may be considered as slum dwellings. Flats or apartments can be either basic or luxurious, but in general they can be provided at the highest densities.

Nationally, and in all regions, more than half of households live in compound houses. Compound houses are communal, single-storey structures with a courtyard where multiple households share common bathroom and toilet facilities. Compounds can vary in size with up to 30 rooms, and households typically occupy one room (UN Habitat Housing Profile). The percentage of households in compound housing increased from about 44 to 51 percent between 2000 and 2010. The next most popular dwelling types are separate houses (19%), semi- detached (8%) and flats (7%). Some six percent of households occupy sub-standard dwelling types including in improvised homes (3%), uncompleted buildings (2%) and huts (1%). Greater Accra has the highest percentage of substandard housing units (GSS).

7.3.5 Housing tenure

Three main tenure forms are owner-occupied, renting and rent-free. Other types include squatting and homelessness.

Some 47 percent of households are owner-occupants. These have a higher share in rural areas (65%) than in urban areas (33%). However, trends show a decline in owner-occupancy in both urban and rural areas (GSS Census data 2000/2010). On a regional basis, owner-occupancy is more common in the three Northern regions (80%) compared to the Ashanti and Greater Accra regions (35%). Renting is more common in urban areas (45%) and particularly in urban Greater Accra and Ashanti compared to other regions.

A large share of households live rent-free in urban and rural areas. Rent-free tenure is greater in the south compared to the north. Only about 0.3 percent of households are squatters[175], with more in Ashanti (0.4%) and double the average in Greater Accra region (0.8%). One in every 1000 Ghanaians was homeless in 2000[176]. Homelessness is more common in urban areas, which account for some 76 percent of the total. Greater Accra has the highest share (37%) of home less households, followed by Ashanti (20%) and Western region (18%).

7.3.6 Construction materials

The quality of housing construction has improved over time. It is generally better in urban than in rural areas, and better in the south than in the north. Houses constructed from mud, mud brick or earth dropped from 50 to 34 percent between 2000 and 2010, while those constructed from cement and concrete increased from 39 to 57 percent. Houses in urban areas are largely constructed with cement and concrete materials while those in rural areas are constructed with mud and mud bricks. Over 70 percent of houses in the three northern regions are constructed from earth and mud brick, and less than 21 percent of cement and concrete blocks. Some 21 percent of northern roofs are thatch.

[175] The 2010 census provides information on squatter settlers; the 2000 census does not.

[176] Data on homeless is not available from GSS for 2010 census.

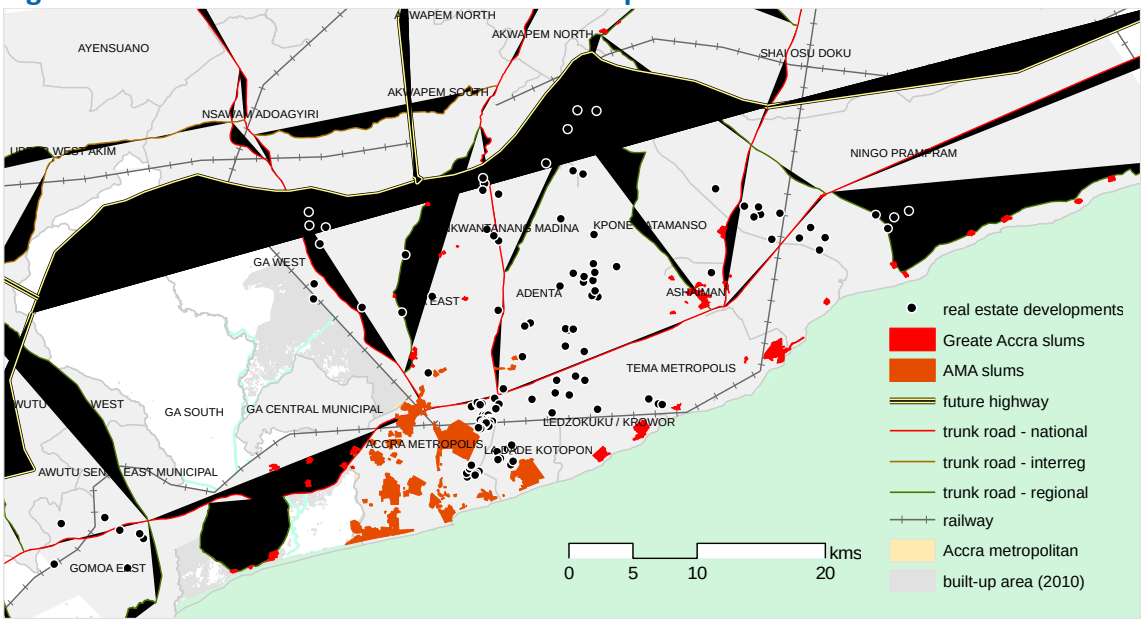
7.3.7 Residential real estate, gated communities, and slums[177]

Real-estate development

Real estate development is concentrated in Greater Accra and has recently spread to Sekondi-Takoradi (UN Habitat, 2011). Developers have introduced gated communities, which are enclaves of well-serviced housing that adheres to official planning standards. Most real estate developments are priced well beyond the financial means of most Ghanaians. Buyers are predominantly middle- and high-income earners and Ghanaians living abroad. Over the years, prices have increased; according to Regimanuel Estates, a major developer, the price of an average two-bedroom unit has increased from about USD 18,000 in 1994 to USD 90,000 in 2012. House prices now range from about USD 30,000 to USD 500,000. According to GREDA, the high costs are due to difficulties in land acquisition, importation of building materials, lack of public infrastructure in most municipalities, and high interest rates and short loan periods. GREDA has expressed willingness to work with government to find creative ways of promoting affordable low cost housing. One developer would like to price semi-detached housing at a range of between 35,000 USD and 55,000 USD, but is finding that land acquisition in urbanised areas remains a main challenge.

A NSDF survey in GAMA found that real estate developments are spread out over a 75 kilometre wide area from Kasua in Central region to Prampram district in the east, and from the coastline to the alignment of the planned ring road (Figure 7.26)[178]. Many are clustered together in Accra Metropolitan district, and near to the international airport. Many fall well within the existing built-up area. Nevertheless, a large number are located at the periphery of the built-up area, some close to existing trunk roads and some fairly distant.

Figure 7.26 Location of real estate developments and slum areas



Source: NSDF Study 2013-15

[177] Residential real estate development is a relatively new industry in Ghana and data are scarce and sometimes conflicting. For example, the Bank of Ghana estimates that, between 1988 and 2003, some 10,954 houses were built, while Asiedu and Arku estimate that 50,000 dwelling units were completed (UNHABITAT 2011). The Ghana Real Estate Development Association (GREDA), whose members include the largest housing developers, reported that only 1,431 units were constructed in 2011.

[178] The location of real-estate developments was determined by a survey undertaken by NSDF Study in 2013.

Gated communities

A recent study of gated communities in Accra provides insights into this type of development[179]. In general, gated communities are located on the urban fringe. Most feature detached houses but semi-detached units and flats are also provided in some neighbourhoods. All units are exclusively for sale and most (90%) are owner occupied. Some are available for rentals but mainly to the expats communities. Construction materials are generally of above average quality.

Demand for gated communities is driven in part by a quest for security and safety. However, while all communities are heavily manned by security guards, most have not (yet) installed CCTV cameras or any other electronic facility for monitoring security.

Gated communities are generally well-endowed with physical and social infrastructure. Most have open spaces, playgrounds, security posts and health clinics, but few if any have libraries and schools. While all houses are connected to mains electricity, most residents keep back-up generators. Water supply is provided by Ghana Water Company Limited and is generally reliable compared to other parts of Accra, but many residents still use commercial water suppliers. Solid waste collection service is provided but at an extra cost.

The authors of the study found that despite the rapid proliferation of gated communities, policies, legislative frameworks and bylaws on the establishment of gated communities are still missing links in the spatial governance of Accra.

Slum and Informal Settlements[180]

The UN estimates that by 2020 about 45 percent of Ghana's urban population will live in slums[181]. A comprehensive, national-level survey of slums and poverty has not been undertaken, but the few data sources that are available provide insights into the issue.

Slum communities have been identified in the major cities of Accra, Kumasi, Tamale and Sekondi Takoradi. Accra slums have been identified and mapped by AMA and NSDF[182]. There are 95 slum areas, 45 within AMA and 50 in the Greater Accra region (Figure 7.26). AMA slums comprise about 28 km^2 or 16 percent of the district area while the other slums total about 10 km^2 in area. Many slums are in the inner city close to the central business district, while gated communities and residential developments at the periphery. This provides an incentive and opportunity to link the slum upgrading to the more prosperous developments nearby. Failure to do so may result in increased safety and security issues.

AMA's Participatory Slum Upgrading Plan reveals the following about slums in Accra:

- over 30 percent of AMA households live in slums;
- four slum types: transient, cosmopolitan, migratory, indigenous- depending on the stage of maturity and ethnic/social composition;
- poor housing and access to sanitation facilities and improved water supply;

[179] Prince Aboagye Anokye, John Paul Tanyeh, Felix S. K. Agyemang, 2013

[180] There is a dearth of quantitative data on slums in Ghana

[181] Based on the UN five characteristics of slum dwellings: durable housing of a permanent nature, sufficient living space not more than 3 ppr, easy access to safe water at a reasonable price, access to adequate sanitation, and security of tenure that prevents forced eviction.

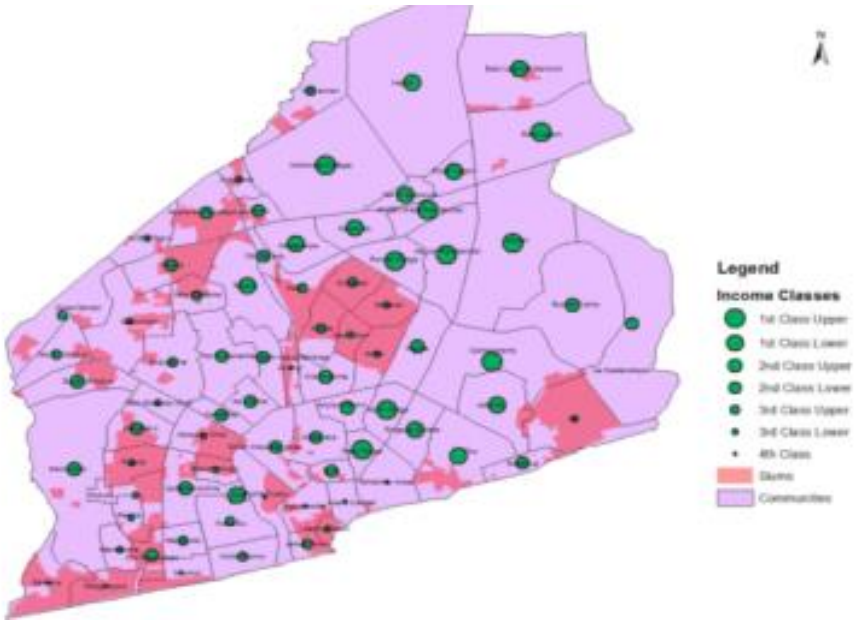
[182] NSDF Study has undertaken a survey to locate slums in the Greater Accra Region. The study is available in Annex.

- poor environmental sanitation practices;
- lack of enforcement of planning regulations;
- high-density that reaches 1100 people per hectare;
- overcrowding five to over ten person per room;
- strong correlation between income classes and slum communities.

Figure 7.27 compares the locations of AMA slums with the income classes in the area[183]. The map also shows the link between slum areas and lower income classes. Policies on whether and how to address these slum areas—such as in situ upgrading or relocation and redevelopment and relocation—can have an impact on national spatial development.

[183] From the AMA Medium Term Development Plan, Participatory Slum Upgrading Plan

Figure 7.27 Accra slums and income classes



Source: AMA Medium Term Development Plan

The National Slum Upgrading and Prevention Strategy provides a multidimensional framework to upgrade existing and prevent new slums. Among the most important actions are improving community participation, improving infrastructure, providing low cost housing, improving tenure security and implementing strategies to improve the income-earning capabilities of slum dwellers. One of the options may be the approach piloted by TAMSUF in the Ashaiman district in Greater Accra region with UN HABITAT support.

7.3.8 Strategy for affordable housing

A recent study by McKinsey Global Institute, "A blueprint for addressing the global affordable housing challenge", provides lessons for how Ghana may address its own housing affordability challenge. After studying 2,400 cities, the report identifies four levels that can improve affordability: (i) unlocking land supply at the right location; (ii) adopting an industrial approach for quick, large-scale development; (iii) improving efficiencies in operations and maintenance to reduce costs and preserve housing stock; and (iv) expanding access to lending and reducing access to finance costs for buyers and developers.

Level 1 is the most critical, has the largest impact on reducing housing costs, and is the most relevant to spatial planning. The study points out that "projects must be built where residents can reach jobs in reasonable commuting times, families have access to schools and vital services, and people can connect with the society around them". It found that there are six strategies for unlocking land for affordable housing. Described as actions, these are:

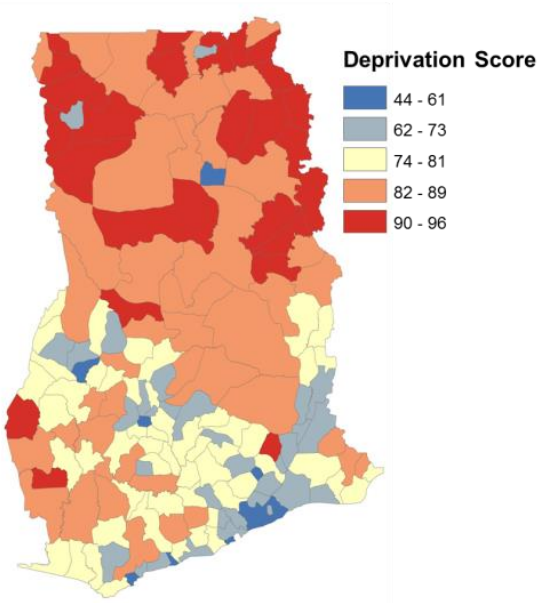
- develop new land around transportation infrastructure;
- release government-owned land for development;
- use regulatory measures to incentivise unlocking of private land;
- assemble or readjust land to allow development;
- formalize ownership of informal land and modernize land-registration systems;
- reform urban land rules to increase supply (i.e. increase density limits);

7.4 Basic Services

Good access to basic services at the household level can decrease the disease burden, increase worker productivity, encourage investment and improve quality of life. Basic services include electricity, drinking water, sanitation, and liquid waste disposal and solid waste collection. NSDF examined access to basic services at regional, district and urban settlement level.

District level access to three key basic services—drinking water, sanitation and electricity—is compared in figure 7.28. The figure maps the extent to which households in each district are deprived of access to these services. Access to water is defined as having piped water or a borehole on premises; access to sanitation is defined as having either a WC or KVIP in premises. A score of 100 indicates total deprivation while a zero score represents a perfect score. Data for the score is based on the 2010 GSS census data.

Figure 7.28 Basic services deprivation score



Source: NSDF Study 2014 based on GSS 2010 Census data

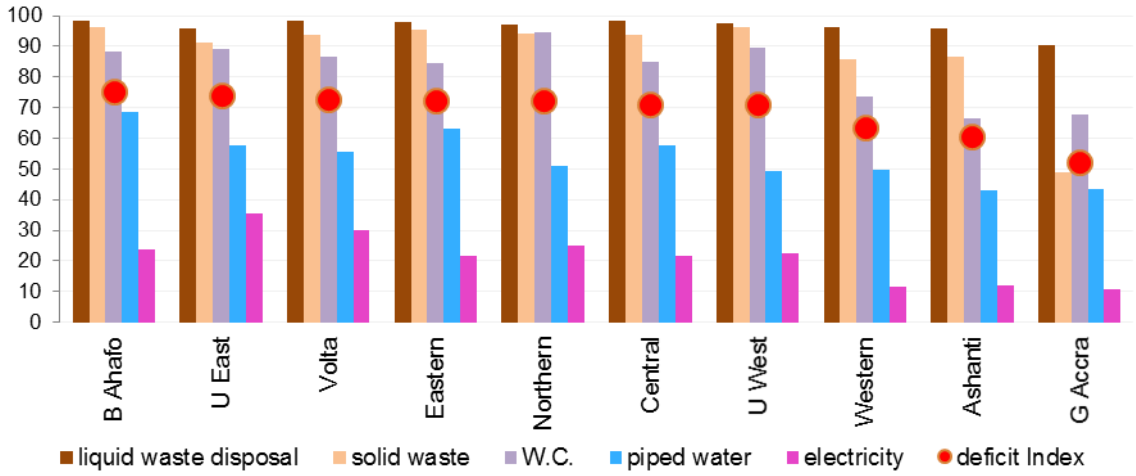
Over 40 percent of the population lack access to either drinking water at home, electricity or WC/ KVIP at home. In general, the northern section of the country is more deprived than the south. In the north, however, the more urbanized centres of Tamale, Wa and Bolgatanga have better services than the remaining of their regions.

Basic services in urban areas

Access to basic services in urban areas is considered to be more important than access in rural areas. This is because urban areas are generally expected to provide these services, and because the public health consequences of not providing them in areas of higher population density.

Figure 7.29 compares household-level access to basic services in urban areas by region and consider liquid waste disposal, solid waste collection, presence of a WC, access to piped water and access to electricity. It also shows the aggregate deficiency.

Figure 7.29 Basic services deficits in urban areas by region, 2010

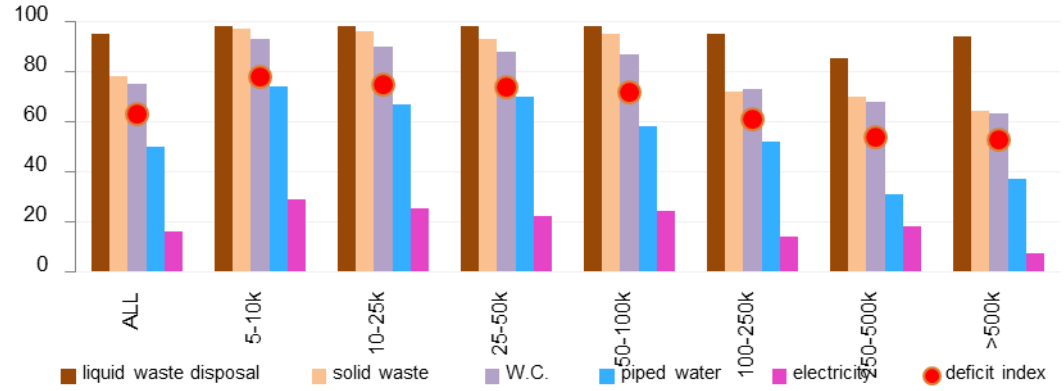


NSDF Study 2014 based on GSS Population Census 2010

Overall deficiencies are lower in Greater Accra followed by Ashanti and Western regions. In general, deficiencies are highest for liquid waste disposal, where all regions show deficits above 90 percent. Solid waste collection has the second worst deficit level in general, and in all regions but Greater Accra. Sanitation shows the third worse deficits, above 60 percent in all regions. Piped water deficits are less severe but still range from about 40 percent in Accra to almost 70 percent in Brong Ahafo. Electricity deficits are the lowest: three regions (Greater Accra, Ashanti and Western) have deficits of about ten percent; in the others they range from about 20 to 25 percent.

Basic service deficits vary by settlement size class (Figure 7.30). The overall deficit index correlates with settlement size; smaller settlements have higher deficits. This pattern generally holds for all types of services except liquid waste and piped water, where the largest size class (>500k) has higher deficit levels than the next largest size class.

Figure 7.30 Basic services deficits by urban settlement size-class, 2010



NSDF Study 2014 based on GSS Population Census 2010

7.5 Poverty

NSDF analysed data on poverty rate, gap and contribution at the region, district and urban settlement levels. While the data is somewhat dated, it provides an understanding of the spatial disparities and trends of time.

7.5.1 Poverty distribution by region

Poverty incidence or poverty rates—or the share of the population below a poverty line—are highest in the three northern regions where they have remained above 50 percent from 1992 to 2006. In Upper West region, poverty rates have stayed above 80 percent. More positively, all other regions have registered a decline in poverty, particularly in Greater Accra, Eastern, Western, Central, and Ashanti where in 2006 poverty rates ranged, respectively, from 11 to 20 percent.

Poverty gaps—a measure of the severity of poverty—show a similar pattern to poverty rates, with the northern regions still the worst off. However, the poverty gap has increased in Upper East and Upper West and declined somewhat in the Northern region. The poverty gap has also increased in Greater Accra, but declined in Ashanti, Volta, Western, Eastern and Central regions.

Poverty share is an area's population in poverty as a percentage of the national total. In 2006, Northern region share was almost twice that of Ashanti's, the next largest.

Table 7.1 Poverty gap, rate, and contribution

	poverty gap	poverty rate	contribution
Upper West	54.6	87.9	10.9
Upper East	46.5	70.4	11.7
Northern	39.6	52.3	22.3
Volta	23.1	31.4	8.2
Brong Ahafo	26.4	29.5	9.5
Ashanti	25.8	20.3	11.9
Central	21.5	19.9	6.1
Western	22.9	18.4	6.5
Eastern	22	15.1	7.1
Greater Accra	25.9	11.8	5.8

Source: GLSS5 (2006)

Table 7.2 shows poverty incidence, regional share of total poverty and poverty reduction rates—by type of locality for three time periods. The table is sorted by the 2006 poverty incidence rate. Between 1998 and 2006, the highest percentage drop in poverty reduction was in urban coastal and forest zones, indicating a possible link between urbanization and poverty reduction.

Table 7.2 Poverty incidence, share of total, reduction rates by region

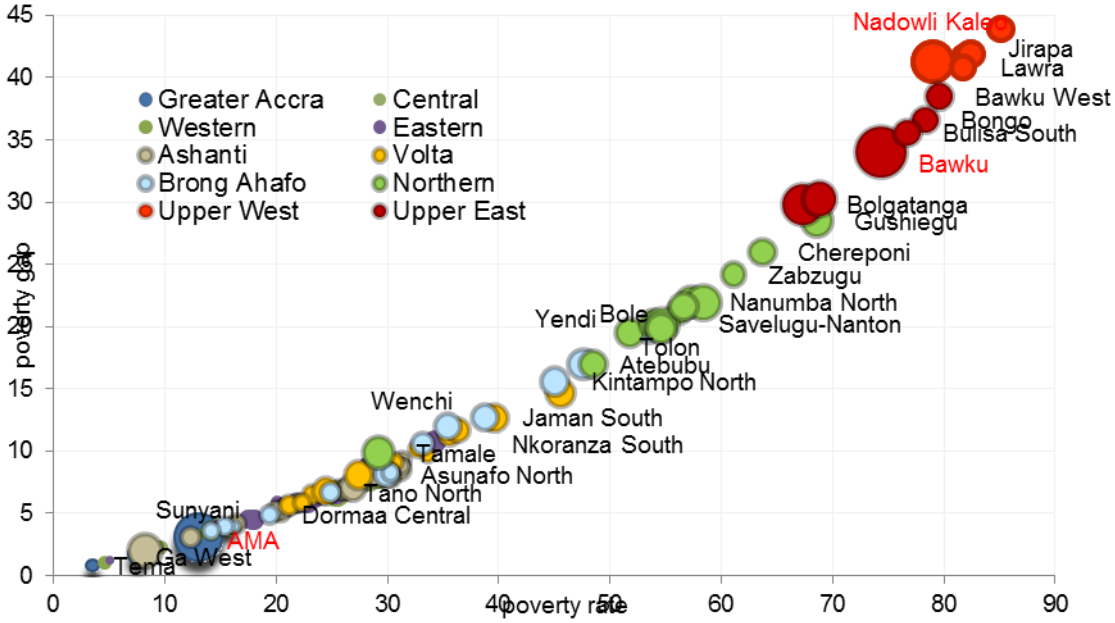
	Poverty Incidence			% of total poverty			Poverty reduction rate	
	1991	1998	2006	1991	1998	2006	1991-1998	1998-2006
Urban Coastal	28.3	31	5.5	4.7	4.6	1.1	1.3	-19.4
Urban Forest	25.8	18.2	6.9	5.5	5.4	3.5	-4.9	-11.4
Accra (GAMA)	23.1	4.4	10.6	3.7	1.3	4.4	-21.1	11.6
Urban	27.7	19.4	10.8	17.8	16.6	14.3	-5.0	-7.1
Rural Coastal	52.5	45.6	24	14.4	16.7	9.2	-2.0	-7.7
Urban Savannah	37.8	43	27.6	3.9	5.2	5.2	1.9	-5.4
Rural Forest	61.6	38	27.7	35.3	30.1	27.2	-6.7	-3.9
National	51.7	39.5	28.5	100	100	100	-3.8	-4.0
Rural	63.6	49.5	39.2	82.2	83.4	85.7	-3.5	-2.9
Rural Savannah	73	70	60.1	32.6	36.6	49.3	-0.6	-1.9

Source: NSDF Study 2014 based on WBGUR, 2013

7.5.2 Poverty distribution by district

Analysis of poverty by district provides a deeper understanding of the spatial distribution of poverty, as poverty rates, and gaps, can vary widely within regions. Figure 7.30 shows a bubble diagram of the poverty rate, gap and share for the 110 districts existing in 2007. Poverty rate is plotted on the x-axis, poverty gap on the y-axis, and poverty share is indicated by the size of the circle. In the Upper East, with the highest regional rate, Nadowli Kaleo poverty rate/gap is 85/44 while that of Kassena Nankana is 68/30. While Accra Metropolitan has a low poverty rate and poverty gap, the large number of poor means that its poverty share was second only to Bawku in the Upper East. Accra Metropolitan's poverty density was almost twice that of Kumasi and almost 8 times that of Bawku.

Figure 7.31 District poverty rate, gap and share



Source: NSDF Study 2014 based on GSS and GLSS5 (2006)

7.5.3 Poverty distribution by urban settlement

Table 7.3 identifies the five settlements with the highest poverty rates and the five with the highest poverty shares. The five poorest settlements—with poverty rates above 80 percent but with lower poverty shares—are all in the northern regions. The five with the largest share of poverty, but lower rates, are in Upper East, Northern and Greater Accra regions.

Table 7.3 Poverty in selected urban settlements

Name	population '000	district	region	poverty rate	poverty rate rank	# in poverty ('000)	poverty share	poverty share rank
Pusiga	7	Bawku	UE	0.89	1	6	0.6	53
Bunkpurugu	6	Bunkpurugu	NR	0.88	2	6	0.5	60
Janga	5	Mamprusi West	NR	0.88	3	4	0.4	85
Gushiegu	14	Gushegu	NR	0.87	4	12	1.2	14
Zebilla	8	Bawku West	UE	0.84	5	7	0.6	45
Bawku	51	Bawku	UE	0.55	42	28	2.7	1
Wa	67	Wa	UE	0.42	88	28	2.7	2
Yendi	40	Yendi	NR	0.67	21	27	2.6	3
Bolgatanga	49	Bolgatanga	UE	0.51	49	25	2.4	4

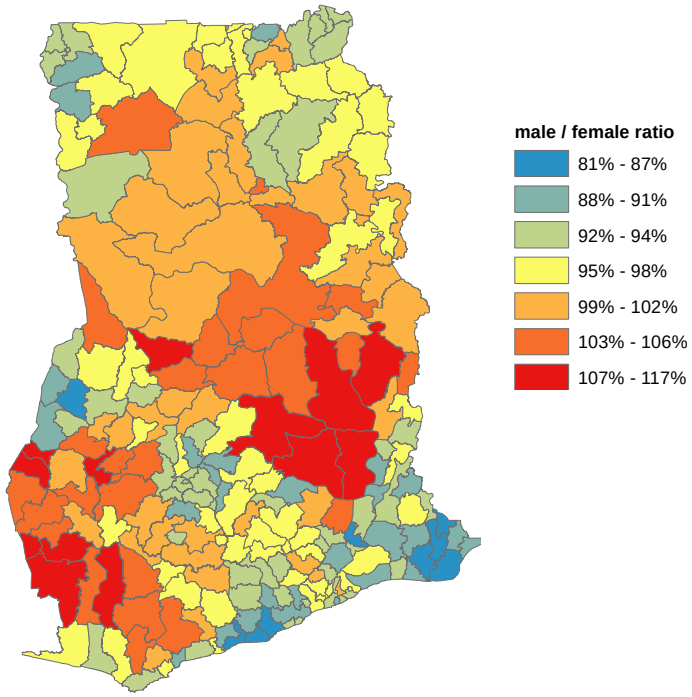
Ashaiman	150	Ashaiman	GA	0.16	176	24	2.3	5

Source: NSDF Study based on GLSS5 (2006)

7.6 Gender and development

Women play a key role in socio economic development. Women comprise more than 50 percent of the population in all ten regions, largely because of their higher life-expectancy. However, the male-female sex ratio varies significantly by district (Figure 7.32). Districts in the middle of the country and in Western region have higher sex ratios. Districts with higher levels of urbanisation, particularly in the 'triangle' but also around the regional capitals, tend to have more females than males.

Figure 7.32 Male-female ratio by districts



Source: NSDF Study 2014 based on GSS census data, 2010

7.6.2 Women and the economy

Women have an important role in the economy. Of the total number of economically active women, 65 percent are engaged in agriculture, 12 percent in commercial retail and marketing, and 10 percent in small scale manufacturing.

Key constraints in improving the economic outputs of women include inadequate size and conditions of markets, inadequate access to farm land, exclusion from formal sector and managerial positions, lack of child care facilities in both formal and informal work places.

Men and women display different patterns in their use of space. For example, women's journeys are more complex than men's—with stops for childcare, school, work, and shops—and women are less likely go by private vehicle and more likely to take public transport. At night, they feel less safe than men, especially in the inner city, or social housing estates.

Spatial planning may respond to these and other gender issues through: public transport routes that support women's travel patterns; improved safety features of

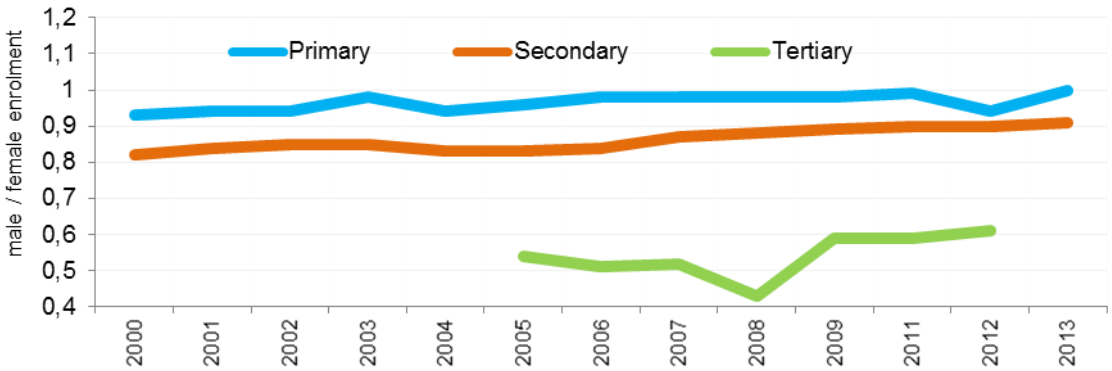
public spaces; more support facilities, such as local shops, childcare, and public toilets; and more local job opportunities through mixed use development.

7.6.3 Women and education

Increasing the number of educated women is one of the most important ways to bridge gender gaps and to achieve overall development goals. In general, an educated woman has more job opportunities and better health, enabling her to provide better services and opportunities for her family.

The proportion of girls enrolled at the primary, secondary and tertiary levels has been improving over the decade. Figure 7.33 shows that the gender parity index (GPI), which is the number of enrolled girls divided by the number of enrolled boys. In 2013, girls have achieved parity with boys at the primary level but not at the secondary and tertiary level, where the large disparity is a major concern.

Figure 7.33 Gender parity index for primary, secondary + tertiary education

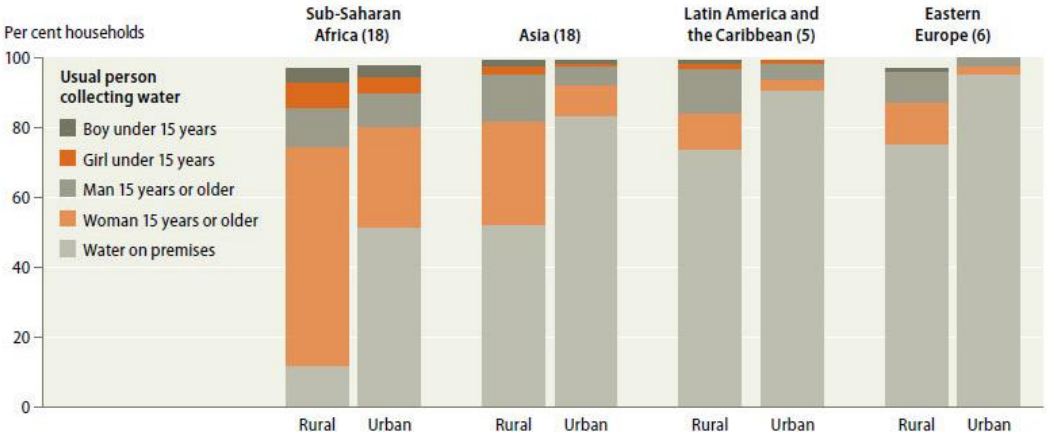


Source: NSDF Study 2014 based on UNDESA, MDG Indicators

7.6.4 Women, basic services, and urbanisation

In general, households in Sub-Saharan Africa are less likely to have a water source on premises than in the rest of the world (Figure 7.34). The share of rural households with on-site water is about 10 percent compared to 50 percent in urban areas. In both rural and urban areas, where households lack a water source on premises, women and girls are far more likely to be responsible for water collection. However, urban women are far less likely to be burdened with water collection than the rural women. This difference may be a factor in women's propensity to migrate to urban centres.

Figure 7.34 Who is responsible for water collection?



Source: The World's Women, 2010; Trends and Statistics, UNDESA 2010

7.7 Social Welfare: Disability, Social Security and Retirement

The National Social Protection Strategy (NSPS) provides a rights-based approach to address social vulnerabilities in the country. The policy aims at creating an all-inclusive and socially empowered society.

7.7.1 Disability Issues

Three percent of the population suffers from a disability—which can relate to sight, hearing, or speech, or to physical, intellectual and emotional issues—and a large share suffer from multiple disabilities (GSS 2010). Disability varies by type, gender and regions (Table 6.4). For example, more Volta males (4.1%) are disabled than Brong Ahafo (2.4%) males; more Eastern females (4.8 %) are disabled than Brong Ahafo (2.8%) females. More females than males have disabilities in Ashanti, Eastern and Greater Accra. For both males and females, sight followed by physical and emotional issues are the most common problems. In all regions, more females than males are disabled in sight and hearing. In Northern region, females are more disabled than males except in matters of speech.

Table 7.4 Population by disability, gender and region, 2010

Table 7.5		Volta	Upper East	Upper West	Eastern	Central	Western	Northern	Greater Accra	Ashanti	Brong Ahafo
Male											
# with disability '000	350	41	20	13	44	34	33	31	49	58	27
% with disability	2.9	4.1	3.9	3.8	3.4	3.3	2.7	2.5	2.5	2.5	2.4
% of disabilities											
visual/sight	38	42	38	35	41	40	40	28	39	38	32
hearing	14	15	19	16	15	13	13	17	10	14	16
speech	16	16	14	12	17	15	16	13	15	16	18
physical	25	26	22	21	29	28	25	18	24	26	27
intellectual	16	17	14	14	16	14	15	16	18	15	16
emotional	19	21	14	19	18	16	16	23	21	16	22
other	11	8	8	16	8	8	10	22	12	10	9
Female											
# with disability '000	388	50	20	13	51	42	33	30	55	66	27
% with disability	3.2	2.7	2.5	3.9	4.8	2.9	3.2	2.4	3.7	3.9	2.8
% of disabilities											
visual/sight	42	46	42	40	44	45	43	29	45	42	34
hearing	16	16	23	19	16	15	13	18	10	15	18
speech	12	12	11	9	13	11	12	11	11	12	15
physical	26	27	21	21	30	29	26	19	23	26	29
intellectual	15	17	12	12	15	12	15	16	16	14	16
emotional	18	21	12	17	18	15	16	24	22	16	21
other	10	7	8	16	8	8	9	22	11	10	9
%male-%female											
% with disability	-0.25	1.33	1.40	-0.16	-1.40	0.39	-0.42	0.15	-1.21	-1.40	-0.42
visual/sight	-4.06	-4.13	-4.65	-4.81	-3.06	-4.67	-3.27	-0.70	-5.81	-4.22	-1.57
hearing	-1.29	-0.95	-4.38	-3.49	-1.02	-1.49	-0.42	-1.32	-0.04	-1.60	-2.36
speech	3.74	4.03	3.23	2.75	4.23	3.96	3.83	2.10	3.90	4.33	3.25
physical	-0.61	-0.62	1.17	0.00	-0.96	-1.54	-0.98	-0.45	0.67	0.12	-2.06
intellectual	1.15	0.35	1.58	2.17	1.57	1.58	0.63	-0.46	1.66	1.64	0.81
emotional	0.27	0.72	1.44	1.60	0.07	0.80	-0.06	-0.80	-0.69	0.30	0.39
other	0.50	0.49	0.31	0.42	0.55	0.21	0.56	-0.66	1.19	-0.10	-0.19

Source: NSDF Study 2014 based in GSS 2010

Disabled people in Ghana have lower educational achievements, fewer jobs, and poorer health than those without a disability. Planning a built environment that considers the needs of disabled people promotes social inclusion. Buildings, transport access, public spaces, and recreation facilities should have disabled access facilities and incorporate the needs of various users. Creating inclusive planning policies, caters for the needs of various users, and also has benefits for other groups as the elderly and families with children.

7.7.2 An aging population

With Ghanaians living longer, there is an increasing need to plan for the growing number of elderly people. The growing number of elderly persons will have an impact on a gamut of planning policies covering housing, transport, health, safety, land use planning and recreation.

7.7.3 Youth

Ghana has a youthful population structure typical of developing countries, with a population pyramid having a broad base and a narrow top. In 2010, over 38 percent

of the population was below 15 while in Northern region this figure reached about 50 percent. The spatial distribution of population by age group shows a distinct pattern (Figure 7.35). Northern districts generally have a higher share in the 0-4 and 5-14 age groups and a lower share in the 15-64 age group than those in the rest of the country. Urbanised districts tend to have a higher share of adults and lower share of children.

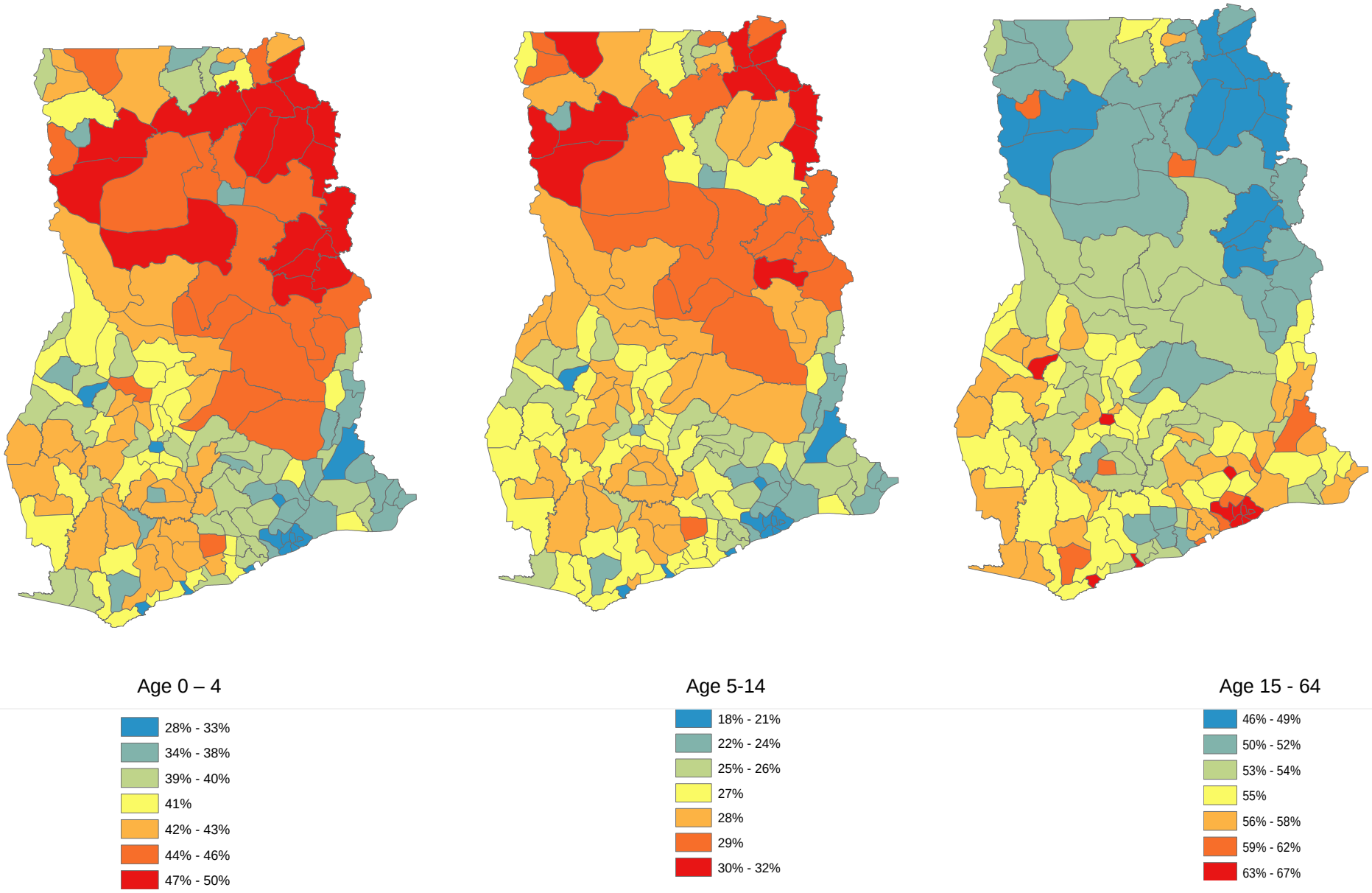


Figure 7.35 Percent district population in age group

7.8 Zone of Special Concern: SADA

A key development challenge for the NSDF is addressing the spatial disparities between the North and South of the country. The Northern Savanna area, occupying three main regions, covers about half of Ghana's territory and is its least developed section. Many government initiatives have sought to reduce the disparities between the north and south, with studies showing some improvements in social conditions within the last two decades. Nevertheless, the north still lags behind the south in terms of education, poverty levels and physical infrastructure. To bridge the North-South poverty gap, the World Bank, in its document “Tackling Poverty in Northern Ghana”, recommends geographically targeting the North to improve infrastructure, agriculture and business climate.

The NSDF builds on the strategies of Government of Ghana and the World Bank to address the North-South disparity. Savanna Accelerated Development Authority (SADA), the Government’s strategy, aims at repositioning Northern Ghana as an economically competitive zone in the Sahelian region. The key target is to reduce poverty by 20 percent by promoting environmentally sustainable practices while developing industry, infrastructure and human capital. The program envisions that all key stakeholders—the private sector, Government, research institutions, civil society groups and community based organizations—will work together to create a competitive region.

7.8.1 Economy

The economy of the North is mainly rural. Over 70 percent of the population is engaged in low yield subsistence agriculture with small scale farmers cultivating land areas ranging from three to five acres. Thus worker productivity and incomes are low; the three Northern regions are among the lowest contributors to GDP with GDP per worker below the national average. With a high share of its population under the age of 15, the lack of employment opportunities results in a high level of out-migration.

To create a competitive North, the NSDF recommends diversifying the economy, increasing productivity, and improving the living standards of local people. These recommendations are in line with the SADA strategy which targets seven industry sectors for diversifying the economy and creating a competitive zone: value added agriculture, tourism, mineral exploration and exploitation, metal manufacturing and fabrication, transport and logistics management, knowledge services and life sciences.

Strengthening Agriculture

The three northern regions have the largest percentage of regional lands cropped with low yields and with high levels of food insecurity. Subsistence rain fed agriculture on small scale farmlands, limited access to improved seed materials, poor milling ratios, poor storage facilities are, amongst others, the main contributors to the low agricultural output.

According to the World Bank, raising agriculture productivity in the North could raise the GDP to over 6% above the target. The history of agriculture policies in the North, from 1950 to 1983, also shows that agriculture has the potential to reverse the net drain of capital from the North. Accordingly, SADA’s pro-poor growth model is based on modernizing agriculture through market based out grower schemes and the cultivation of crops such as rice, tree crop production, production of selected staple crops, horticulture, semi-intensive production of ruminants and value added agriculture.

An estimated 219,000 ha of land will be dedicated to the production of rice: 196,000 in lowland production, 18,000 in upland and 5,000 in irrigated land. In the short term, 50 percent of land will be cultivated (95,000 ha) by 95,000 households. In addition, 18,000 ha and 5,000 ha will be sustained for another 20,000 households. Block farming will be promoted in large valleys with the private sector providing improved seedlings. The distribution regionally is as follows: 178,000 ha in Northern region (Gushiegu/Karaga, East Gonja, Tolon Kumbunga, Yendi), Upper East region (Naraga, Tamde, Chuchukga, Gbefembilisi, Wiesi) and in Upper West region.

Another 500 acres of land in each district would be dedicated to mango production. To reduce rural poverty, about 60% of rural households will be targeted for mango production. Another 308,000 poor households would be assisted to cultivate cereals (maize, sorghum and millet) and legumes (cowpea, groundnut) of their choice.

Promoting Value Added Agriculture

Agro processing would be encouraged to increase the productivity of all stakeholders along the value chain. Small holder schemes would be linked to medium and large scale enterprises to boost production. Agro processing will cover high value fresh produce, canned products, rice milling, textiles and oil seed products.

The cultivation of tomatoes, mangoes and other high value fresh fruit produce that thrive in the Northern climate would be encouraged. Projects as the USAID TIPCEE is targeted at identifying such varieties in Upper East and Northern region.

The Northern Star Tomato factory (Pwalugu) and other canneries would be revamped to take advantage of the high demand for canned products, particularly tomatoes, while exploiting existing local know how for tomato production.

Logistic hubs will be established in Hamile/Wa, Paga/Bolgatanga, Pusiga/Bawku, Tamale, Buipe to serve as exporting processing centers for high value fresh foods. The new trunk roads linking Wa to Tamale, the upgraded trunk road between Bolgatanga and Bawku, improved inland water transport and the new international airport at Tamale will further facilitate transportation of fresh food produce for exports.

The Nasia, Tono and other rice mills will be established to take advantage of the high domestic demand for rice. Rice cultivated in Gushiegu, Karaga, Tolon Kumbungu and Yendi will feed the Nasia rice mills. The Tono mills will take advantage of the production of rice in the irrigated fields near Navrongo (Tono) and Bolgatanga as well as the low valley fields in Fumbisi and Gbedemblisi valleys.

Cotton ginneries will be promoted in Tamale, Bolgatanga and Tumu to take advantage of the large quantities of cotton in the Savannah/Sahel region. NSDF supports the cultivation of cotton as a cash crop in the North. Nonetheless as cotton has potential to degrade soils, NSDF recommends regulation of cotton production and strengthening trade with other Sahelian countries to supply cotton for the ginneries. The scaled cotton plants would contribute to the development of textile industry in the region.

Oil processing facilities would be established to facilitate and expand the production of soya, bean, groundnut, cashew and mango seeds and promote out-grower schemes. Medium scale oil processing producers such as Bosbel in Tamale would be supported. Large scale shea butter plantations and processing facilities would be established near Tamale.

Tourism

Community Tourism initiatives[184] as identified in the National Tourism Development Plan would contribute to the development of community centred tourist attractions within the Mole National Park and other areas in the North.

The proposed recreational corridor along the Volta Lake with its improved transportation network will contribute to the development of adventure, eco-tourism, and culture tourism in such areas as Bolgatanga, Vea and Gambaga. Areas along the Tono dam will be developed for Avitourism.

Mineral exploration and exploitation

To diversify the Northern economy, SADA proposes the exploration of the mineral resources in the Northern territories.

Gold deposits in Upper West region are available in the Wa-Birimian valley from the north of Tuna to Hamile. Additional deposits are found in the Birimain Nagodi belt and in Sandema.

Other mineral deposits include iron ore in Tumu and Sheini hills in Zabzugu-tatale; granite in Bongo, limestone in buipe, barite and brine in Daboya and manganese in Kapili and Kalimbi hills

The Northern region also has various minerals in the Birimian- Bole belt, Bui belt and Maluwa basin.

Metal manufacturing and fabrication

Artisanal metal producers would be linked to GRATIS and other organizations to improve their skillset and develop the manufacturing and fabrication industry.

Transport and logistics management

Transportation services and logistic centres will be established to promote export oriented businesses. These will include post-harvest facilities such as pack houses and terminals at airports.

Knowledge services- SADA

A cluster of knowledge services would be established to support agriculture, tourism, mining, recreational and cultural products. The faculty at the University for Development Studies and the polytechnics as well as research teams at the Savannah Agriculture Research Institute and the Navrongo Health Research Centre, would collaborate with the private sector to strengthen academic-industry linkages. This synergy would further boost the knowledge services sector into a competitive cluster capable of servicing local business needs as well as other regions of Ghana and the Savannah/Sahel region.

Life sciences

Pharmaceutical, medical, biotechnological and other health related industries would be developed. This industry would focus on innovative products and services to provide customized solutions for diseases predominant in the Savannah/Sahel region e.g. Cerebro spinal meningitis.

[184] The National Tourism Development Plan identifies tourism potentials in the north

Improving the Business Climate in the North: Urban Networks and Improved Connectivity

Locational disadvantages, small market size, risks associated with doing business and an underdeveloped labour market contribute to the low level of private investments in the North. According to the World Bank, current fiscal policies as lower taxes will favour greater investments in the north and rural areas outside regional centres. However, high initial start-up costs, locational constraints and poor infrastructure deter investments in the northern regions. For example, investors qualifying for incentives under the free zone arrangements have incentives that are attractive with no constraints on location would rather establish their firms within these zones rather than the North given its locational disadvantages.

To attract private investment to the North, SADA proposes the development of targeted investment attraction by promoting special planning zones, cluster development and improving the value chain system. However, creating a special planning zone will be ineffective if locational disadvantages are not addressed. The NSDF proposes the development of urban networks and improved connectivity within these centres and the surrounding regions to minimize the locational disadvantages of the region.

The NSDF proposes the development of the Tamale, Wa and Bolgatanga-Bawku urban networks. The Tamale urban network, for instance, is made up of compact urban centres whose urban population is projected to increase by 65 percent by 2035. Designated commercial agricultural centres in the Bui, Kabaga, Katanga valleys are within the sphere of the Tamale urban network. The upgrade of the Tamale airport to an international airport, improved water and road transport will facilitate the growth of this urban centre. The urban network has the highest percentage of skilled workers with better access to social services. The Wa urban network has few and dispersed settlements; however, with the development of infrastructure, the network will be strengthened to create favourable conditions for the growth of firms and industry.

Following the urban network approach, the main urban centres of Tamale, Bolgatanga, Yendi and Wa will be home to a cluster of service industry which would include firms, research institutions, universities, financial bodies and public agencies. This cluster will support the registration and growth of firms. The development of water, air and road transportation networks within these urban systems and surrounding rural areas would contribute to reducing the cost of doing business and would bridge the forward and backward linkages between agriculture and the economy.

The development of urban networks would encourage a clustering of settlements in the north and minimize the north-south migration while improving the markets for produce from the northern regions. Over 50 percent of rural settlements fall within the sphere of these urban networks consisting of Tamale, Bolgatanga, Yendi and Wa. Greater interactions between urban and rural settlements would minimize the physical, human and financial capital that restricts the poor from fully participating in economic activities. A strengthened feeder road network system would improve linkages between industries and rural production centres. These networks as well as outgrower schemes would minimize the physical, human and financial capital that restricts the poor from fully participating in economic activities. Enterprise development projects, such as the *Making Markets Work for the Poor*, would aim at exploring opportunities to assist small scale facilities in production areas so that they have comparative advantage over large industries.

Improved transportation networks within and across regions will facilitate trade within the region and across regions and international borders. The circular road from Tamale-Wa-Tumu-Navrongo-Tamale will enhance movements. In addition to these, NSDF recommends new and upgraded trunk roads between Wa and Tamale (I-14), Wa and Bolgatanga (I-11), Bimbila and Tamale (N-9), Bolgatanga and Bawku, Nakpanduri and between Walewale, Gushiegu, Karaga and Tamale. Improved ferry crossings and the development of the railway line will create and enhance a favourable development environment.

In addition, SADA would promote trade fairs and exhibitions encouraging partnership between firms in the north with other business associations within the Sahel region.

7.8.2 Climate Change and Improved Livelihood

Sustainable tree crop production would improve the land cover and ecological conditions in the savannah lands. Further, several donors, including OXFAM, USAID, DFID, CIDA, DANIDA and UNDP, have supported projects to alleviate poverty, improve livelihoods while mitigating climate change. Such projects as the Northern Ghana Food Security and Resiliency, Feed the Future and Resiliency in Northern Ghana would ensure food security while discouraging agricultural practices that have adverse effect on the environment.

The green infrastructure network would also protect, link and preserve forests and waterways in the region. Protected areas along the Oti, Black and White Voltas would contribute to the conservation of the Eco-system and encourage tourism. For sustainable agricultural development in the North, NSDF also promotes irrigation schemes for specific areas where the water could be channelled from northern Volta Lake. Last but not least the implementation of the SADA strategy, which is in a way a kind of NSDF for the northern regions, remains to be operationalised.

Volume I

Chapter 8

Climate Change

8 Climate change

The recent report from the Intergovernmental Panel on Climate Change, *Change Climate Change 2014 Synthese Report*, makes a good case for considering climate change. It states that global warming is inequivalent, that it is caused by greenhouse gases emitted by human activities, and that it will impact human and natural systems. It confirms that the impacts will include sea level rise, more and less precipitation and extreme weather events. It points out that the risks will be greater for some areas, including Africa, and particularly for the disadvantaged people and communities. On a more positive note, it says that climate change impacts can be limited with reductions in greenhouse gases and adaptation.

This chapter will review the climate change policy and institutional framework. It summaries the causes, trends and forecasts for Ghana, examines the spatial impacts of climate change, and recommends appropriate mitigation and adaptation measures.

8.1 Climate Policy and Institutional Framework

Ghana ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and is among the nations that are responding to the challenges of climate change institutionally and through policies, strategies and actions. This section discusses the policy and institutional framework for addressing climate change.

8.1.1 Institutional framework

Ghana has a well-developed institutional framework for addressing climate change. The Environmental Protection Agency (EPA) is the lead institution for climate change and its parent, the Ministry of Environment Science, Technology and Innovation, hosts the National Climate Change Committee which has representatives from relevant MMDAs, academia, donor agencies, private sector and NGOs. The Forestry Commission and Energy Commission have created climate change units for REDD+[185] and energy efficiency issues, respectively. The Ministry of Finance and Economic Planning has a natural resources and climate change desk. Finally, NDPC and the National Disaster Management Organization (NADMO) are, respectively, mainstreaming climate change and disaster risk reduction into national development planning at all levels.

8.1.2 The climate change policy framework and projects

Ghana National Climate Change Policy

The Ghana National Climate Change Policy, or NCCP, was prepared in 2013 and launched in 2014 with a vision “to ensure a climate-resistant and climate compatible economy while achieving sustainable development through equitable low carbon economic growth for Ghana”. Its three objectives are effective adaptation, social development and mitigation. The policy gives priority to adaptation over mitigation and identifies five strategic areas: energy and infrastructure, natural resources management, agriculture and food security, disaster preparedness and response, and equitable social development.

NCCP also identifies ten programme areas to address critical issues. Expressed as actions, these are: develop climate-resilient agriculture and food security systems; build climate-resilient infrastructure; increase resilience of vulnerable communities to

[185] REDD stands for "reducing emissions from deforestation and forest degradation".

climate change risks; increase carbon sinks; improve management and resilience of terrestrial, aquatic ad marine ecosystems; address impacts of climate change on human health; and minimise impacts on access to water and sanitation; address gender issues in climate change; address migration; and minimise greenhouse gas emissions.

GSGSA 2014-2017 on climate change

The draft GSGSA 2014-2017 also addresses climate change mitigation and adaptation in its section on climate variability and change and under the areas of agriculture and natural resources.

The section on climate variability and change highlights several climate-change-related issues, of which the most spatially-relevant are: rising sea level, degrading urban waterfronts and declining agriculture productivity. Both mitigation and adaptation are considered. Mitigation policies include the promotion of a “green” economy, while strategies to achieve this policy include: (i) promoting energy-efficiency in the transport and agricultural sectors and (ii) prioritizing technical and systemic innovation initiatives in the energy, transport, natural resources, waste management and eco-tourism sectors. Adaptation strategies include: (i) alternative livelihoods strategies for the vulnerable poor, especially women; (ii) better managed water resources; (iii) improved agricultural practices; and (iv) demand- and supply-side measures for adapting the national energy system to anticipated climate change impacts.

The key marine and coastal zone policy calls for the following: map and conserve coastal forests and wetlands, properly site industries, replant mangroves, improve liquid and solid waste management, provide fish processing infrastructure and strengthen community resource management and alternative livelihood schemes.

The key wetland and water resource policy calls for the following: protect wetlands from degradation, rehabilitate degraded wetlands, provide alternative livelihoods, adopt watersheds planning, and promote the sustainable use of wetlands for farming, grading and fishing and timber production and salt making.

The key natural disasters, risks and vulnerability policy calls for reduced vulnerability to and mitigation of the impact of natural and man-made disasters, especially in the Accra capital region. Identified hazards issues include floods, droughts, forest and other fires, and earthquakes. Spatially relevant strategies to support this include increasing the resilience of disasters in the national capital and restricting development in flood-plains, waterways, and wetlands.

National Infrastructure Plan on climate change

The National Infrastructure Plan also responds to climate change, noting that it may have "implications for the planning, design and implementation of initiatives in the transport sector". It stresses that "future decisions on the choice of transport investments will be influenced by the potential emission rates of the various modes". It also points out that the transport sector accounts for 99.7 percent of gasoline consumption of which most is used for road transport. The transport sector accounts for over 60 percent of non-biomass carbon dioxide and over 50 percent of nitrogen oxide emissions.

Other climate-change programmes and projects

Climate change programmes and projects include (i) "Building Capacity to meet the Climate Change Challenge (B4C-Ghana)", funded by the Open Society Foundation, led by the University of Ghana, and includes the Ghana Wildlife Society and Centre for African Wetlands; (ii) the West Mamprusi District Assembly (WMDA) project to

support alternative livelihood options, funded by Hanns Seidel Foundation, a German non-governmental organisation, to plant trees as part of a buffer zone, reduce exposure to crop farming by adapting to ruminants' production; (iii) Africa Adaptation Programme, funded by JICA and UNDP, to mainstream climate change, develop capacity and leadership, develop an early warning system, expand financing opportunities and build and manage climate-change knowledge and (iv) the Integrated Coastal and Fisheries Governance (ICFG) Initiative, funded by USAID, is active in six coastal districts of Western region.

The latter project, known as the Hen Mpoano (Our Coast) initiative, aims to ensure that the coastal and marine ecosystems are sustainably managed to provide goods and services that generate long term socio-economic benefits to communities while sustaining biodiversity. It will help to integrate management reforms into the food security agenda given the high dependence of the population on fish in the diet, the economic importance of the fisheries sector and declining stocks.

8.2 Climate change causes, trends and forecasts

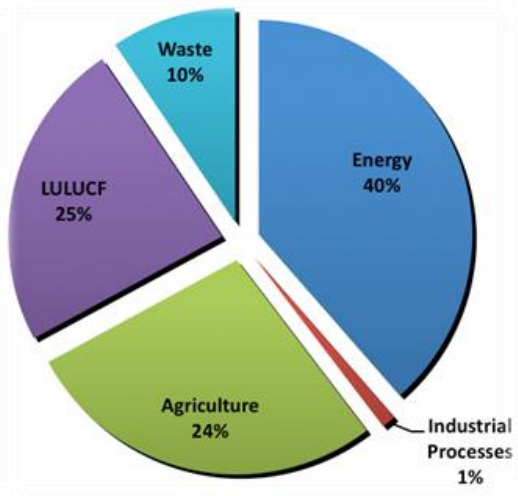
It is import to understand the causes, trends and forecasts of climate change and its impacts in order to better plan measures to address, mitigate and adapt to the changes.

8.2.1 Global and Ghanaian contribution to climate change

Climate change is caused by the emission of six greenhouse gases (GHG) which are released as a result of human activities[186]. Important emitting activities are electric power generation for electricity, heat, and industrial activities; land use changes such as deforestation, bush fires and burning; agriculture including fertilizer use and livestock; transportation; wastewater treatment and solid waste landfills.

Ghana contributed only about 24 mega-tonnes[187] of CO_2 equivalent gas, or about 1.1 tonnes per person, which is low compared to the global average, and particularly compared to the USA's 20 tonnes per person. The electric energy generation sector contributed 40 percent of all greenhouse gas emissions followed by 25 percent for the land *use, land use change and forestry sector (*LULUCF*),* 24 percent for agriculture, 10 percent for waste and 1 percent for industrial processes (see chart)[188].

Percentage of Ghana's greenhouse gas emissions



Nevertheless, between 1990 and 2006, greenhouse gas emissions increased by 107 percent, or over 240 percent if emissions from LULUCF are included. Increase emissions are attributed to increases in power from thermal (fossil fuel) sources, transport fuel consumption, livestock numbers and emissions from fertilizer application, and per capita solid waste generation accompanied by poor urban waste management practices. Increased methane gas emissions are a result of

[186] GHGs include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbon, and sulphur hexafluoride, all of which are released as a result of human activities.

[187] In 2006, more recent figures were not available.

[188] Environmental Protection Agency of Ghana, 2011

biomass burning, valley-bottom rice cultivation and enteric fermentation from domestic livestock, while decrease nitrous oxide is due to a reduction in agricultural fertilizer use. It is generally accepted that if Ghana follows a high-energy intensity development model of the western countries, GHG emission levels will skyrocket.

While Ghana's energy sector is discussed in other chapters, it is important here to note that its main energy resources are wood-fuels, hydro-electric power and fossil fuels. In-country primary energy production is comprised of 90-95 percent wood fuels, 5-10 percent hydro energy and less than one percent solar energy. Solar energy is used for sun-drying of selected crops and solar electric energy generation is negligible, only about 150 tonnes of oil equivalent.

8.2.2 Urban contribution to climate change

Urban settlements, with over 50 percent of Ghana's population, consume a larger share of its energy and produce a larger share of greenhouse gases. In addition, the urban population is not only growing faster than rural population but per capita energy consumption is increasing at a faster rate than rural areas. This energy is used in generating electricity for light, heat and cooling, electric equipment and industrial machinery and for cooking, industry and transportation.

Globally, 70 percent of greenhouse-gas emissions come from cities[189], but the per capita emissions vary greatly, from only 0.12 tons of CO_2 equivalent (tCO_2e) in Kathmandu to 7 tons in New York to almost 20 tons in Washington, DC[190]. The differences in developed cities is in part due to spatial planning, as pointed out by UN-HABITAT's Executive Director; "cities are places where the greatest efficiencies can be made. This makes it imperative that we understand the form and content of urbanization so that we can reduce our footprint. Understanding the contribution of cities to climate change will help us intervene at the local level. With better urban planning and greater citizen participation we can make our hot cities cool again".

Sectoral contribution to urban emissions also varies. Globally, electrical energy demand, use and supply are projected to grow significantly and mostly in cities. Transport of goods by road and more private vehicles on poor roads with more congestion and slower traffic will lead to more fuel consumption and related emissions. New and retrofit buildings present a large opportunity to reduce emissions, particularly in fast growing cities in developing countries. Freight transport is an important and growing source of emissions due to demand for material goods and global trade (IPCC).

8.2.3 Primary effects of climate change[191]

Three primary changes related to climate change have been recorded in Ghana: increasing temperatures, sea-level rise, changing precipitation patterns, seasonal shifts and increasing sea and lake water temperature and acidity.

Increasing temperatures. Global average annual temperature has increased by 1°C per decade since 1960 and is predicted to rise by between 1.5 and 5.9°C by 2100[192]. Temperatures in Africa have increased throughout the 20th century and the

[189] Hot Cities: battleground for climate change; UN-HABITAT; 2011

[190] www.worldbank.org/urban - March 2011

[191] While climate change is irrefutable and well-documented, climate change scientists are uncertain as to the likely magnitude of future emissions, the effect that this will have on climate change and the resultant impact that the change will have on global and local environments and development sectors. For this reason, scientists prepare scenarios that are based on a combination of different assumptions. The Intergovernmental Panel on Climate Change (IPCC) prepared four projections which cover the theoretical maximum variation in precipitation outcomes which it termed, from wettest to driest: global wet, global dry, local wet and local dry. The discussion of the primary effects of climate change is based on these scenarios.

[192] Climate change, agriculture, and foodcrop production in Ghana, Policy Note 3, September 2012, International Food Policy Research Institute

rate has increased since in the twenty-first[193]. Assuming a 2°C global increase by 2050, average summer temperature in Africa will increase by 1.5°C, leaving 45 percent of the continent exposed to heat extremes. With a 4°C global scenario, temperatures would be higher, worsening agricultural growing conditions, especially in coastal West Africa. In Ghana, between 2020 and 2080, average temperatures are predicted to increase by 4.1°C between January and May and by 3.5°C during the summer months. Northern, Upper East, and Upper West regions will have the highest increases and Brong Ahafo the lowest.

Changing precipitation patterns: Since 1960, average annual rainfall has decreased in Ghana by about 2.4 percent per decade. Rainfall has also become more variable and erratic and shows a cyclical pattern with high rainfall levels followed by drought every decade or so. Between 2020 and 2080, rainfall is projected to decline by up to 20 percent, with the sharpest declines predicted in the south-western regions. In the Volta Basin, prolonged dry seasons will replace shorter dry spells. The wettest regions will be Ashanti and Western regions and those near the coast—Volta, Eastern, Central, and Greater Accra. The driest regions will be in the north. Rainfall projections also show increased rainfall in the coastal zone during the longer dry season between December and February.

Rising sea level: Sea levels have risen globally by 2.1 percent per year over the last 30 years. IPCC predicts a rise in average sea level over the next 100 years ranging between 13 to 28 centimetres in a low scenario and 26 to 59 centimetres for a high scenario (IPCC 2007). Other projections show a rise of up to 30 centimetres by 2050 and by one meter by 2100. Sea level rise will impact all coastal settlements, but in addition, there is evidence that many large urban areas through the world are sinking as a result of large-scale extraction of groundwater, mining of materials for construction and minerals for industry, and soil compaction from urban development[194]. It is unclear if or to what extent this is happening in Ghana's coastal cities, but some coastal communities have been hardly affected, e.g. Panbros, Grefi and Gbegbeyise communities on the Dansoman coastal area of Accra, Ankobra settlement in Western region, and many other coastal communities. Sea level rise will exacerbate inundations and episodic flooding tide in low lying coastal areas, wherefore mitigation plans are required, and mainly regulations to limit or rather ban development in those areas.

Seasonal shifts: Between 1961 and 2000, there was an increase in the number of warm spells over southern and western Africa, and a decrease in the number of extremely cold days (New et al., 2006).

Increasing sea and lake water temperature and acidity: In addition to sea level rise, the ocean's physical and chemical properties are changing. Warmer air temperatures warm oceans and lakes, and warmer waters hold less dissolved oxygen, which in turn fosters harmful algal blooms and increased toxicity of some pollutants. In addition, the oceans are absorbing more carbon dioxide, which increases their acidity. The combined impact of these changes are still not clear, but it is likely that it will threaten coral reefs, fisheries, protected species, and other natural resources[195].

[193] 50 Years of Urbanization in Africa - Examining the Role of Climate Change; J. Vernon Henderson Adam Storeygard, Uwe Deichmann; World Bank Development Research Group

[194] http://sustainablecitiescollective.com/david-thorpe/317091/sinking-feeling-coastal-cities-doomed-disappear-beneath-waves with evidence from a new European Space Agency satellite

[195] Draft EPA New England Regional Climate Adaptation Plan, September 2013

8.2.4 Secondary biophysical impacts

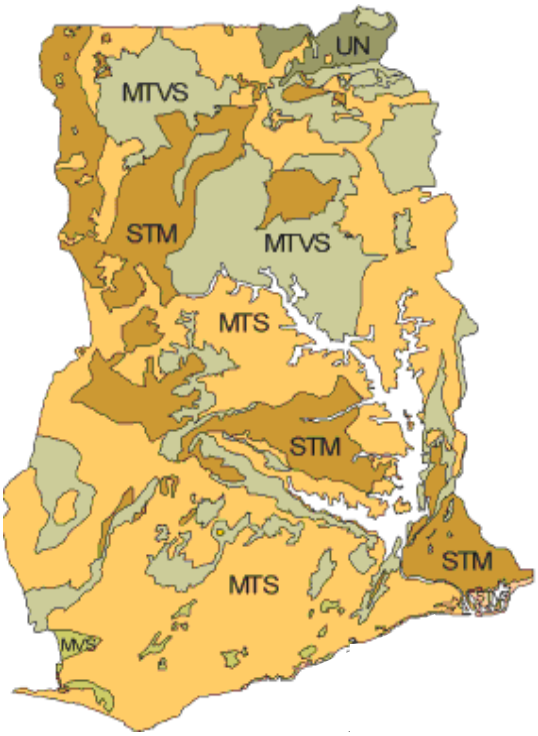
Primary changes in the climate are forecasted to result in numerous secondary biophysical impacts on water availability, land loss and degradation, salt water intrusion and forest cover loss.

- **Rain water runoff** in streams and rivers will vary widely across the country; runoff will increase into the Volta basin and decrease in the south western part.
- **Flooding** will increase in frequency and intensity in many rural and urban areas. Watersheds that cover parts of neighbouring counties are also affected, increasing the need for cooperation in managing shared water resources.
- **Droughts,** or long periods without rain, will increase as a result of lower moisture levels due to higher temperatures and less precipitation.
- **Land loss and degradation** will occur through erosion from extreme rainfall events, swelled rivers and streams, floods and sea level rise and storm surges. One study estimates that a sea-level rise of 30 centimetres by 2050 would result in the loss of over 20,000 hectares of land[196]. Another study—of three communities mentioned above, at Dansoman near Accra—predicts a loss of over 200 metres of coastline or about 0.80 km^2 of land by 2100, affecting over 650,000 people and 900 buildings[197]. Figure 8.1 shows areas of erosion hazards including areas that have already experienced some coastal erosion.
- **Salt water intrusion** will occur as a result of sea level rise and erosion. The impact of salt water intrusion into the coastal aquifer will render well-water unfit for drinking and require the development of alternative sources. It will also reduce agriculture yield.
- **Forest cover loss** will occur as a result of reduced rainfall and an increase in bushfires. Loss of forest cover will lead to desertification. In 2005, one study estimated that close to half of all districts, or 35 percent of the land area, is desert and that thus desertification is advancing at about 20,000 hectare per year.

[196] The estimate was prepared using the 'DIVA' global model, which is an integrated model of coastal systems that assesses the biophysical impacts of SLR taking into account coastal erosion, coastal flooding, wetland change and salinity intrusion into deltas. DIVA uses information on land use and coastal population and economic growth to determine the lands permanently lost to SLR.

[197] Impacts of Coastal Inundation Due to Climate Change in a Cluster of Urban Coastal Communities in Ghana, West Africa, 2011

Figure 8.1 Map of erosion hazard



STM - slight to moderate
MTS - moderate to severe
MTVS - moderate to very severe
MVS - moderate-very severe
UN - unclassified

Source: NSDF Study 2013 based on LUPMIS data

8.2.5 Sectoral impacts

Ghana's major economic sectors are sensitive to the projected impacts of climate change, particularly rising temperatures, erratic rainfall, floods and more extreme weather events. Climate change impacts will extend to many sectors, including those identified by the NCCP such as agriculture and food security, energy and infrastructure, natural resources, social development and tourism.

Agriculture and food security: The agriculture sector is particularly vulnerable to climate change owing to the agricultural-dependent economy, large number of agricultural jobs particularly small-scale farmers, and a low-tech rain-fed production system. Both food and cash crops will be impacted by temperature rise, decreased rainfall and drought, rain cycle variability and change as well as land loss from erosion, degradation and bush fires. Studies in Africa predict yield losses for important food and cash crops of between 8 to 15 percent by 2050, and between 20 to 47 percent for individual crops by 2090[198]. One Ghanaian study suggests that food crop yields will decrease by seven percent between 2010 and 2050. Lower yields will lead to increases in food prices. Poorer urban households may suffer more than rural farmers who may realise higher incomes. Figure 8.2 shows that agriculture revenue loss is predicted for most of Africa and half of Ghana.

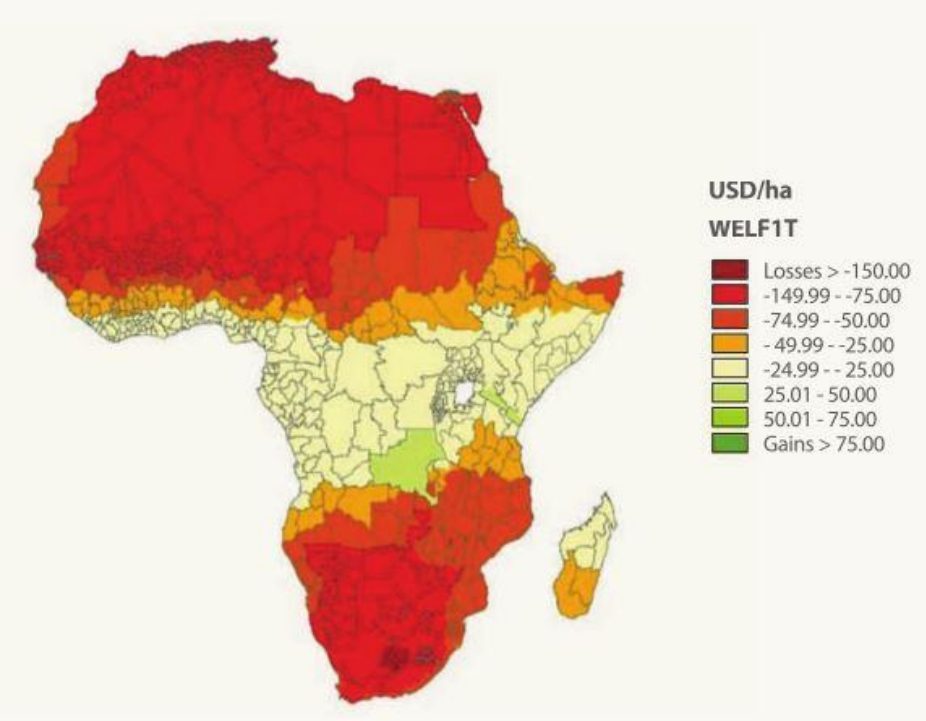
Increased rainfall unpredictability will increase farmers risk and impact livelihoods. While some coping strategies exist—such as shifts in planting periods, planting on raised ridges, drought-resistant varieties, stream water irrigation—although some

[198] 50 Years of Urbanization in Africa - Examining the Role of Climate Change; J. Vernon Henderson Adam Storeygard, Uwe Deichmann; World Bank Development Research Group

may be harmful including farming along river banks, excessive use of weedicides and unsustainable farming practices[199].

Cocoa production may decrease as a result of damage to the coastal zone from flooding, soil moisture changes, land loss and migration to urban areas. Some studies predict a fall in cocoa production from 2020 to 2080; others suggest that the whole cocoa industry may fail.

Figure 8.2 Change in net revenue per ha from moderate change in temperature and precipitation



Source: African Journal of Agriculture and Resource Economics, 2008

Energy and infrastructure: Studies predict that Ghana will be water-stressed by 2025 (NCCP). Reduced water levels in reservoirs, as already seen at the Akosombo, will decrease hydropower[200]. At the same time, temperature increases will increase energy demand. However, meeting the higher demand through thermal sources, including emergency generators, will increase emissions. Higher cooling-water temperatures will also reduce the efficiency of thermal power plants. Increased frequency of extreme weather events may also lead to disruption of electrical service.

Roads may deteriorate more rapidly from increased floods, rainstorms, strong winds and higher temperature. Unpaved and untreated feeder roads will be most affected as will the agricultural producers who live in these areas. Urban roads are also vulnerable.

Basic water and sanitation facilities may be damaged by floods, which may contaminate water wells and boreholes and other supplies. In general, there will be less water available on the surface, in aquifers and in rivers. Almost all users of water—including farmers, households and industries, and hydropower generation—

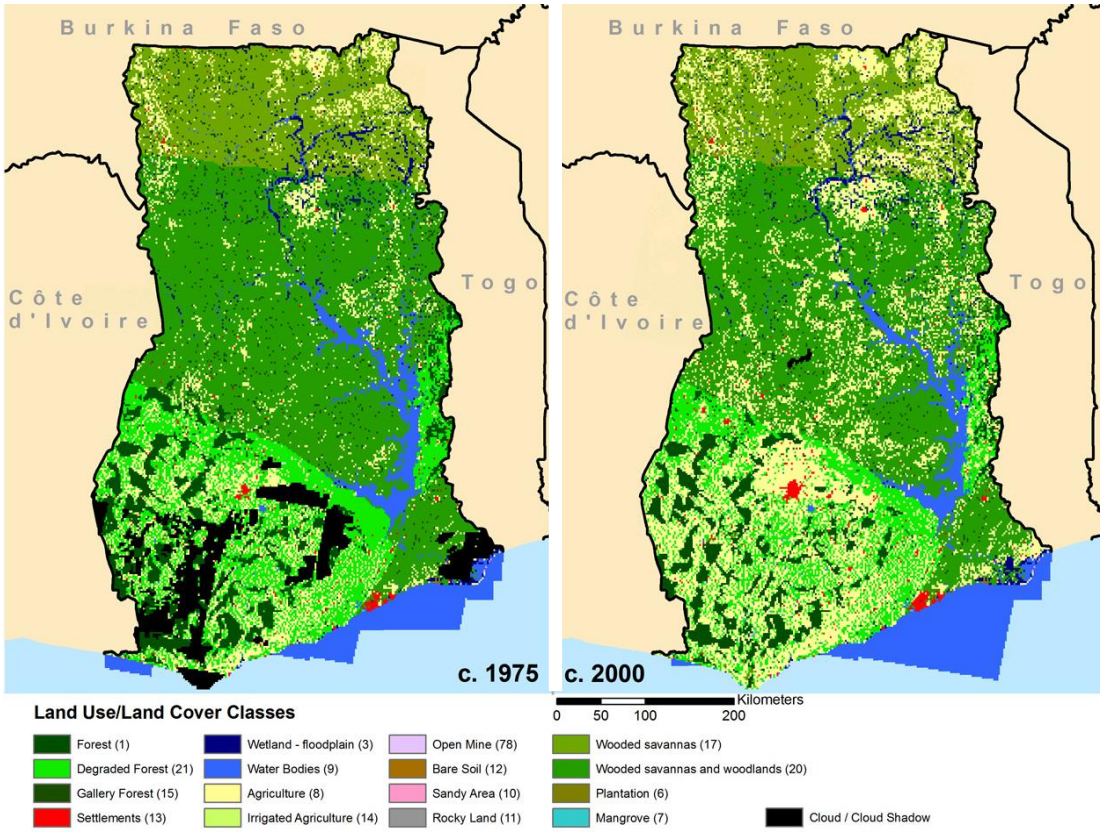
[199] Assessment of coping and adaptation strategies to climate change in Offinso North and South Districts, Ashanti Region, Ghana, Gloria Djagbletey, Paul Bosu, George Ametsitsi, Shalom Addo-Danso, Ernest Foli, Joseph Cobbinah, Prempeh Bando and Elvis Nkrumah, 1st IUFRO-FORNESSA Regional Congress, Nairobi Kenya. 25th-30th June 2012

[200] The dam once supplied 70 percent of Ghana's energy but now accounts for only 30 percent

will be affected. Salt water intrusion will further reduce water for many coastal communities without mains connections.

Natural resource management: Climate change will impact forests, wetlands, coastlines, soil and land resources. Forest will be degraded and lost by rainfall decreases and drought, higher temperatures, increased bushfires, biodiversity loss, and indirectly by the need to increase crop land. Wetlands will be lost through sea level rise. Soil erosion now affects almost 70 percent of the total land surface.

Figure 8.3 Ghana land use / land cover change



Source http://lca.usgs.gov/lca/africalulc/images/ghana_lulc_change_pair_factsheet_map_1280.jpg

Social development (human welfare, public health and education): Human health and welfare will deteriorate directly through the harsher (hotter) environment, with the warming effect "magnified" in cities. Health will also be impacted by an increase incidence of diseases and reduced access to water and food, disruption health services delivery, e.g. flooding of facilities, and the loss of transport infrastructure. The poor will also suffer through loss of assets and livelihoods. The most affected social-economic groups will be small- and migrant farmers and fisherman, women and children, the aged and physically challenged. Women are particularly vulnerable to the negative impacts of climate change, given their relatively higher levels of poverty and their responsibilities for household water, food and fuel. Recent studies have documented a link between temperature increases and rainfall declines on the health, education and poverty levels of children.

Extreme heat can and have impacted human health. USA and Europe have recoded hundreds of heat-related deaths. Schools without AC are closed. Buildings without air conditioning or proper ventilation, which are those with lower income status, are the most uncomfortable and dangerous. Warmer temperatures and extreme weather

events can combine to encourage the spread of infectious diseases. Increasing temperatures tend to increase in electricity demand due to the increase in air conditioning use, which leads to increases in emissions of nitrogen oxides (NOx) and particulates.

Tourism: Tourism may be impacted by higher temperatures, sea level rise, and lower lake levels. Climate change impacts on tourism may be felt the most in coastal zones as a result of degradation and loss of tourism assets such as beaches, coral reefs, cultural sites, and hotel accommodation. Sea-level rise may threaten many heritage resources, many located at vulnerable coastal sites including many forts, castles, monuments, and Asomdwe Park. There are at least 27 significant tourism assets, including festival sites, located in the coastal area[201]. Higher temperatures may reduce the attractiveness of open-air ecotourism in wildlife areas and parks. A drop in the levels of Volta and Bosomtwe lake levels would also make them less attractive.

8.3 Spatial impacts of climate change

Climate change and climate change impacts will have different spatial manifestations. The transitional zone will experience some drought as well as an earlier end of rainfall, changing the two-season cropping into one, and reducing agriculture yields. The forest zone rainfall will decrease more than the other zones. Coastal zone will face rising sea levels, erosion and salt water intrusion. Finally, the savannah zone will be the worst-affected region in terms of droughts and road-deterioration due to high reliance on agricultural incomes and consumption and greater remoteness and therefore higher transaction costs.

8.3.1 Population migration

Owing to climate impacts, significant numbers of people may migrate to areas with better land and opportunities. People will migrate between regions but also from countries to the north of Ghana, which will become hotter and drier. Urban areas will get the bulk of the climate refugees, increasing the demand for jobs and putting pressure on urban services.

Ghana has made major progress on poverty reduction in recent decades. Nevertheless, poverty persists, particularly in the north and in urban pockets, and it is the poorest people who will bear the brunt of the impacts of climate change. The poverty situation will be exacerbated by climatic stress in northern regions where temperatures are already higher. Lower agricultural productivity and periodic flooding will also increase the pressure on the vulnerable youth from the north to migrate southward.

8.3.2 Coastal area

With a coastline of about 550 km long, Ghana's coastal area[202] is arguably the most vulnerable to climate change impacts. This is because it has a high density of vulnerable and valuable natural and productive assets; a large and growing population living near and in cases at the coastline; and a significant investment in development including buildings and infrastructure. It also will be affected by a large share of types of climate changes and events.

[201] These are: Amanzuri Conservation, Akosombo Dam, Shai Hills, Ostrich Farm, Antique Ceramics, Fort Prinzenstein, Fort Good Hope, Fort Patience, Fort Amsterdam, Busua, Fort Metal Cross, Nkrumah Grave, Ankasa Park, Nzulezo Village, Fort St Apollonia, Xavi Bird Sanctuary, National Museum, Nkrumah Memorial, Du Bois Memorial, Ada Resort - Volta Estuary, Cape Coast Castle, Elmina Castle, Hogbetsotso Festival, Aboakyer Festival, Edina Bakatue Festival, Fetu Afahye Festival and Akwanbo Festival.

[202] NSDF adopts the definition of the coastal area as that delineated by AK Armah, Department of Oceanography & Fisheries, University Of Ghana, in 2004. He established the inland boundary of the area at the 75 meters in elevation although he noted that there was limited data on the topography of the area.

Coastal assets at risk include natural ecosystems such as mangroves, coral reefs and literal zones, which also provide habituates for thousands of birds, especially migratory species; natural features such as lagoons, river estuaries and deltas, beaches and cliffs; and economic activities such as tourism, fisheries, coastal agriculture, salt production, sand and stone winning, ports and transportation, oil and gas exploration, and power generation. There are about ninety lagoons and associated wetlands, including five of the six Ramsar wetlands—Anlo-Keta lagoon complex, Densu delta, Muni Langoon, Sakumo Lagoon and Songor Lagoon. The three main ports are at Tema, Sekondi and Tekoradi while there are also fishing landings at Saltpond, Elimina and Axim.

The coastal area accounts for about six percent of the total land area but about 29 percent (7.13 million) of the national population and about 40 percent (5.13 million) of the national urban population. The area is about 70 percent urbanised and this trend is expected to continue. The total population, urban population and rural population all grew at rates above the national average (2.9 percent compared to 2.6; rural population 1.7 compared to 1.3 percent). Moreover, a significant percentage of the urban population has high concentration of poor populations in potentially hazardous and vulnerable areas.

There are over 60 urban centres in the coastal zone. These include Accra, the national capital and two regional capitals, STMA and Cape Coast.

Climate change impacts at the coast include sea level rise and erosion, salt water intrusion, storm surges, and river and area flooding. Coastal erosion has been occurring for decades and full assessment of vulnerable areas is overdue. Nevertheless, a survey of erosion hotspots conducted several years ago identified some 22 erosion hotspots at the following locations: Esiama, Axim, Princess Town, Dixcove, Adjua, Amanful, Shama, Komenda, Elmina, Senya Beraku, Kokrobite, Bortianor, La South, Teshie, Nungua, Tema (metro), Prampram, Old Ningo, Ada Foah, Dzita, Keta, and Tantum. Rising sea levels could erode the barrier beaches at Keta and elsewhere, destroying the coastal lagoons, rendering the land without protection. The ten major rivers that flow through the coastal area—the Volta, Densu, Ayensu, Nakwa, Amisa, Kakum, Pra, Butre, Ankobra and Tano—extend the coastal influence zone inland through tidal action and salt water flows up to several kilometres; moreover, these rivers present additional flooding risks.

8.3.3 Urban settlements and climate change

Urban settlements deserve a special climate-change focus because of need for adaptation and their potential contribution to mitigation.

- Urban infrastructure that is provided today will still be in place by 2035 and beyond, when the conditions are likely to be very different. Urban populations will have increased significantly and will face climate related stresses related to food security, water supply and other. Addressing these vulnerabilities today will help ensure that cities avoid the problems and reap future benefits.
- Urban areas are highly vulnerable to the impacts of climate change. As many urban areas are close to the sea, they are vulnerable to sea-level rise impacts including erosion, floods and salt water intrusion.
- Rising temperatures in urban areas will exacerbate the “heat-island” effect — cities are hotter because they absorb and trap more solar radiation, buildings can impede air movement, and buildings and transport systems generate heat. Higher heat levels affect comfort, health, labour productivity, leisure activities, and add to energy consumption.

- Urban settlements are more likely to experience flooding because of their large non-porous paved areas and road surfaces, altered and narrowed natural drainage systems or underdeveloped, insufficient or clogged man-made drainage systems. The altered landscape can create conditions (poorly drained areas) for water- and vector-borne diseases which can spread faster amongst the higher density population. Urban areas with poor sanitation and solid waste treatment could coalesce to affect the local quality of life and economic activity.
- The urban poor, often in informal settlements and slums (mostly in Accra but also in other large and medium-sized cities), are especially vulnerable, as the housing units tend to be built on hazardous sites and to be susceptible to floods, landslides and other climate-related disasters, and are less resilient to shocks;
- Urban infrastructure at risk includes roads, power and telecoms. Paved roads may be damaged and deteriorate faster under extreme climate events, which unpaved roads are more vulnerable to, may be rendered impassable, damage to both types requiring high repair cost and leading to delays and lost trips. Urban roads located at the coast and along rivers and in swamps are also at risk of erosion. Infrastructure for power transmission and communications is vulnerable to high winds and outages will have significant economic consequences;
- Reduced water supply from reduced precipitation and underground water resource replenishment may be a very serious concern for some human settlements, particularly in arid and semi-arid areas;
- Climate change migrants—including permanent migrants and short-term migrants responding to a particular climate event —may seek new livelihoods in urban areas and place additional demands and hence strains on infrastructure and services.

8.4 Responding to climate change

8.4.1 Three types of responses to climate change

There are two types of responses to climate change: mitigation and adaptation. Mitigation measures reduce the causes of climate change; adaptation measures lessen the climate change impacts. More recently, a third response has been added to the mix, that is, ongoing development. Global best practice accepts that all three types of measures are critical to reduce current and future losses associated with climate change and should be pursued together for “triple wins”. For specifically, these three types of response, they are described below.

Mitigation planning focuses on limiting climate change by reducing the emissions of greenhouse gasses and increasing carbon sequestration, or absorption, in carbon sinks – largely by increasing forested areas and preserving wetlands. Mitigation has a long-term, global focus; local actions will not have immediate or visible local effects. Yet many experts hold that immediate mitigation action is critical. Mitigation planning and action is most effective when there is strong civic capacity to organize public interest in global warming and when it can be linked to local development objetives[3]. The types of mitigation measures that reduce emissions include: improving energy efficiency; increasing use and share of renewable energies such as solar, biofuels, wind and hydro; and reducing emissions through better land use management. Sectors with the most feasible mitigation measures include energy supply, industry, urban development, buildings, transport, agriculture, forestry, and waste management and recycling.

Adaptation planning focuses on reducing the vulnerability of natural and man-made systems, building adaptive capacity and building long-term resilience in response to present or expected climate change stress. Adaptation strategies may be grouped into three types: adaptation, protection and retreat, or “working with nature”,

"climate-proofing" and "development relocation. Adaptation refers to actions such as strengthening or raising buildings, dams and roads to avoid flooding. Protection refers to actions such as building dams or sea walls. Retreat refers to actions such as prohibiting or encouraging development away from vulnerable areas. Adaptation may also include hard and soft measures. Hard measures involve investments in infrastructure; soft measures include community early warning systems.

Development-as-usual interventions may include relocation of vulnerable populations, better and stronger housing, improved public health interventions, urban agriculture, and local economic development. Migration from vulnerable to less vulnerable areas may also be considered as a form of house-hold scale retreat. Researchers disagree on the extent of climate-change induced migration in Ghana. Some hold the view that "migration is an adaptation option and should not be seen entirely as something negative"[203].(Eakin et al, 2009, Ensor and Berger, 2010, and McGray et al 2007).

"Triple wins" – also known as climate compatible development – are climate change policies and actions that simultaneously contribute to adaptation, mitigation and development benefits (GDPRD, 2011). Triple wins in the agriculture sector are sometimes termed 'climate-smart agriculture' that: (i) sustainably increases productivity and resilience (adaptation), (ii) reduces or removes greenhouse gases (mitigation), and (iii) enhances achievement of national food security (development goals)" (FAO, 2010: ii). Triple wins are considered by donors as the most cost-effective climate change interventions.

The World Bank's "The Cost of Adaptation to Climate Change in Africa" and the "Ghana Case Study" provide many general lessons as well as Ghana-specific recommendations to address climate change adaptation. Finding that Africa is the world's most vulnerable region with respect to climate change impacts, the Bank suggests that Africa's investment priority should be adaptation over mitigation measures, but adds that adaptation should be complemented with emission reduction. In general, it found that adaptation investments are not only affordable (as a percentage of GDP) but can substantially reduce the hardship from climate change.

For the Bank, the most economic strategy is to address c*urrent* climate events as well as deal with *future* climate change while pursuing traditional development activities that address economic development, human development, poverty reduction and institutional capacity.

Finally, given the uncertainty of climate change scenarios, the Bank points out that adaptation should start with "no-regret" measures that address current issues – such as water storage in drought-prone areas and flooding in coastal zones – and avoid expensive, long-term adaptation investments until the climate changes are better understood and the trend more ascertained. The Bank's recommendations relating to climate change adaptation in Ghana include measures in the following areas:

A recent survey by the United National University (UNU) in three communities in the Afram Plains, that have experienced climate-change related droughts and floods, suggest ways that food security could be enhanced. These include increasing farm-based storage facilities; improving the transportation system, especially feeder roads that link food production areas and major markets; providing farmers with early

[203] "Climate change impact, migration and conflict –vulnerability and adaptation", Abu Mumuni, Regional Institute for Population Studies, University of Ghana, Legon

warning systems; extending credit to farmers; and the use of supplementary irrigation[204].

8.5 Climate change mitigation

The mitigation strategy targets the three sectors with highest greenhouse gas emissions and removals: energy, forestry and agriculture. The energy sector presently emits the most CO^2 while the forestry and agricultural sectors show increasing emissions. In addition, the forestry sector is now emitting more carbon than it is storing (NPPC). Others are; agricultural and food security, disaster preparedness and response, natural resource management, equitable social development and energy, industrial and infrastructure development.

8.5.1 Agricultural and food security

The National Climate Change Policy considers agricultural and food security as an important climate change concern and includes as one of its adaptation strategies the development of climate-resistant agriculture and food security systems. According to NCCP, the key challenges of the agriculture sector are: loss of agricultural land from urban development, wildfire, overgrazing; inadequate infrastructure including roads, storage facilities and markets; poor access to credit; widespread slash-and-burn soil fertility maintenance practice; land-grabbing for biofuels production; and inadequate R&D and human resources.

NPPC aims to develop climate-resistant agriculture and food security systems for all agro-ecological zones and the human resource capacity for climate-resilient agriculture. The main interventions related to spatial planning are to: (i) prepare spatial plans to address conflicts between peri-urban agriculture and human settlements; (ii) improve post-harvest capacity through better storage and processing facilities and other infrastructure; (iii) promote diversified land use practices including agro-forestry, dry land farming, urban farming; (iv) improve productively through better farming practices including integration of trees; and (v) improve R&D in climate-smart agriculture.

According to the World Bank, the most important measures are to: raise yields by increasing agricultural R&D and extension services to produce new (early-maturing) crops and livestock; increase water availability by widespread development of long-term water-storage for dry periods and small-to-mid-size irrigation schemes; diversify crop types and generate off-farm income, particularly in cocoa areas; and improve access to credit.

A UN study of adaptation options found that the most cost-effective adaptation strategy in the agricultural sector is to seal unpaved roads to increase their resilience to precipitation, temperature, and floods. This measure would help ensure that small farmers retain their access to market and inputs. The study also found that, for crops most affected by climate change such as maize, rice, pulses but not horticulture crops, increasing irrigation is less effective than increasing agricultural R&D and extension services at reducing yield losses.

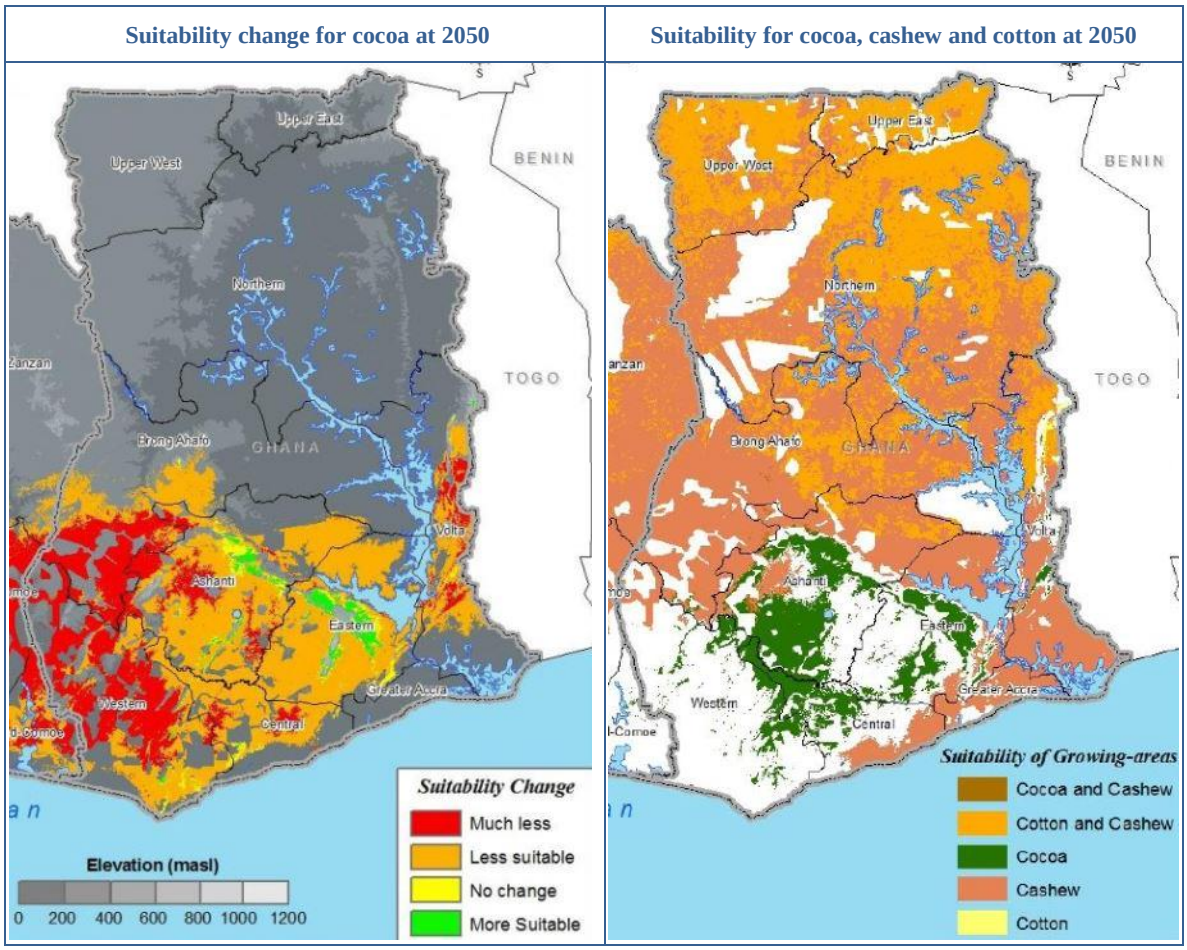
NSDF supports these objectives through the following:

- mapping and analysis of the present yield and coverage of the major food crop types, identifying areas for agriculture intensification, crop diversification, and collaboration between high and low performing districts in specific crop types;

[204] Climate change/variability and food systems: evidence from the Afram Plains, Ghana; Samuel Nii Ardey Codjoe, George Owusu

- mapping and analysis of the status and trends of the major land cover types, identifying option areas for increasing crop area into grassland cover, particularly in urban food sheds;
- mapping, analysis and proposed urban food sheds to increase food security through local food production. The food sheds will protect and potentially increase the farm area in proximity to urban centres;
- propose an agriculture growth corridor.

Figure 8.4 Suitability change for cocoa / suitability for cocoa, cashew & cotton at 2050



Source: International Centre for Tropical Agriculture (CIAT)

8.5.2 Natural resources management

Ghana's NCCP includes natural resource as one of its five main policy areas and identifies two focus areas: (i) increase carbon sinks and (ii) improve management and resilience of terrestrial aquatic and marine ecosystems.

Carbon sinks are essential to capturing and storing atmospheric carbon. The key challenge to increasing carbon sinks (forests and mangroves) is their increasing destruction. NCCP lists ten causes of this destruction of which the main ones, arguably, are (i) land use changes owing to uncontrolled settlement expansion and agriculture (ii) unsustainable use of forest products for fuel and timber; and (iii) wildfires that follow dry seasons or droughts.

NCCP key objectives are to decrease forest and mangrove loss and restore degraded forests. The main interventions related to spatial planning include (i)

substitution of wood fuel with LPG; (ii) degraded forest rehabilitation and off-reserve forest development; (iii) agro-forestry; and (ii) consolidation of bio-reserve and new forest buffers.

NSDF supports these objectives through the following:

- identify and map the districts and urban centres by type of cooking fuel with the highest use of charcoal for priority action;
- identify the districts and areas where forests are most degraded, most rapidly degrading, and their proximity to urban and rural population centres;
- Identify potential sites for new power plants closer to population centres and for energy-intensive industry to locate close to power plants.

It is noted that the government has already increased investment in reforestation, afforestation, plantation programmes and sustainable forest management interventions that have contributed about 10 percent of net greenhouse gas removals (Environmental Protection Agency of Ghana, 2011). Additional investments are being made in protection and improved management of wetlands, mangrove rehabilitation and reforestation, and community resource management (Gordon et al., 2011).

8.5.3 Improve management and resilience of terrestrial aquatic and marine ecosystems (adaptation and mitigation)

Terrestrial aquatic and marine ecosystems provide essential environmental and economic services including shoreline protection and sources of livelihoods. The key challenges are destruction of the systems by urban development expansion, sedimentation, pollution for urban, and industrial and agricultural effluents and chemicals.

NCCP key objectives are to better manage these ecosystems. The main interventions related to spatial planning include: (i) mapping and spatial plans at all levels, (ii) ecological networks or biological corridors to link fragmented forests, (iii) protected river courses; and (iv) afforestation.

NSDF supports these objectives through the following:

- mapping the coastal wetlands together with potential stressors including urban built-up areas, roads, and known coastal erosion hotspots to support the priority preparation of a resource management plan;
- identify the areas where coastal forests are most degraded, most rapidly degrading, and their proximity to urban and rural population centres;
- propose a green infrastructure network that incorporates fragmented forests, rivers and their buffers and functions as ecological networks and biological corridors.

8.5.4 Energy, industrial and infrastructure development (mitigation)

Ghana's NCCP includes energy, industrial and infrastructure development as one of its five main policy areas and identifies one focus area: minimise greenhouse gas emissions.
NCCP notes that gas emissions are increasing from fuel consumption for power and transport, agriculture, waste, biomass burning and that emissions may be reduced through increased use of clean energy and improved energy efficiency. Key challenges to mitigation include: inadequate data and data collection systems; high costs of mitigation technologies; and lack of investment in renewable energy.

NCCP's objectives are to strengthen GHG reduction measures particularly from energy users – power generation, transport, oil and gas and biomass – industry and waste sectors.

The main interventions most relevant to spatial planning include: (i) promote efficiency in all energy user sectors; (ii) promote use of cleaner forms of energy including renewables; (iii) reduce volume and emissions from wastes. The World Bank concurs with these interventions, recommending actions to diversify energy mix from existing large hydropower to more renewable sources such as solar, wind, biomass, waste conversion, and mini-hydro dams and promote energy efficiency in all sectors (World Bank, 2011).

NSDF notes that missing from this set of interventions are actions to reduce electricity transmission and distribution losses through localising energy production plants and locating bulk-electricity users close to power generation plants.

Energy sector mitigation measure call for the following action to increase the use of renewable: gradually replace fuel wood and charcoal (for cooking) with biogas and LPG; increase solar-electricity to reduce petroleum products and electricity; massively afforest or reforest to rehabilitate degraded lands. It also calls for reduced electricity transmission and distribution losses, promotion of efficient cook-stoves, establish local woodlots.

NSDF supports these interventions through the following:

- mapped locations of existing power generation onto the centres of power demand to identify potential gaps in power generation to guide the siting of new plants;
- mapped potential areas for wind turbines along the coast and at sites of high elevation that potentially have relatively continuous high wind speeds of nine meters per second (Environmental Protection Agency of Ghana, 2011);
- mapped areas with existing and planned solar energy plants as well as potential areas for solar energy plants based on solar radiation and energy demand;
- mapped areas with existing commercial biomass production and areas with high forest and grassland cover that could potentially be used for biomass energy, identified and mapped the districts and urban centres by type of cooking fuel with the highest use of charcoal for priority action;
- identified areas for potential production of liquid biofuels, which have potential use in the transport sector (Ghanaian Strategic National Energy Plan (2006-2020);
- documented the potential contribution of regional and urban forms to reducing energy use and GHG emissions (see "smart-growth regional and urban forms" in the section below);
- documented the potential contribution of transport sector.

8.5.5 Promote smart-growth low-carbon, regional and urban forms (mitigation)

The nearly doubling of Ghana's urban population between 2015 and 2035 presents an important and unprecedented opportunity to influence the spatial location of development into more energy-efficient, "low carbon" settlement forms that need less energy and minimise the extent of avoidable climate change. Importantly, the settlement forms that develop over this period will last for perhaps hundreds of years and therefore will influence energy consumption far into the future.

Regional and urban form influences travel behaviour through the location, use-mix and accessibility of land use development that includes dwellings, workplaces, shopping and leisure time facilities. Travel behaviour factors include the reason for the travel, frequency of trips made, where people go, by what mode, through which route, at what time, and who accompanies whom. The most important travel behaviour is the vehicle-kilometres-travelled per person, or VKT. VKT is directly related to the amount of energy consumed in transport, the transport sector as well as the level of greenhouse gas emissions.

Regional and urban forms have several travel-influencing characteristics. At the national scale, the most important travel-influencing characteristics are settlement population size and regional accessibility. Key characteristics at the city and town scales include urban centrality and centeredness, fragmentation, compactness and density, land use mix, connectivity and public transport accessibility. These are discussed below.

Promote larger / discourage smaller settlements: The population size of an urban settlement largely determines the types of public and private facilities and services it has. In general, larger settlements have more services, of wider variety, and of better quality than smaller ones. And as a result, people in larger settlements are less likely to travel to another settlement, at least for the services in there settlement. In addition, larger settlements tend to have significantly higher average densities than smaller one – doubling of the city population is associated with a 19 percent increase in density[205], another characteristic of low carbon urban form. Finally, as a result of the size and density, larger settlements are more likely to have better public transport services. This suggests that larger settlements are "greener" than smaller settlements in the sense that VKT and GHG emissions are lower. The implications are that at large number decentralised villages and small settlements should be discouraged while fewer larger urban centres (say above 20-25 thousand inhabitants) should be encouraged to develop.

- **Urban growth containment (green belts):** Urban growth containment policies have several objectives that include farm and forest land protection, sprawl reduction. Localized food production is considered a low carbon measure in that it reduces shipping, storage, and packaging needs.
- **Promote regional accessibility:** Regional accessibility refers to the location of a development relative to a regional urban centre. It also relates to the share of jobs and services available within a given travel distance or time. Studies show that regional accessibility has a major impact on trip length and mode choice, and therefore the average VKT, but has little effect on the total number of trips per person. While dispersing jobs to suburban locations can sometimes reduce commute lengths, it may also tend to increase non-commute vehicle travel.
- **Promote urban centrality and centeredness:** Centrality may be defined as the share of the population that lives close to the centre of the urban settlement rather than to its periphery. Some authors use the concept to define and measure sprawl dynamically as the increasing share of the urban population living in suburbs. A related characteristic is centeredness, or the share of jobs and other attractions that are located in the main activity centres as compared to being dispersed. Where centrality is high, people tend to drive less and use alternative modes more.
- **Discourage scattered development:** Scattered development that may be measured by the relative amount and the spatial structure of the open spaces that are fragmented by the non-contiguous expansion of cities into the

[205] Making Room for a Planet of Cities; Shlomo Angel; Policy Focus Report; Lincoln Institute of Land Policy; 2011

surrounding countryside. Fragmentation increases the distance between destinations, lowers the overall density, and tends to increase vehicle distance travelled.

- **Promote compactness:** Compactness is the degree to which the city footprint deviates from a circular form. Compact settlements are more accessible – the more circular, the closer are its locations to the settlement centre and to one another, and the less VKT.
- **Promote higher density:** Average urban population density is the ratio of an area's total population to its total built-up area. This characteristic applies to a region, district, city or neighbourhood, street or plot or building. It has a large impact on both the model choice (bus-drive-cycle-or-walk) and on travel distances. For example, studies show that as density increases, the share of trips by car decreases as does the average trip length. In higher density areas it also tends to cost less to construct, operate and maintain expensive networked urban infrastructure including roads, drains, sewers, and electricity lines as well as provide public service such as solid waste collection. This suggests that higher densities are "greener" than lower densities. Higher density transport-oriented-development, or TOD, located near to public transport stations and corridors, has greater accessibility and connectivity and thus encourages people to take public transport. Low-density suburban development in general is more energy- and GHG-intensive than dense urban cores and downtowns. Higher density development also creates a critical mass make economic efficient district energy (cooling) systems.

  New York City's per capita greenhouse gas emissions are among the lowest in the United States, largely because more than 70 percent of the population commutes by public transit and because less energy is needed to heat, light, cool and fuel buildings. Atlanta, USA and Barcelona, Spain have essentially the same population (about 2.5 million), but Atlanta sprawls of 4,200 km^2 whereas Barcelona occupies only 162 km^2. As a result, Atlanta consumes much more energy due to its urban form and higher per capita energy consumption.

- **Promote mixed land uses:** This refers to the proximity of different types of land uses. The characteristic applies at several scales – cities, neighbourhoods, streets and within buildings – as well as within types (such a mixed housing types and price ranges). A fine-grained land use mix reduces vehicle ownership, trip length and car use and increases use of alternative modes, such as walking, biking, or public transport. A good mix of jobs and housing is particularly important for reducing commute distance and per capita vehicle distance travelled. A good mix of convenience stores and housing promotes access by pedestrians and cyclists within neighbourhoods.
- **Promote physical and digital connectivity:** Physical connectivity is the density of links or intersections between the roads or paths in a network. For example, streets connecting large urban blocks are less connected than those around smaller blocks. Increased connectivity reduces vehicle travel by reducing travel distances between destinations. It also encourages pedestrian and cycling modes. Digital connectivity that enables virtual transactions – for example: meetings, shopping, and banking – can eliminate the need to travel at all. Increasing the bandwidth and supporting screen would enable virtual meetings.
- **Promote public transport:** This refers to the extent of urban area covered, the service quality, and the ease of accessing that service by walking and cycling. People who live and work in near better quality public transport tend to own fewer vehicles, drive less and rely more on alternative modes. Accessibility can be increased by high density transit-oriented-development, or TOD, located at public transport stations and corridors.

Other land use characteristics that affect travel behaviour include parking supply and management, mobility management, roadway design, walking and cycling conditions.

8.5.6 Improve development and building standards and regulations

Building regulations, codes and standards for new construction and renovation should require or provide incentives for energy-efficient site planning, landscaping, building form, natural cooling designs and technologies such as the use of vegetation and light coloured surfaces on buildings to reduce heat island effects. Development codes should require flood defences and better coping systems for flooding.

Promoting the highest affordable standards of resource and energy efficiency in new development can reduce carbon dioxide (CO_2) emissions arising from construction, building use, and eventual demolition and redevelopment. For example, common-wall and vertical living multifamily housing for reduction of surface area and efficient recycling of solid waste (per capita energy consumption and GHG emissions are 2 to 2.5 times higher in low-density developments than in high-density areas. In addition, building codes should define the location and orientation of buildings in such a manner as to optimally use the sun for heating or cooling, hot water production and electricity production e.g. with photovoltaic roofing.

8.5.7 Low-carbon transport policies and systems

Because transport accounts for significant greenhouse gas emissions, it is imperative that mitigation policies focus on ways that these emissions can be reduced. International best practice includes the following measures:

- Require prepare mobility and transport plans of all urban areas above a certain size (say 20,000 inhabitants) that cover all modes: pedestrians, mobility-impaired, cyclists, public transport users, two-wheelers and different types of car users (commercial, commuters, visitors);
- invest in alternative transport modes with improved coverage, quality and attractiveness of alternative transport systems including public transport, cycling and pedestrians, and demand-responsive transit and smart car-sharing;
- discourage private vehicle use by removing fuel price subsidies; introducing fuel taxes to incorporate externalities of carbon emissions, pollution, and energy security; raising the price of driving travel, by road and/or area pricing; limiting parking provision and raising parking charges; introducing of networks of carpool lanes (Ewing et al. 2008);
- reduce emissions per kilometre travelled by adopting improved vehicle performance standards; encouraging better driving habits and properly inflated tires; improving road quality and maintenance; improving traffic management; encouraging the development and use of low-carbon alternative fuels, including biofuels; and providing incentives purchasing zero-emission electric vehicles (ZEV). Note that the introduction and widespread use of ZEV would need to consider power generation supply and demand as well as the capacity to provide the recharging sites across the country;
- reduce new road-building and widening as experience shows that new roads generate additional traffic; urban areas cannot build their way out of congestion. New roads should be the option of last resort as a solution after considering other options including mobility management;
- Infrastructure and transport – improve and expand feeder road system, increase road maintenance and improve design and construction standards to handle

increased climate stress, improve the timing (before rainy season) of road construction, and create emergency rerouting plans.

8.5.8 Disaster preparedness and response

Ghana's NCCP includes disaster preparedness and response as one of its five main policy areas and identifies two focus areas: (i) build climate resistant infrastructure and (ii) increase resilience of vulnerable communities to climate-related risks.

NCCP notes the infrastructure is both vulnerable to climate change impacts and plays a role building resilience to these impacts. Key challenges that are spatially-relevant include: low lying settlements, poor settlements in marginalised areas, coastal erosion that destroys infrastructure, and poor drainage and siltation of river beds. The list infrastructure mentioned in the NPCC includes roads, dams, power plants, distribution lines, and settlements as well as sea defence walls.

NCCP's objectives are to build climate resistant infrastructure to protect coastal and inland settlements, ecosystems and services. The main interventions to achieve these objectives are to: (i) encourage relocation of settlements and economic activities from vulnerable areas; (ii) climate-proof important infrastructure providing key services; construct storm drainage systems, river bank protection, buffer zones and afforestation on embankments; and ensure rural communities have access to markets and key services.

NSDF supports these interventions through the following:

- mapped locations of existing power generation onto the centres of power demand to identify potential gaps in power generation to guide the siting of new plants;
- mapped potential areas for wind turbines along the coast and at sites of high elevation that potentially have relatively continuous high wind speeds of nine meters per second (Environmental Protection Agency of Ghana, 2011);
- mapped areas with existing and planned solar energy plants as well as potential areas for solar energy plants based on solar radiation and energy demand;
- Coastal zone – protect key man-made and natural assets including ports, harbours, beaches and mangroves; avoid investments in coastline defences as costs will exceed benefits; ensure designs and locations of new oil-and-gas development/infrastructure in Western region and climate change factors; and zone new development away from vulnerable areas and those exposed to sea level rise and storm surges (WB).

NCCP notes the infrastructure is both vulnerable to climate change impacts and plays a role building resilience to these impacts. The key spatially-relevant challenges that are include: low lying settlements, poor settlements in marginalised areas, coastal erosion that destroys infrastructure, and poor drainage and siltation of river beds. The list of infrastructure mentioned in the NPCC includes roads, dams, power plants, distribution lines, and settlements as well as sea defence walls.

NCCP notes the risks of and vulnerability to climate change impacts varies spatially and among different social groups, particularly women, and youth. Key challenges that are spatially-relevant include: increasing population and unplanned urbanisation, coastal inundation and erosion displacing settlements, and poverty and unemployment. The main policy objectives are therefore to protect assets and livelihoods of vulnerable communities in coastal and inland areas and build their resilience.

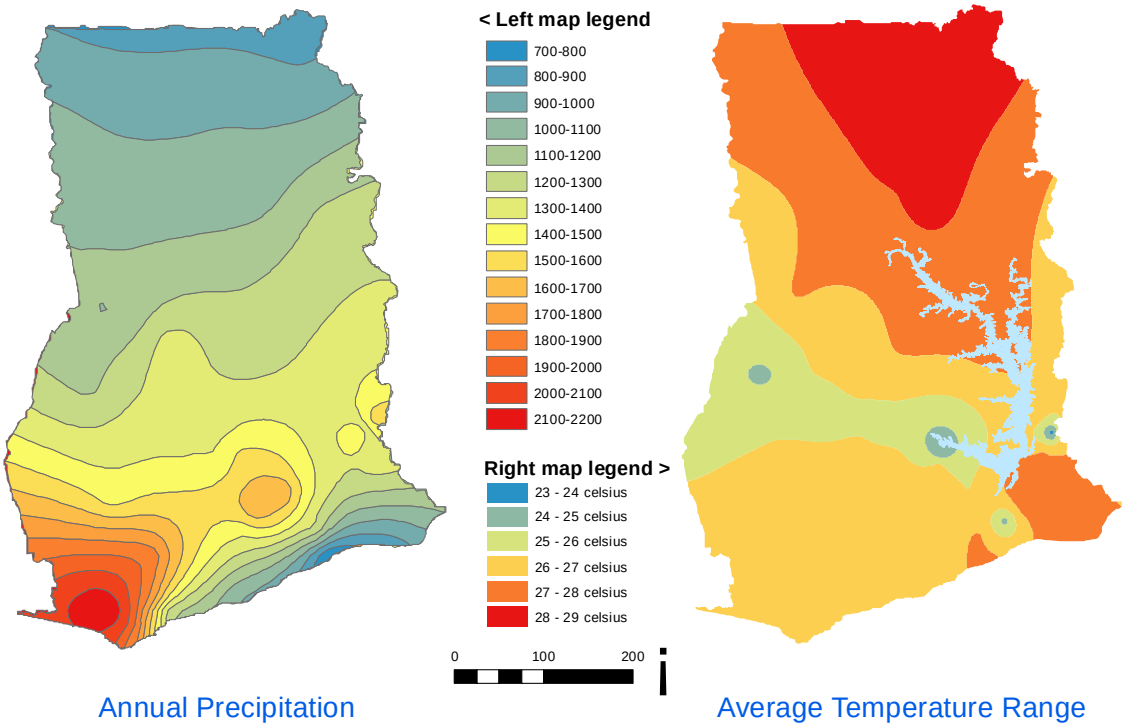
Spatially-relevant interventions to achieve this include: (i) provision of infrastructure including roads, boreholes and wells as well as education; (ii) focus on the vulnerability of migrants urban strategic planning; and (iii) increase investment in social services and infrastructure.

NSDF supports these objectives and interventions through the following:

- map of coastal-influence zone with locations of the most vulnerable communities (including urban slums) and economic assets including trunk and feeder roads, boreholes, tourist sites, and erosion hot spots. Identification of vulnerable communities will inform decisions on whether to protect present areas and current livelihoods or to plan for resettlement to other locations. A long-term plan for gradual resettlement is preferable to an after-disaster resettlement, which will be more chaotic and will involve severe losses[206];
- map of major fishing landings as fishing is a major protein source and employment of 10 percent of the population who also are among the poorest and most climate-change vulnerable;
- map of the education outcomes and facility service levels by district to enable prioritising and targeting of most deprived areas;
- proposed new east-west highway to encourage inland urban development and provide alternative to the existing coastal trunk road;
- map of tourist assets – because it is a growing foreign exchange-earner, depends largely on natural and historical assets located at the coast, including beaches, mangroves, estuaries, wetlands, forts and castles. In addition, these would benefit from the maintenance of the ecological character of coastal habitats.

[206] Climate Change and Sustainable Cities: Major Challenges Facing Cities and Urban Settlements in the Coming Decades; Dr. Mohamed EL SIOUFI, Ph.D., Head, Shelter Branch, United Nations Human Settlements Programme; UN-HABITAT; International Federation of Surveyors, Article of the Month – June 2010

Figure 8.5 Annual precipitation and average temperature range



Source: NSDF Study extracted from LUPMIS

8.5.9 Promote green infrastructure at all scales.

NSDF proposes a national green infrastructure network throughout Ghana as a means to help protect forest reserves and national parks, deliver ecological services such as water quality improvement and flood control as well as quality-of-life benefits such as recreation, shade, and visual amenity. At the national level, the network incorporates features and large-scale features including national parks and forest reserves, rivers and streams and wetlands. At the city scale it should also include green belts around cities, green buffers and veins around rivers, streams and roads, as well as more porous road and parking area surfaces and rainwater harvesting systems. At the local scale it can include small elements such as rain gardens and green roofs.

The green infrastructure network plan will guide the existing reforestation / afforestation programme to concentrate planting activities so as to contribute to the network. A new urban tree canopy programme supports the development of green towns and cities. The urban trees will have many functions. In addition to storing carbon, cleaning and cooling the air, providing shade and visual amenity, the trees and their planters will filter the rain before it washes over sidewalks and streets into storm drains and pipes, and help replenish ground water tables.

8.5.10 Address rural settlements at the coast

Settlements located at the coast are likely to derive a large part of their income from fishing and related activities. Nevertheless, coastal locations will be increasingly vulnerable to flooding and erosion due to predicted sea-level rise and high tides as a result of climate change. NSDF has found that the rural settlements within 5 km of the coast line have an estimated total population of 687,000. Some 286,000 people are in settlements less than 1 km from the coast. Local authorities should be encouraged to assess the vulnerability of these settlements and determine required mitigation measures.

Table 8.1 Rural settlement population ('000) within specified distance of coastline

	1 km	2 km	3 km	4 km	5 km
G Accra	106	126	158	202	249
Central	74	93	117	154	191
Western	48	61	67	78	95
Volta	58	79	89	116	152
ALL	286	359	431	550	687

Source: NSDF Study analysis of Forestry Department satellite image

8.5.11 Equitable social development

The NCCP addresses the climate change impacts on social development in the following areas: (i) human health (ii) water and sanitation and (iii) migration.

Human health: The key principle of this focus area is to ensure equitable access to quality health care across the country. The key spatially-relevant challenges to achieve this are deficits and poor condition of health infrastructure including health facilities, transport and ICT, especially in rural and peri-urban areas. Key interventions identified by the NCCP include improvement of nutrition through increased food processing capacity, food banks, and food storage. Based on the identified challenges, NCCP may consider adding an intervention to reduce deficits and improve health care infrastructure.

NSDF contributes to attaining this objective by mapping health facilities and analysing the level of access at the regional and district levels.

Water and sanitation: The key principle of this focus area is to ensure equitable access to safe and adequate water to meet human needs across the country. The key spatially-relevant challenges to achieving this are lack of water harvesting, lowering of water holding capacity of rivers due to siltation from river-bank farming, water pollution from wastes, high use of pit latrines and poor solid waste management. The key objectives are to develop water resources, particularly to serve the vulnerable, and to make water resource management climate resilient. The key spatially-relevant actions are to develop irrigation and hydropower schemes, implement water and sanitation programmes in at-risk areas, and provide economic incentives to manage water resources and watersheds.

Migration: This focus area recognises that migration will likely increase due to climate change, that it may increase political problems and conflicts in receiving areas, but that it is an important household-level adaption strategy that should be planned for.

The key spatially-relevant objectives are to ensure migrants have equal opportunities to economic opportunities and social services and to promote development in both origin and destination areas. Actions to achieve this objective are of two types: those that improve the economy of source areas to curb the flow of migrants through rural development investments and alternative livelihood programmes, and those that address the needs of the migrants at destinations through, for example, vocational training, social safety nets, micro credit.

NSDF contributes to this objective by:

- identifying, mapping and quantifying existing migration patterns areas and forecasting future migration;
- identifying and mapping vulnerable and marginal areas and their deficiencies in education, health, roads, market services, natural resources, and skill sets so as to better geo-target interventions in all sectors;
- identifying opportunities and measures to improve rural economies such as agricultural growth corridor, cropland expansion, grassland;
- proposing an urban hierarchy and regional and urban forms that could accommodate migration.

8.5.12 Manage watersheds and water resources

The forecast of a reduction in rainfall means that water resources management will become critical. Ghana is also well endowed with water resources, but the amount of water available changes markedly from season to season as well as from year to year. However, availability of water is decreasing, owing to rainfall variability, rapid population growth, increased environmental degradation, pollution of rivers and draining of wetlands.

NSDF contributes to this objective by:

- Identifying and mapping international cross-border watershed-wide policies and strategies to adapt to climate change impacts within Ghana and between Ghana and neighbours and ensure that climate change policies and programs on both sides of the border are well-aligned. International level planning is important to address climate change impacts because of the spillover or trans-boundary

effects – issues such as watershed management must be addressed with neighbours;

- Proposing a green infrastructure network that will incorporate rivers and buffers and help retain the hydrologic function of natural features to ensure quality and quantity of municipal drinking water supplies;
- Identifying and mapping existing built-up areas, quantifying the built-up area density so as to target measures to decrease impervious surfaces (those sealed by buildings and infrastructure);
- Propose densification of urban areas.

8.5.13 Water conservation and efficiency

Adaptive capacity in the face of decreased water supply and increase demand must be to reduce waste and increase water use efficiency. Increasing fluctuations in the level of all lakes – leading to increased erosion, exposure of submerged lands, and constraints on lake transport – will require better shoreline management. Water conservation reduces energy consumed for pumping and treating and saves water in case of drought.

8.5.14 Reducing exposure to climate change in coastal areas

Urban Population

The coastal area covers 2000 km^2 or less than one percent (0.85%) of the national territory. NSDF estimates that within this area is home to over 7.60 million inhabitants or 31 percent of the national population. This population is comprised of over 5.6 million urban inhabitants, and almost 2 million rural dwellers, representing 45 and 16 percent of the national urban and rural populations respectively. Map 1 on Figure 8.8 shows the urban population in the coastal area.

The rural population in the coastal area lives in over 4000 rural settlements. Analysis of the spatial location of these settlements shows how near they are to two potentially hazardous geographic features – the coastline and coastal rivers. The key findings are that in the band between the shoreline and lines drawn at a distance of 100, 250, 500, and 1000 meters inland, there are about 55, 140, 200 and 280 settlements with a populations of about 35,000. 88,000, 126,000 and 162,000 people, respectively. Between the shore and lines at 3 and 5 kilometres inland, there are 425 and 885 settlements with over 240,000 and 510,000 respectively. Map 2 on Figure 8.9 shows the location of rural settlements and their estimated population size in the coastal area.

The urban population in the coastal area inhabits 85 urban (aggregated) centres. Between 2000 and 2010, the urban population in the coastal area grew at the high rate of 3.3 percent annually, i.e. from almost 4.12 to 5.6 million, an increase over 1.5 million people, or 27 percent of the total urban increase.

Of the 85 urban centres, there are 33 centres with a total population of over 5 million inhabitants, whose centre points are located within five kilometres of the shoreline, and may be said to have a coastline exposure that is vulnerable to sea level rise[207]. Other urban settlements that are most vulnerable may be those that are located on sand dunes between the sea and wetlands or lagoons. These include Half Assini and Princess Town in Western region; Elimina and Apam in Central region; and from Ada Foah to Aflao in Volta Region.

[207] In rough size order these are Accra-Tema, Secondi-Takoradi, Cape Coast, Elmina, Kimenda, Half Assini, Axim, Dixcove, More, Apam, Mumford, Keta, Alfai, Shama, Esiama, Bonyere, Princess Town, Biriwa, Anamabo, Akplabanya, Anyamam, Adafoah, Anloga, Woe, Tegbi, Tantum, Busua, Abandze, Abuesi, Aboadze, Ekon, Amanful, Adjua, Senya Beraku, Fetteh, Assafa, Narkwa, and Essarkyir.

Built-up cover

Urban development as expressed in built-up area is present throughout the coastal area from East to West. In general, built-up areas tend to cling to and stretch out along the shoreline, and there are few stretches of shore that remain free of built up land cover.

The larger urban settlements have significant exposure to the shoreline. For instance, the coastal lengths of the urban footprints of all of the larger urban centres – including Accra-Tema, Sekondi-Takoradi, Cape Coast, and Saltpond (but excluding Winneba) – are more than twice that of the dimension that is perpendicular to the coast.

Other urban settlements that may be at risk are those that are close to wetlands or lagoons and include, the Keta Lagoon in Volta region, Anlo, Afiadenyigba, Klikor, Agbozume, Anyako, Kesseh, Sogakope and Dabala, and in Western region, Jewi Wharf.

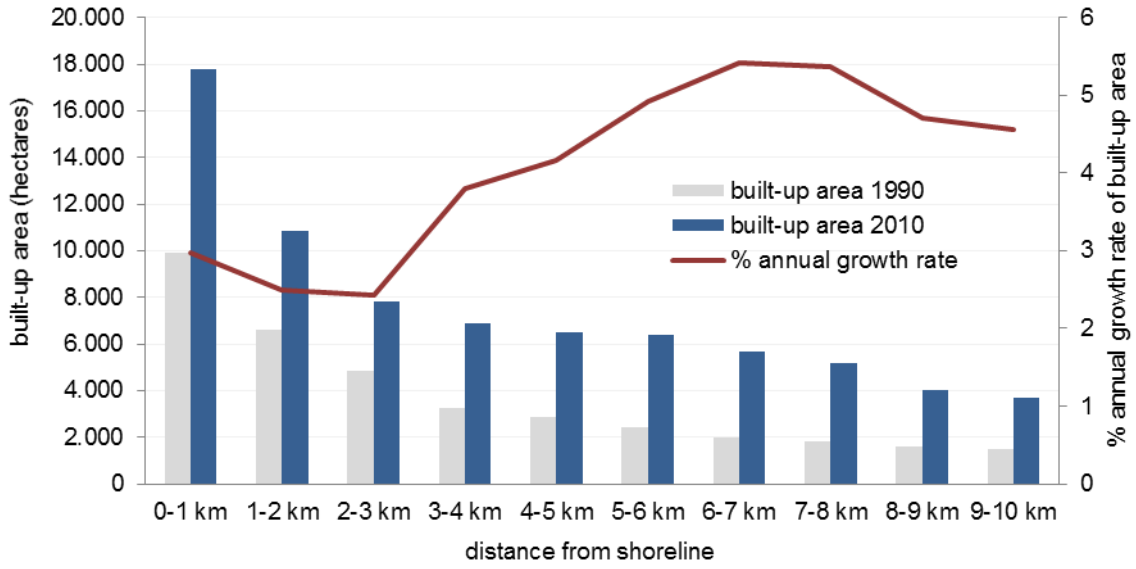
Built-up land cover, which is a proxy for physical urban development, is concentrated at the coast both within the first kilometre band as well as within the ten kilometres band.

Built-up land cover is concentrated at the coast, which is a reflection of the attraction of this location. Figure 8.6 quantifies how built-up land cover is distributed within ten one-kilometre bands from the shoreline. It shows that most built-up land cover is in the first one-kilometre and that built-up cover decreases sharply with the distance from the shore, particularly between the first and second kilometre.

Despite the threat of climate change, built-up land cover within the coastal area is increasing rapidly. Between 1990 and 2010, the built-up cover increased considerably in the coastal area. During the same period, the area between the shoreline and kilometre-ten doubled. The rate of increase of this area (3.6%) exceeded the urban population growth rate at (3.3%), giving evidence of a decline in the population density of built development. The growth rate of built-up land cover exceeds the overall population growth rate in all distance bands, and is the lowest at band 2-3 km. From this low point it increases in both directions so that at the coast it increased by almost 3 percent.

A closer look at the built up land cover is provided in Figure 8.7, which quantifies how built-up land cover is distributed between the shoreline and the one-kilometre line in bands of 100 meters each. It shows that the band next to the shoreline has the most built-up land cover and that built-up cover decreases with the distance from the shore, with the exception of bands 300-400, 600-700 and 800-900 meters. Within this set of bands, all but the one closest to the shoreline, 600-700 m and 800-900 m have seen a built-up land cover increase exceeding 3 percent per year

Figure 8.6 Area of built-up land cover in 100m distance band from shoreline



Source: NSDF Study based on Forest Commission satellite imagery

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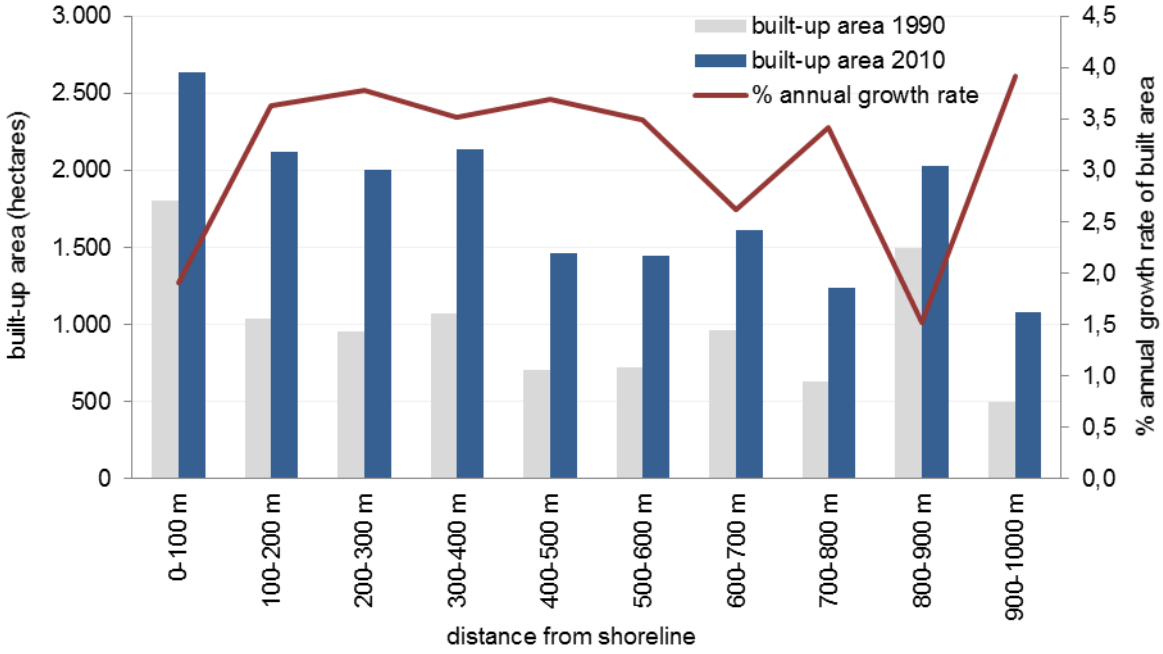
Figure 8.7 Area of built-up land cover in 1 km distance band from shoreline



Source: NSDF Study based on Forest Commission satellite imagery

Sand and reefs' barriers

Coastal erosion has already required action to protect coastal communities. For example, at Atorkor in the Volta Region, an eroded road was reconstructed along with 2.7 km coastal barrier to secure the livelihood of fishing communities and guarantee access to fresh water. At Ada East District of Greater Accra region, a project is reclaiming over 14 km of coastal bed involving beach nourishment and protective barriers.

Rivers

There are numerous rivers that cross through the coastal area. Map 1 on Figure 8.8 shows the major rivers and the urban settlements that are near to these rivers. Those larger urban settlements are Accra, STMA, Cape Coast, Winneba, Saltpond, Komeda, Prestea,Twifo Praso, Agona Swedru, Adeiso, Nsawam, and Adidome. Additionally, urban settlements on rivers that may be at risk include Elubo, Samreboi, Asankran Bremang, Wassa Dunkwa, Asankragua, Achimfo, Asemkrom, Assorkaw Essaman, Daboase and Daboase Jct, Breman Kuntanase, Esueyia, Asikuma and Ajumako.

Fish landings

There are 334 fish landing beaches in 195 fishing villages along the Ghanaian coastline. By region these are:

Table 8.2 Fish landing beaches, villages and fisherman

Region	Volta	G Accra	Central	Western	National
fishing villages	29	48	43	75	195
landing beaches	63	68	103	100	334
fisherman	17,382	35,168	44,303	27,366	124,219

NSDF maps the location of seven fish landings at Axim, Sekondi, Takoradi, Elimina, Cape Coat, Saltpond, Accra and Tema. The Ministry of Fisheries has constructed two fishing harbours and twelve more fishing landing sites with a loan from the Chinese Government at Ada, Teshie and Jamestown in Greater Accra; Winneba, Moree, Gomoa Fetteh, Senya Bereku and Mumford in Central region; Axim and Dixcove in the Western region; and Keta, Tepa Bofoase and Gyamani in Volta region. The landing sites were designed to include a police post, fire post, day care centre and a pre-mix station.

Trunk roads and feeder roads

The density of trunk roads within the coastal area is justifiably higher than the national average because of the higher population density. While all trunk roads are vulnerable to climate change impacts, those within the coastal area are likely to be of higher risk owing to proximity to rivers and the shoreline, crossing sometimes wetlands, as well as higher loads and traffic. Map 2 on figure 8.8 shows the trunk roads and feeder roads within the coastal area.

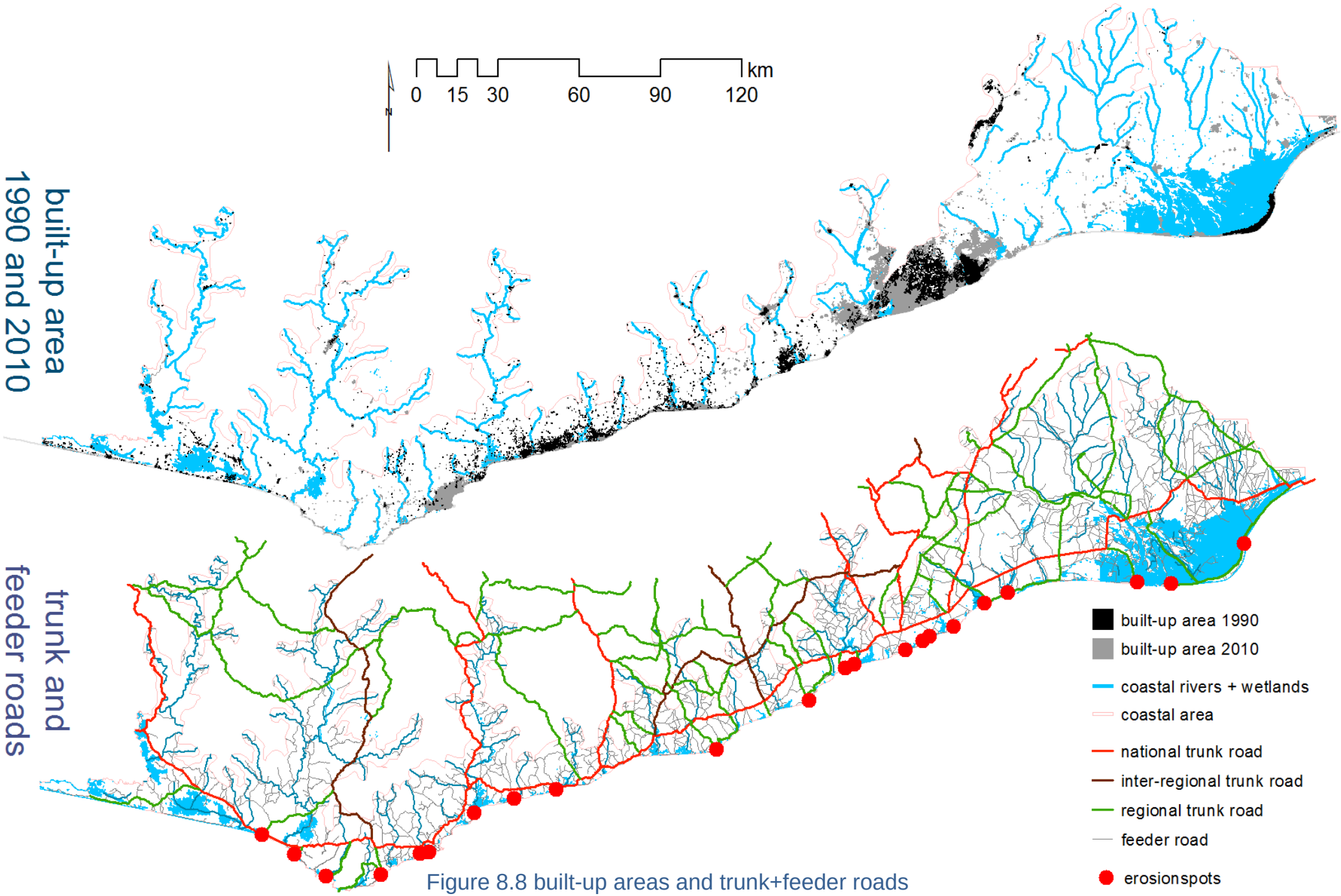


Figure 8.8 built-up areas and trunk+feeder roads

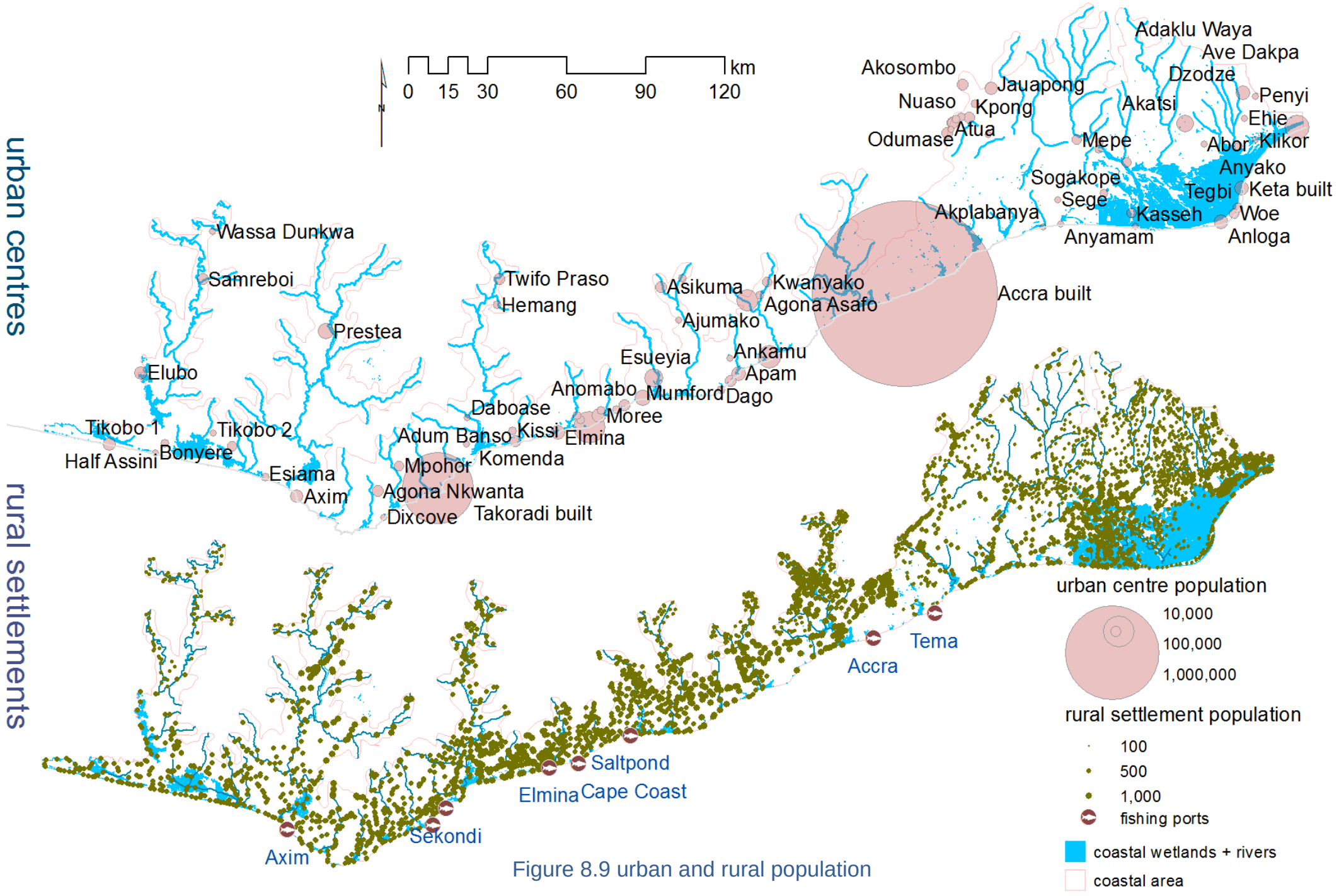


Figure 8.9 urban and rural population