National Action Plan on Prevention and Containment of Antimicrobial Resistance in Liberia

2018 - 2022

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Acknowledgments

The decision of the Ministry of Health (MoH) to develop the Antimicrobial Resistance (AMR) National Action Plan (NAP) was conceived following the World Health Organization (WHO) sponsored conference held in Harare, Republic of Zimbabwe in early January 2017.

A multisectoral approach has been used throughout its development; the NAP has been extensively reviewed by colleagues from diverse institutions and line ministries covering animal, environmental, plant and human health. The Pharmacy Division of the Ministry of Health (MoH) and the National Public Health Institute of Liberia (NPHIL) would hereby like to express its sincere appreciation and gratitude to the Financing Unit at the Ministry of Health, the Environmental Protection Agency (EPA), Liberia Water and Sewage Corporation (LWSC), Ministry of Agriculture (MOA), National AIDS Control Program (NACP) and National Malaria Program.

Partners and institutions who have also significantly contributed include Centers for Disease Control and Prevention (CDC), Food and Agricultural Organization of the United Nations (FAO), Mother Pattern College of Health Sciences, and United States Agency for International Development (USAID). A special recognition goes to the World Health Organization (WHO) for providing technical and financial support throughout this process.

Foreword

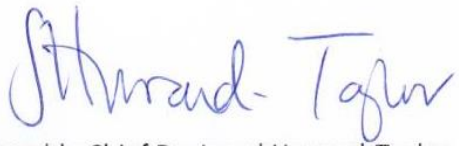
Antimicrobial resistance (AMR) poses a serious threat to public health, growth, and global economic stability; if not contained, the Sustainable Development Goals (SDGs) for 2030, such as ending poverty, ending hunger, ensuring healthy lives, and reducing inequality, are unlikely to be achieved. These issues are all central to the Pro-Poor Agenda for Development and Prosperity (PPADP) 2018 – 2022, and hence combating AMR is a national priority for Liberia.

In response to this imminent crisis, the Government of Liberia has developed the National Action Plan (NAP) for Antimicrobial resistance (AMR) 2018 – 2022, which outlines five strategic objectives:

- To improve awareness and understanding of AMR through education and training;
- To strengthen knowledge and evidence base through surveillance;
- To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures;
- To optimize the use of antimicrobial medicines in human and animal health;
- To ensure sustainable investment through research and development.

This action plan complements existing national plans and guidelines including the Investment Plan for Building a Resilient Health System 2015 - 2021, the National Action Plan for Health Security 2018 – 2022, National Health Quality Strategy 2017 - 2021 and the National Infection Prevention and Control Guidelines 2018 amongst others.

AMR is a complex systemic issue and needs to be treated as such; it has been incorporated into the "One Health Coordination Platform" which embraces multisectoral collaboration amongst human and animal health, agriculture, finance, environment and well-informed consumers. Using this approach, and with our political engagement I am confident that Liberia will do all in its capacity to contain antimicrobial resistance.



Honorable Chief Dr. Jewel Howard-Taylor
Chairperson, One Health Coordination Platform
Vice President
Republic of Liberia

Abbreviations and Acronyms

ABHR	Alcohol-Based Hand Rub
ACCEL	Academic Consortium Combating Ebola in Liberia
ACT	Artemisinin-based combination therapies
AM	Antimicrobial
AMR	Antimicrobial Resistance
AV	Anti-viral
BCC	Behavioral Change Communication
CASC	County Antimicrobial Stewardship Committee
CDC	Centers for Disease Control and Prevention
C&S	Culture & Sensitivity
CHA	Community Health Assistant
CHO	County Health Officer
CHT	County Health Team
CHV	Community Health Volunteer
CMS	Central Medicines Store
CODEX	An international food standard
CSA	Country Situational Analysis
CSH	Collaborative Support for Health
CVL	Central Veterinary Laboratory
DEOH	Department of Environment & Occupational Health
DST	Drug Susceptibility Testing
ECOWAS	Economic Community of West African States
EPA	Environmental Protection Agency
EPHS	Essential Package for Health Services
EPI	Expanded Program on Immunization
EVD	Ebola Virus Disease
FAO	Food and Agriculture Organization
G2G	Government-to-Government
GAP	Global Action Plan
GLASS	Global Antimicrobial Resistance Surveillance
GOL	Government of Liberia
FAO	Food and Agriculture Organization of the United Nations
HAI	Healthcare Associated Infections
HCW	Healthcare Workers

HF	Health Facility
HRH	Human Resource for Health
ICCM	Integrated Community Case Management
IDDS	Infectious Disease Detection and Surveillance
IAEA	International Atomic Energy Association
IEC	Information Education and Communication
IHR	International Health Regulation
IMCI	Integrated Management of Childhood Illness
IPC	Infection Prevention & Control
JEE	Joint External Evaluation
JHPIEGO	John Hopkins Program for International Education in Gynecology and Obstetrics
JISS	Joint Integrated Supportive Supervision
KAP	Knowledge, Attitude and Practice
KII	Key informants Interview
LMDC	Liberia Medical and Dental Council
LMHRA	Liberia Medicines & Health Products Regulatory Authority
LMIS	Laboratory Management Information and System
LWSC	Liberia Water & Sewage Corporation
MDR-TB	Multi-Drug Resistant Tuberculosis
MHS	Management Sciences for Health
MPCHS	Mother Pattern College of Health Sciences
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOH	Ministry of Health
MRSA	Methicillin-resistant Staphylococcus Aureus
M & E	Monitoring and Evaluation
NACP	National AIDs Control Program
NAP	National Action Plan
NRL	National Reference Laboratory
NSL	National Standard Laboratory
NGO	Non-Governmental Organization
NPHIL	National Public Health Institute of Liberia
NRL	National Reference Laboratory
OIE	Office International des Epizooties (OIE) or World Organization for Animal Health

P&R	Preparedness and Response
PBL	Pharmacy Board of Liberia
PLM	Project Last Mile
PMI	President's Malaria Initiative
PPP	Public Private Partnership
PQM	Promoting the Quality of Medicine
PSM	Procurement and Supply Management
QC	Quality Control
QI	Quality Improvement
QMU	Quality Management Unit
R&D	Research and Development
RH	Redemption Hospital
RHS	Restoration of Health Services (RHS)
SDGs	Sustainable Development Goals
SM	Social Mobilization
SOP	Standard Operational Procedure
SQS	Safe & Quality Services training
SSI	Surgical Site Infection
STG	Standard Treatment Guidelines
TB	Tuberculosis
TOR	Terms of Reference
TWG	Technical Working Group
UHC	Universal Health Coverage
UL	University of Liberia
UMU	United Methodist University
USAID	United States Agency for International Development
VP	Vice President
WAHO	West African Health Organization
WASH	Water, Sanitation and Hygiene
WAAW	World Antibiotic Awareness Week
WHO	World Health Organization

Glossary of Select Terms

Antibiotic Resistance: The ability of a bacterium to grow or survive in the presence of an antibiotic at a concentration that is usually sufficient to inhibit or kill bacteria of the same species and that exceeds concentrations achievable in the human / animal. It is a subset of antimicrobial resistance.

Antibiotic: Any of a large group of chemical substances, such as penicillin, having the capacity to inhibit the growth of, or to destroy bacteria and other microorganisms, used chief in the treatment of infectious diseases

Antimicrobial resistance (AMR): Develops when microorganisms (bacteria, viruses, fungi and parasites) no longer respond to a drug to which it was originally sensitive to. When the microorganisms become resistant to antimicrobials they are often referred to as "superbugs".

Antimicrobial stewardship: A multidisciplinary, systematic approach to optimizing the appropriate use of all antimicrobials to improve patient outcome and limit emergence of resistant pathogens whilst ensuring patient safety. Or the use of coordinated interventions to improve and measure the use of antimicrobials by promoting optimal drug regimen, dose, duration and route. The aim is for optimal clinical outcome and to limit selection of resistant strains. A key component of a multi-faceted approach to preventing antimicrobial resistance.

Antimicrobial: An agent such as a drug that destroys or inhibits the growth of a microorganism.

Evidence based medicine: A process of independent and objective decision making based on consideration of objective data with integration of best research evidence (external) with clinical expertise (internal) and patient values.

Governance: Is the strengthening of organizational structures for appropriate decision making, authority and oversight

Healthcare associated infection (also referred to as "nosocomial or "hospital acquired infection"): An infection occurring in a patient during the process of care in a hospital or other health care facilities, which was not present or incubating at the time of admission. Healthcare-associated infections can also appear after discharge.

Infection prevention and control: Infection prevention and control (IPC) is a practical, evidence-based approach which prevents patients and health workers from being harmed by avoidable infections**.**

One Health: Coordinated, collaborative, multi-disciplinary approach to address health risks that originate at the animal-human-ecosystems interface. The One Health concept recognizes that human health, animal health, and the environment are interdependent and bound to the health of the ecosystems in which they exist.

Surveillance: Ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health.

Executive Summary

This National Action Plan (NAP) on Prevention and Containment of Antimicrobial Resistance (AMR) presents a situational analysis on AMR in Liberia, describes the One Health Coordination Platform governance system, and defines the objectives, strategic, operational, monitoring and evaluation plan for AMR. It also maps current and required resources for combating AMR.

The impact of AMR is particularly concerning in resource constraint settings with higher burden of communicable diseases, fragile healthcare system, inadequate safe water and sanitation, limited AMR awareness and capacity, especially related to surveillance. Liberia is one of the 30 high burden countries for Tuberculosis (TB); in 2016, for new TB cases presenting an estimated 2.6% were multi-drug resistant to TB (MDR-TB), while 18% of previously treated cases were MDR-TB. The challenge of AMR containment is complex, requiring a multisectoral approach however until now engagement of the animal and environmental sectors has been limited. Other issues include the widespread selling counterfeit drugs; a recent Public Health Law amendment to ensure appropriate antimicrobial prescription may go some way in addressing this. AMR laboratory testing capacity is limited however, gradually being scaled up at regional facilities.

To effectively address these challenges the National Action Plan (NAP) for AMR provides guidance for key stakeholders over the period of 2018 - 2022. It complements existing strategies, plans and guidelines. Proposes areas of action:

- Improve awareness and understanding of AMR through education and training;
- Strengthen knowledge and evidence base through surveillance;
- Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures;
- Optimize the use of antimicrobial medicines in human and animal health; and
- Ensure sustainable investment through research and development.

The implementation of this NAP on AMR will be coordinated and overseen by the Antimicrobial Technical Working Group (AMR TWG) under the One Health Coordinating Platform, which will also monitor its progress. Successful implementation relies on the government's commitment, line ministries, regulatory bodies, academia, private sector, civil society organizations and the general public.

Within five years, community health assistants (CHAs), teachers (including universities, nursing and medical and primary schools), local authorities including commissioners, will be orientated on concepts of antimicrobial resistance and interventions. Pre-and in-service curriculums across the relevant sectors will incorporate these concepts.

The NAP will expand the availability of laboratory capacities (including laboratory technicians and equipment), establish sentinel sites for laboratory surveillance including healthcare associated infections (HAIs) in all regions. It will develop systems to ensure a regular and effective monitoring and reporting of antimicrobial resistance patterns across the relevant sectors.

In order to improve the effectiveness of facility infection control measures, County Health and Social Welfare Teams (CHSWTs) shall ensure that facilities have appropriate operational and technical capacities including equipment, supplies and infrastructure necessary for infection prevention and control. District Health Teams shall designate one Environmental Health Technician (EHT) who will be responsible for ensuring efficient implementation of the national SOPs for infection prevention and waste management at all facilities. Each facility will implement Environmental Management and Mitigation Plans (EMMP).

AMR research agenda and economic case for sustainable investment will be developed.

The estimated five (5) year cost for implementation of this plan is **USD$29,527,564 million.** Resource mapping has identified approximately ten (10) planned or ongoing sources of technical and/or financial support, which will require further elaboration by the Government of Liberia.

Introduction

Background

Antimicrobial resistance (AMR), the ability of a microorganism (like bacteria, viruses, fungi and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it (WHO, 2015), is a global public health threat that unless urgently addressed by 2050 will lead to 10 million deaths and a decrease of GDP between 1 – 3.5% per annum.[1] In Liberia, despite lack of data on AMR, the lack of control on selling of antimicrobials, the common practice of buying counterfeit drugs from "drug peddlers," the unrestrained use of antibiotics in the agriculture industry amongst other malpractices, indicate that once monitored resistance to pathogens will be found to be widespread.

In view of these threats, the Food and Agriculture Organization (FAO), the Office International des Epizooties (OIE) or World Organization for Animal Health, and the World Health Organization (WHO) adopted the Global Action Plan to combat AMR (GAP-AMR) during the World Health Assembly in May 2015. The GAP-AMR recommended a multi-sectoral approach from a One Health perspective, and sets out five strategic objectives: to improve awareness and understanding of AMR; to strengthen knowledge through surveillance and research; to reduce the incidence of infection; to optimize the use of antimicrobial agents; and to ensure sustainable investment in countering AMR.

The National Action Plan (NAP) for AMR 2018–2022 is the translation of the GAP-AMR, taking into consideration the local context and AMR status. It provides a common framework for action by all stakeholders from different sectors, including human health, animal health, agriculture and environmental sectors together with the civil society in managing and implementing appropriate AMR control activities, while being part of a collective strategy to meet the overall goal.

NAP for AMR linkages to existing plans

This first edition of AMR NAP complements existing strategies, plans, guidelines, etc. which make reference to preventing and combating AMR in Liberia (see table 1). At the International Health Regulation (IHR) Joint External Evaluation (JEE) held in September 2016 in Liberia, Antimicrobial Resistance (AMR) detection, mitigation and stewardship was highlighted as a key area for improvement. In response to this the One Health Coordination Platform, a multi-sectoral approach to combating human and zoonotic diseases, established an AMR technical working group (TWG) with the mandate to mobilize the local agenda to combat AMR.

[1] World Bank Group. Drug-resistant infections; A threat to our economic future (Sept 2016)

At global level multi-sectoral investment strategies such the Sustainable Development Goals (SDGs), WHO-General Programme of Work (GPW 13, 2018-2023) and Universal Health Coverage (UHC), amongst others highlight the importance of combating AMR.

Table 1 NAP for AMR linkages to existing plans

Linkages to in-country plans and strategies	International supporting documents
● Investment Plan to Build a Resilient Health System (2015 – 2021) ● IDSR Technical Guidelines (2016) ● International Health Regulation Joint External Evaluation for Liberia (2016) ● One Health Coordination Platform (2017) ● Liberia National Health Quality Strategy (2017 – 2021) ● National IPC Guidelines (2018) ● National Action Plan for Health Security (2018) ● SSI protocol Redemption Hospital (draft, 2018) ● National Healthcare Waste Management Guidelines (draft, 2018) ● Laboratory 5-year Strategy (draft, 2018)	● **CDC**: ANTIBIOTIC RESISTANCE THREATS in the United States (2013) ● **FAO**: Action Plan on Antimicrobial Resistance (2016-2020) ● Global Antimicrobial Resistance Surveillance System (2015) ● **OIE**: Standards, Guidelines and Resolution on antimicrobial resistance and the use of antimicrobial agents ● SGDs for 2030 ● WHO General Programme of Work 13 (2018 -2023)

Goal and target population

The goal of this National Action Plan is to prevent and control the spread of resistant organisms while ensuring continuity of successful treatment and prevention of infectious diseases with effective, safe and quality-assured antimicrobials. The plan proposes focus areas based on the principle that AMR requires a multi-sectoral approach comprising effective communication, coordination, and collaboration between the different line ministries, partners, and sectors under the One Health Coordination Platform.

The NAP on AMR targets: the public; ministries; departments and agencies; non-state actors; health professionals; veterinarians; other relevant professionals; professional associations and regulatory statutory bodies involved in the regulation, importation, distribution, retailing, dispensing, use and disposal of antimicrobials and in research into alternatives to antimicrobials.

Guiding Principles underpinning Liberia's NAP on AMR

1. **Collaboration.** Working individually will yield some results but real change requires collaborative action by all jurisdictions, sector partners and the public to better coordinate and respond to AMR.
2. **Integrated One Health approach.** The adoption of an integrated One Health approach recognizes the interconnectedness between humans, animals, crops and the environment, and coordinates actions of all stakeholders.
3. **Prevention first**. Prevention is the most effective, affordable way to reduce risk or severity of infections.
4. **Sustainability**. The implementation AMR NAP will require long-term investment, for instance in surveillance, operational research, laboratories, human and animal health systems, competent regulatory capacities, and professional education and training, in both the human and animal health sectors.
5. **Information sharing.** A concerted response demands that information and best practices are shared and leveraged across jurisdictions and sectors for a coordinated approach to AMR and AMU.
6. **Flexibility.** Progress on the implementation of the NAP on AMR requires a flexible, adaptable, and incremental approach that recognizes that AMR activities and capacities are variable across governments and sectors.
7. **Measuring success.** Common indicators and benchmarks must be developed in order to measure effectiveness of priority actions under the NAP.

Country Situational and SWOT Analysis

Bacterial Resistance

Drug resistance data is limited in Liberia, however information on multi-drug resistance Tuberculosis (MDR-TB) is available. Liberia is one of the 30 high TB burden countries globally with an incidence of 14 per 100,000 population for 2016;[2] of concern is TB treatment coverage of less than 50%, and loss to follow-up exceeding 10%, all contributing factors to an estimated 2.6% of new cases presenting as MDR-TB, 18% MR-TB in previously treated cases, with 24% resistant to Rifampicin (Table 2). This gives a rate of MDR-TB of 9.4 per 100,000 population.

Table 2 Liberia Drug-resistant TB, 2016

Drug-resistant TB care, 2016

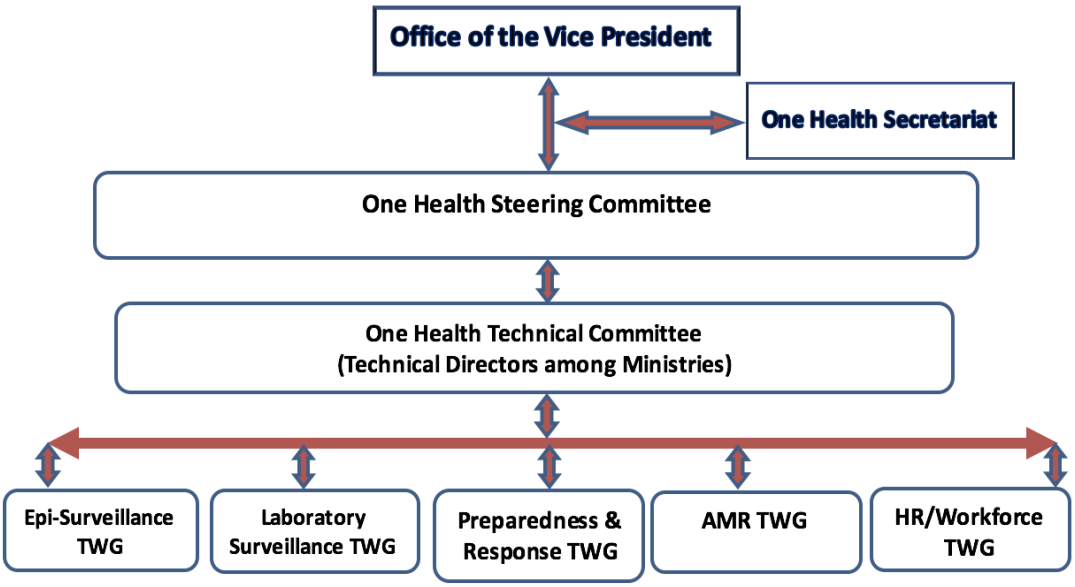
	New cases	Previously treated cases	Total number[c]
Estimated MDR/RR-TB cases among notified pulmonary TB cases			160 (36–290)
Estimated % of TB cases with MDR/RR-TB	2.6% (0.1–5.1)	18% (0.1–36)	
% notified tested for rifampicin resistance	24%	100%	1 876
MDR/RR-TB cases tested for resistance to second-line drugs			0
Laboratory-confirmed cases			MDR/RR-TB: 92, XDR-TB: 0
Patients started on treatment[d]			MDR/RR-TB: 75, XDR-TB: 0

Governance and One Health Coordination Platform

A national multisectoral coordinating group (NMCG) for multi-hazard and zoonotic diseases exists under the One Health Steering Committee platform; this is headed by the Vice President's office with multiple ministries actively contributed to the platform (see Governance section for details). The One Health Technical Committee is buttressed by five technical working groups (TWGs); the TWGs meet on a regular basis and feeds back to the One Health Technical Committee on a quarterly basis. The AMR focal person leads the AMR TWG (see Figure 1). It is a strength that the One Health Coordination Platform has been established; it benefits from political support, is accountable to the government through its structure, has a secretariat, is supported by technical experts and has dedicated funding.

[2] WHO. Global Tuberculosis Report 2017

Figure 1: One Health Coordinating Platform organogram



Despite this multisectoral approach, the following key stakeholders are yet to participate: Ministries of Education and Commerce, City Corporation of Counties, private sector representation (e.g. animal production and food processing industries, private hospitals, veterinary and farmers' associations, pharmaceutical industry, health insurance), regulatory bodies (e.g. LMHRA) and key civil societies (e.g. patient groups, sectoral professional bodies, medical associations).

The animal health sector is challenged by a lack of specific legislation, funding and human resources, to adequately support AMR activities. More awareness and advocacy on good agricultural practices are needed to improve AMR surveillance and detection among farmers involved with food and livestock production. Regulatory framework, enforcement and monitoring for drugs brought into the country are inadequate and no data on drugs for animal health usage is available.

GAP 1: Improving awareness and understanding of AMR through effective communication, education and training

The first World Antibiotic Awareness Week (WAAW) was celebrated from 13 - 19 November 2017. Prior to that, Liberia Medicines and Health Products Regulatory Authority (LMHRA) held regular public communication programs (through radio programs, billboards, and posters) targeting audiences not to buy medicines in the street; the program was however put on hold in 2016 due to financial constraints.

Currently AMR is no formally included in professional training or education programs with the exception of human health laboratories, and faith based institutions such as Mother Pattern College of Health Sciences.

GAP 2: Strengthen the knowledge and evidence base through surveillance and research

Liberia enrolled in the Global Antimicrobial Surveillance System (GLASS) in early 2018.

For human health, the following laboratory (microbiology) capacity exists:

- NRL is the coordination mechanism for all the regional labs in Liberia, including AMR activities. Culture and Sensitivity (C&S) testing for bacterial pathogens is on-going at NRL, but TB Drug susceptibility confirmatory testing (DST) is referred to the supranational reference laboratory in Uganda;
- Regional laboratories (Jackson F Doe hospital laboratory, Redemption hospital laboratory) are being validated to commence C&S testing for human specimens;
- Capacity for C&S at other facilities including JDJ, JJ Dosen, Tellewoyan Memorial, Bomi Local Government and Phebe hospitals in being established;
- An inventory system has been developed to take stock of all materials (media, sera, strains and other consumables) with the aim of knowing which facilities have gaps and ensure availability of materials at facilities;
- AMR reporting tool has been developed, with a plan to disseminate this tool to all current and future testing sites.

Lab deficiencies include:

- The limited technical capacity where approximately 72% of human resources in the laboratory are low cadre personnel (laboratory assistants and laboratory aids), however, has been a bottleneck to expansion of C&S testing capacity to other laboratories;
- Poor infrastructure, inadequate supply chain management for AMR surveillance (i.e. no equipment maintenance plan in place, limited electricity supply), insufficient budgetary allocation for clinical laboratories by the government, and staff attrition, among others, have further affected decentralization of C&S testing capacity

Surveillance activities have been conducted for Tuberculosis (TB), Malaria (artemisinin-based combination therapies (ACT) susceptibility), and HIV Anti-Viral (AV) resistance through Esther Funds France (blood spots were sent to France). There is potential for Methicillin-resistant Staphylococcus Aureus (MRSA) surveillance in some faith based hospitals, as well as potential food borne disease antibiotic susceptibility. There is some capacity for bacteriology analysis of food samples at the National Standards Laboratory in the Ministry of Commerce.

For animal heath, no microbiology laboratory capacity, nor AMR surveillance exist.

GAP 3: Reduce the incidence of infection through effective sanitation, hygiene, and infection prevention measures

Infection prevention and control (IPC) is one of the areas which has made significant strides since the Ebola outbreak and can be leveraged on by other programs to learn from. IPC programs have been established at national and facility level; an IPC unit embedded within the Quality Management Unit (QMU) at MOH, with a national IPC coordinator. Each County Health Team (CHT) and hospital has a designated IPC focal person. The National IPC guidelines which contain a section on AMR were validated in June 2018. IPC principles have been applied in the design of triage and isolation at designated health facilities (Redemption hospital). Monitoring and evaluation frameworks are available (e.g. hand hygiene audits, Joint Integrated Supportive Supervision (JISS)) to ensure adherence to IPC standards. Healthcare-associated infection (HAI) data is being collected at selected hospitals; however, this is not being shared at national level nor integrated into the surveillance system.

IPC measures outside health settings are in progress: promotion of personal hygiene by social mobilization; infection prevention through sex and drugs; water and sanitation; vaccination programs; food chain hygiene practices; and in the environmental sector.

The animal, plant, food and environment sectors do not have hygiene and sanitation programs or training in place. No guidelines are in place advising on animal health, welfare and production. Vaccination in the animal health sector for zoonotic and non-zoonotic diseases (*i.e.* Brucellosis, Tuberculosis, Anthrax) are yet to be done. The Department of Environment and Occupational Health (DEOH) conducts spot inspections of food handling facilities, although not regularly and with logistic limitations, and actions are taken when issues of concern are raised. There is lack of monitoring and surveillance for IPC in animals, plants and food.

GAP 4: Optimize the use of antimicrobial agents in human and animal health

The Public Health Law is being amended to include the “Keep Antibiotics Effective” act. The LMHRA is the national drug regulatory authority for human health, which is non-existent in other sectors. Although animal health follows a similar drug registration process to that of human health, no framework exists to ensure that the procedures are being followed.

Marketing authorization for quality assurance, safety and effectiveness exists for human health. Through the LMHRA, mechanisms for detecting and combating counterfeit

antimicrobial agents are in place for human health; however, LMHRA is currently not operational due to the lack of funding.

An essential medicines list, as well as the National Therapeutic Guidelines exist for human health, are available and widely distributed. The *National Medicine Policy* 2013 emphasizes the need for accessible, prescribed and rational consumption of medicines, and that products should meet local and international quality standards. A section for antimicrobial agents is lacking. Regulation of industries promotional practices is not available in any of the sectors. In addition, there is no regulatory framework for preservation of new antimicrobial agents and stewardship programs.

GAP 5: Economic investment for sustainability and innovations

No AMR research agenda nor projects are in the pipeline for investment in research to develop new medicines, diagnostic tools, vaccines and other preventive interventions.

SWOT Analysis

Strengthens, weaknesses, opportunities and threats (SWOT) analysis summarizing the main situational analysis outputs can be found in table 3.

Table 3 Liberia AMR situational analysis SWOT

Strengths	**Weaknesses**
Established One Health Coordination Platform, including political commitment	Animal and environmental sectors limited engagement and capacity
Experience of IPC program and Early Warning Disease Surveillance can guide other sectors	Limited AMR surveillance, including lab capacity
Human health sector has initiated some of the combating AMR objectives	Lack of governance and accountability of selling of counterfeit drugs
Opportunities	**Threats**
LMHRA model can be used by other sectors	Poor compliance to antibiotic regimes
Funding opportunities for AMR activities	Porous cross borders facilitate illegal selling of antibiotics
Public health law amended to include appropriate antimicrobial prescribing	
Liberia enrolment in GLASS	
ECOWAS commitment to combat selling of counterfeit drugs cross borders	

Governance

Coordination of the implementation of the NAP on AMR shall be the responsibility of the AMR TWG under the One Health Coordination Platform which shall be duly mandated, authorized, funded and empowered in decision-making by the relevant Ministries and constituencies as appropriate. The Charter of the AMR TWG is as follows (table 4):

Table 4 AMR TWG charter

Name of Group:	The Antimicrobial Resistance Technical Working Group (AMR TWG)
Purpose statement:	The purpose of the Antimicrobial Resistance TWG (AMR TWG) is to oversee and to coordinate AMR-related activities in all relevant sectors to ensure a systematic, comprehensive approach to controlling, monitoring and or containing the global threat of AMR. The AMR TWG shall be charged with the responsibility to address all AMR-related activities from central to county levels. The scope shall be broad enough to address all five strategic objectives of the Global Action Plan (GAP) and National Action Plan (NAP) on AMR, prioritizing activities in a step-wise approach. **Principles:** ● ***Leadership:*** The AMR TWG is expected to lead facilitation and, when appropriate, coordination of a national response to the threat of AMR. The Ministry of Health (Chief Pharmacist) shall be the chair of the AMR TWG. His/her role shall be extended to making recommendations and submitting progress reports to national and global governing bodies, (e.g. UN, WHO, OIE, GLASS and FAO) and providing a platform for program planning and implementation via established technical implementation mechanisms in the form of Technical Working Groups (TWGs). ● ***Political support***: As human health is the ultimate concern of activities to control AMR, MoH shall lead the group.

	● ***Authority to act***: The coordinating group shall have sufficient authority to ensure that its recommendations and plans are implemented. ● ***Accountability***: The group shall be accountable to the Technical Committee under the One Health Coordination Platform. ● ***Information sharing:*** The AMR TWG provides a structure for information-sharing to mutually reinforce activities among sectors with triggering mechanisms-national, county, district, healthcare facility and community levels vice visa. ● ***Facilitation and coordination:*** The AMR TWG shall facilitate and coordinate efforts to contain and reduce the threat of AMR at national level. The AMR TWG shall build a collaborative, cooperative, supportive environment for sharing knowledge, information and experience. The scope of each participating party shall be defined to avoid overlapping and/or duplication of functions. The AMR TWG shall also oversee the development of the NAP on AMR, and oversee all the activities of the TWGs. ● ***External interactions:*** Collaboration with external agencies and organizations is essential. The AMR TWG shall collaborate with regional and global bodies. ● ***Internal interactions*****:** The national AMR initiative shall align with disease-specific programs (Human, Animal and Environmental). As many agencies, sectors and programs have responsibilities in areas affected by AMR, a guiding principle of the AMR TWG is to find the most appropriate ways to facilitate and provide synergy with new or existing work so that the overall objectives of the programs are achieved. Furthermore, the AMR TWG shall be appropriately integrated and have clearly defined roles and responsibilities in the existing health system, public health and disease-specific programs, animal health and production, the food sector and environmental initiatives. The cross-cutting nature of the AMR shall add value to these systems and programs, not supplant them.
Date approved by government:	June, 2018
Date to be reviewed:	June 2022

A: Structure	Membership and Terms of Office:
Office bearers:	The AMR TWG shall be composed of members representing the relevant sectors, notably the human, animal and environmental health. The members of the AMR TWG shall include the following: • Ministry of Health – Quality Management Unit, Divisions of Pharmacy and EPI • National Public Health Institute of Liberia – National Public Health Laboratory • National Public Health Institute of Liberia – Environmental Health • Liberia Medical Health Regulatory Authority (LMHRA) – Laboratory • Ministry of Agriculture – Animal Health Sciences / Epidemiological Unit • Ministry of Agriculture – Central Veterinary Laboratory • Environmental Protection Agency – Compliance / Laboratory • Forestry Development Authority – Wildlife Management/Conservation • Ministry of Commerce and Industry – Inspector/Laboratory Units • Ministry of Justice- Codification Unit • National Disaster Management Agency • Ministry of Education (MoE) • Liberia Water and Sewer Cooperation • National TB Control Program • National Malaria Control Program • National HIV Control Program • CU-College of Health Science • UL- College of Health Science • UMU- College of Health Science • Mother Patter College of Health Sciences (MPCHS) • Tubman University • Adventist University-College of Health Science

	• Pharmaceutical Business Association • Central Medicines Store (CMS) • Civil Society Organization • Community representative **Developmental Partners** • Centers for Disease Control and Prevention (CDC) • Clinton Health Access Initiatives • Collaborative Support for Health (CSH) • Department for International Development (DFID) • Food and Agriculture Organization of the United Nations (FAO) • Gesellschaft für Internationale Zusammenarbeit (GIZ) • Global Fund • International Atomic Energy Association (IAEA) • PREDICT • United States Agency for International Development (USAID) • World Bank • World Health Organization (WHO) • World Organization for Animal Health (OIE) **Regulatory Bodies and Councils** • Liberia Medicines and Health Products Regulatory Authority (LMHRA) • Pharmacy Board of Liberia (PBL) • Liberia Medical and Dental Council (LMDC) • Liberia Board for Nursing and Midwifery (LBNM)

In attendance (non-voting):	Committee Officer/Minute Taker
Chair:	The Chief Pharmacist shall chair the AMR TWG
Minimum number of meetings:	The AMR TWG shall meet monthly on the second Wednesday or as the need arises.
B: Authority/ Mandate	**Terms of Reference:**
	The National AMR TWG shall address all AMR-related activities in the country. The scope is to address all five strategic objectives of the global action plan, which have been adopted and adapted in the country with prioritizing activities in a step-wise approach. The following strategic objectives shall therefore be addressed by the AMR TWG: ● Engender socio-behavioural change by AMR awareness, education and training; ● Institute sentinel surveillance and research on AMR; ● Inculcate good sanitary practice in human, animal and environmental health; ● Entrench antimicrobial stewardship to optimize antimicrobial use in human and animal health; ● Ensure sustainable investment for AMR prevention and containment; The AMR TWG will additionally; ● Identify other stakeholders and facilitate the formation of an inclusive AMR TWG; ● Facilitate the development, mid-term review, implementation, monitoring and evaluation of the NAP; ● Annually review the prioritized list of activities to inform annual implementation plans; ● Facilitate, coordinate and monitor the implementation of national and operational plans for the containment of AMR in the country; ● Oversee the risk analysis and implement mitigation strategies annually;

	● Lobby with government, national and international funders for human and financial resources to implement the NAP; ● Lead the bi-annual reporting against indicators and the monitoring and evaluation plan and institute interventions as appropriate; ● Ensure regular data collection and information sharing by instituting effective communication and coordination amongst all stakeholders, members of the AMR TWG and their constituencies, sectors and disciplines; ● Report on the prevalence of and trends in AMR (evidence-based) to technical committee and partners linked to JEE score on progress on country performance including the global AMR surveillance system;
Receives reports and recommend-action from:	● Technical Working Groups ● Other relevant structures
Refers matters to:	The AMR TWG shall be accountable to the National Delegating Authority, One Health Technical Committee (OHTC). Periodic briefs shall be given to the OHTC status implementation of the AMR NAP. The OHTC shall further refer matters to the One Health Steering Committee (OHSC)
C: Operation	**Standard Operating Procedures**
Agenda approved by:	Chairperson
Agenda distributed to:	Members
Draft minutes approved by:	Chairperson
Minutes distributed to:	Members
Other relevant meeting procedures:	The meeting format and rules shall conform to national norms. Standard operating procedures shall be elaborated, transparently and according to the principles of best practice, to guide the activities of the AMR TWG.

	The AMR TWG shall have a mechanism (with appropriate records) to ensure that its members have no conflicts of interests and that the work of the AMR TWG in the interests of public health is *transparent*. This shall ensure the AMR TWG's credibility is not undermined. At least a 2 weeks' notice with an agenda shall be given to members for a TWG meeting. Ad-hoc meetings shall be called should the need arise at the discretion of the Chairperson in consultation with the Secretariat For meetings of the AMR TWG: 1. The agenda shall close 15 days prior to a meeting and the agenda and supporting documents shall be distributed 7 days prior to the meeting. 2. Items for the agenda shall be submitted in electronic format and hard copy to the Committee Chair. Urgent items may be added to the agenda up to 5 days before a meeting. 3. Decisions shall be taken by consensus. 4. Apologies for absence shall be submitted in writing to the Chair. 5. Substantive members may send a mandated representative. 6. All meetings shall be recorded.

At the County level, the lead Departments (Health and Agriculture) shall establish a **County Antimicrobial Stewardship Committee (CASC).** CASC will comprise of County Executive Committee members, County Chief Officers of relevant Departments, Technical County Directors and experts; the CASC will be responsible for approving budgets and work plans, resource mobilization and implementation of the NAP at the county level (table 5).

Table 5 Roles and Responsibilities of national, national/county and county governments

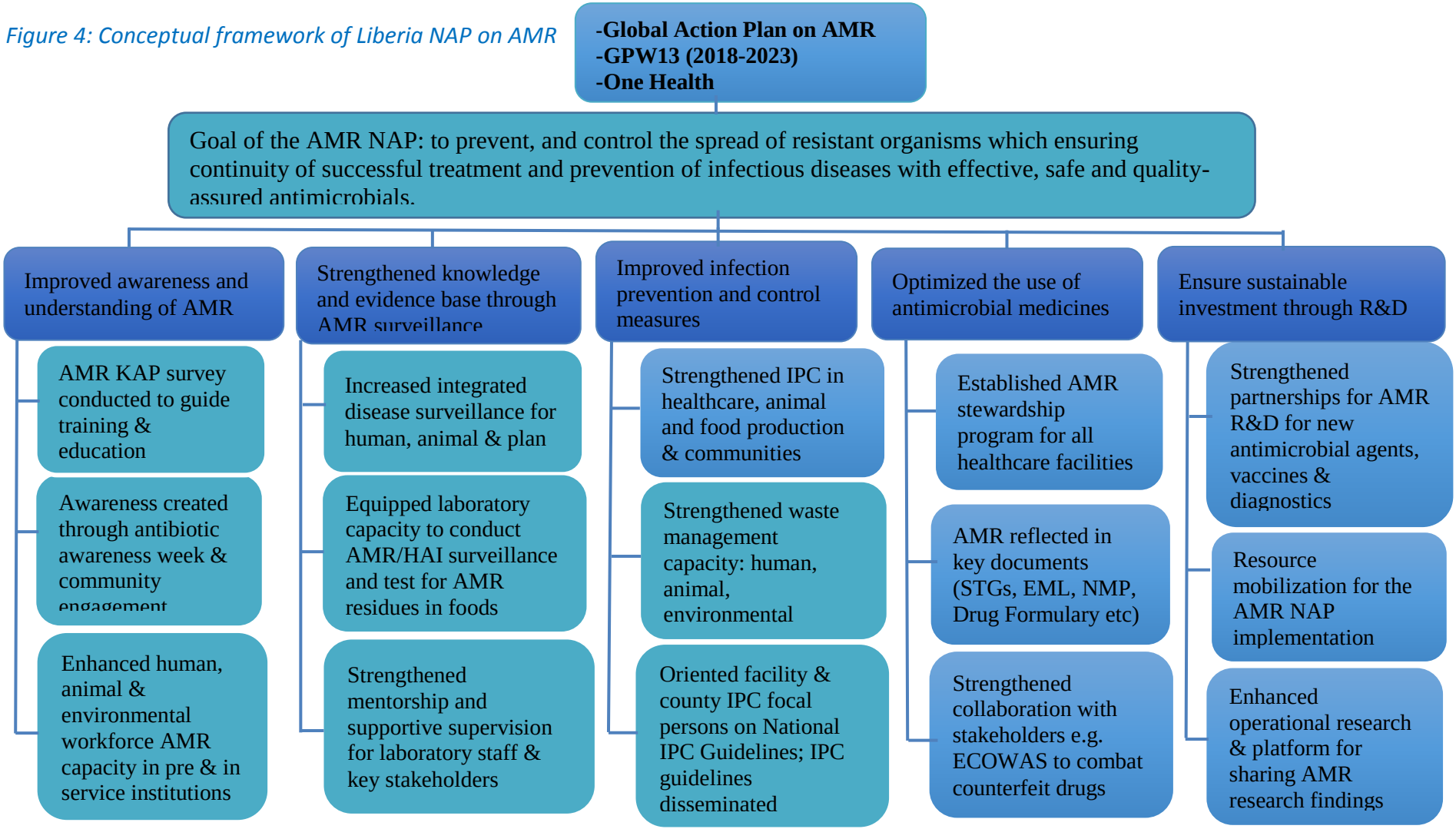
National government	National/county government	County government
1. Develop and disseminate appropriate messages on AMR to suit different target groups; 2. Develop AMR curriculum for inclusion in universities, middle level institutions and schools; 3. Develop and support the implementation of a National integrated AMR surveillance system. 4. Mobilize resources for implementation of the National integrated AMR surveillance strategy. 5. Support data collection, provision of feedback to stakeholders and maintenance of the national database on AMR; 6. Develop guidelines for compulsory reporting on AMU and AMR trends by all stakeholders including County Governments in line with international requirements and local legislation. 7. Build the capacity of the Laboratories to support AMR surveillance 8. Review and develop guidelines for infection prevention and control (IPC); hygiene & sanitation; good agricultural and animal husbandry practices; preventive vaccinations; farm biosecurity; food and water safety & prudent antimicrobial use. 9. Develop and/or review existing legislation to support compliance IPC guidelines.	1. Enhance multisectoral communication and provide budgetary support towards a "One Health" Communication approach to AMR; 2. Develop tools for public communication and awareness creation on AMU and importance of prevention and containment of AMR; 3. Develop and deploy effective and varied communication tools & approaches to influence multisectoral behavioral change; 4. Ensure appropriate employment and deployment of appropriate technical staff to support implementation of the guidelines developed. 5. Allocate resources to support the implementation of infection prevention and control measures.	1. Mobilize resources for information dissemination; 2. Disseminate developed AMR messages stakeholders within their areas of jurisdiction' 3. Mobilize resources to implement the surveillance strategy in their counties**;** 4. Facilitate the transmission of data on antimicrobial resistance and consumption to the National government; 5. Disseminate AMR surveillance data to the county stakeholders. 6. Support and monitor the implementation & compliance to the relevant guidelines; 7. Provide incentives for utilization of disease preventive measures and

10. Develop and review policies, guidelines and strategies to optimize and regulate the use of antimicrobials. 11. Review, develop and enforce legislation on prudent use of antimicrobial agents. 12. Provide for mechanisms to implement the guidelines by County Governments. 13. Ensure that professional regulatory bodies support health care provider compliance to antimicrobial use guidelines. 14. Review and/or develop appropriate legislation on antimicrobial use. 15. Strengthen the integrated regulatory system to ensure that antimicrobial agents are appropriately used in human and animal health. 16. Strengthen the laboratory capacity for the regulatory authority to support quality assurance, including post market surveillance, for antimicrobial agents. 17. Increase investment in research for new and existing antimicrobials, diagnostic tools, alternative medicine, vaccines and other interventions. 18. Provide an enabling environment for private sector to undertake research and development of new antimicrobials, vaccines, alternative medicine and diagnostics. 19. Collaborate with local and international research organizations to support research in antimicrobial resistance.	6. Ensure appropriate human resourcing including deployment of technical staff to support prudent use of antimicrobials. 7. Ensure that antimicrobials are manufactured, distributed, prescribed and dispensed as per developed standards and guidelines. 8. Ensure uninterrupted access to essential antimicrobial agents at all levels of care. 9. Strengthen diagnostic services for human and animal health to support prudent use of antimicrobials. 10. Invest in operational research on AMR that takes into account the needs of Liberia 11. Institutionalize mechanisms for coordination of the AMR agenda across all the relevant sectors. 12. Integrate the AMR agenda within the sectoral plans	vaccines as alternatives to prophylactic antimicrobial use.

Conceptual Framework of the NAP on AMR

This conceptual framework illustrates the background, goals, strategic objectives and interventions of the NAP on AMR (Figure 2).

Figure 4: Conceptual framework of Liberia NAP on AMR



Strategic Plan

The goal of this National Action Plan is to prevent, and control the spread of resistant organisms which ensuring continuity of successful treatment and prevention of infectious diseases with effective, safe and quality-assured antimicrobials. To achieve this goal strategic objectives and interventions have been defined, which align with the global strategy for combating AMR (see table 6). Priorities for year 1 (2018- 2019) are also highlighted.

Table 6: Global strategic objectives, national strategic objectives, national strategic interventions 2018 – 2022

Strategic Objectives of the GAP	Strategic Objectives of the NAP	Strategic Interventions of the NAP	Year 1 Priorities
1. Improve awareness and understanding of AMR through effective communication, education and training.	1. Improve awareness and understanding of AMR through effective communication, education and training.	1.1 Conduct AMR integrated KAP survey to guide training and education 1.2 Develop and disseminate a comprehensive communication strategy for AMR for various stakeholders 1.3 Conduct regular public awareness campaigns on AMR 1.4 Enhance AMR capacity in pre-service institutions (human, animal, environmental, food production and food safety workforce) 1.5 Enhance AMR capacity in-service institutions (human, animal, environmental, food production and food safety workforce)	1.1, 1.2, 1.3
2. Strengthen knowledge and evidence base through surveillance and research.	2. Strengthen knowledge and evidence base through surveillance	2.1 Strengthen lab AMR capacity 2.2 Establish a surveillance system for AMR in human health 2.3 Establish a surveillance system for AMR in animal health 2.4 Establish an integrated AMR surveillance system 2.5 Establish an early warning system to determine risk factors of AMR	2.1, 2.4
3. Reduce the incidence of infection through effective sanitation, hygiene	3. Reduce the incidence of infection through effective sanitation,	3.1 Orient healthcare workers (HCWs) on the National IPC Guidelines 3.2 Strengthen community level prevention 3.3 Strengthen IPC in health care facilities 3.4 Strengthen animal health and agricultural practices	3.1,

and infection prevention measures.	hygiene and infection prevention control measures.		
4. Optimize the use of antimicrobial agents' medicines in human and animal health.	4. Optimize the use of antimicrobial agents' medicines in human and animal health.	4.1 Develop and enforce legislation on prescriptions for combating AMR 4.2 Reflect AMR in key documents: Standard Treatment Guidelines, Essential Medicine List 2016 4.3 Establish AMR stewardship program for selected facilities 4.4 Establish an antimicrobial prescription monitoring system 4.5 Establish a monitoring system for non-prescribed antimicrobials 4.6 Strengthen the LMHRA drug quality control lab 4.7 Establish/strengthen animal drug regulatory body to address AMR 4.8 Strengthen EPA to address AMR 4.9 Collaborate with WAHO and ECOWAS focal persons to combat counterfeit drugs	4.1, 4.2
5. Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions.	5. Ensure sustainable investment through research and development	5.1 Establish a multisectoral research agenda on AMR 5.2 Establish Public-Private Partnerships (PPP) for AMR R&D 5.3 Establish funding mechanism for AMR Research & Development (R&D)	

Operational Plan

The NAP on AMR budget summary according to the five strategic objectives of the GAP is a total of **US$29,527,564** for the 5 years (table 7). The operational plan with the specific activities to be implemented, timelines and budget lines can be found in tables 8 – 10.

Table 7: NAP for AMR budget summary 2018 - 2022

No	Strategic Objectives	2018	2019	2020	2021	2022	Total
1.	Improve awareness and understanding of AMR through education and training	$884,185	$ 908,797	$ 808,854	$823,550	$ 752,300	$4,177,686
2.	Strengthen knowledge and evidence base through surveillance	$1,939,203	$ 1,385,795	$1,756,217	$1,284,125	$ 1,284,125	$ 7,649,464
3.	Reduce the incidence of infection through effective sanitation, hygiene and IPC measures	$3,042,265	$ 2,140,086	$1,909,048	$1,905,298	$ 1,905,298	$10,901,995
4.	Optimize the use of antimicrobial medicines in human and animal health	$1,994,268	$1,016,553	$1,485,224	$1,011,221	$ 694,254	$ 6,201,519
5.	Ensure sustainable investment through research and development	$205,700	$ 67,800	$187,800	$67,800	$ 67,800	$ 596,900
#	**Total**	**$8,065,621**	**$ 5,519,030**	**$ 6,147,142**	**$5,091,993**	**$ 4,703,777**	**$29,527,564**

STRATEGIC OBJECTIVE 1: IMPROVE AWARENESS AND UNDERSTANDING OF AMR THROUGH EDUCATION AND TRAINING

Table 8: Strategic objective 1 operational plan

No	Interventions	Specific activities	Time-frame	Cost (USD)
1.1	Conduct AMR integrated knowledge, attitude and practice (KAP) behavioral survey to guide training and education	1.1.1 Establish a national AMR Risk communication and education taskforce	Within year 1	-
		1.1.2 Organize a working committee to develop and update KAP survey questionnaire	Within year 1 & 4	3,000
		1.1.3 Recruit data collectors for KAP survey	Within year 1 & 4	4,500
		1.1.4 Conduct one day orientation workshop for data collectors in Monrovia	Within year 1 & 4	1,500
		1.1.5 Conduct one day pre-test KAP survey in Monrovia	Within year 1 & 4	3,000
		1.1.6 Roll out KAP survey in 4 regions in Liberia	Within year 1 & 4	27,000
		1.1.7 Hire a local consultant to analyze KAP pre-test survey data and roll out data	Within year 1 & 4	18,000
		1.1.8 Print copies of validated KAP survey reports	Within year 1 & 4	3,000
		1.1.9 Disseminate copies of validated KAP survey reports to relevant sectors and key stakeholders	Within year 1 & 4	-
		1.1.10 Develop information, education and communication (IEC) materials on behaviour change communication (BCC) materials such as billboards, posters, flyers, banners on optimal antimicrobial use and AMR, targeting diverse stakeholders in human, animal, plant and environmental health in simple English and vernaculars	Within year 2 & 5	56,554.00
		1.1.11 Distribute IEC materials on BCC materials such as billboards, posters, flyers, banners on optimal antimicrobial use and AMR, targeting		-

		diverse stakeholders in human, animal, plant and environmental health in vernaculars		
1.2	Develop and disseminate a comprehensive communication strategy for AMR for various stakeholders	1.2.1 Develop risk communication strategy for AMR informed by the results of the KAP survey and behaviour of the general public, policy makers, animal and health service providers, veterinarians and farmers	Within year 2	75,500
		1.2.2 Print communication strategy on AMR for stakeholders	Within year 1	-
		1.2.3 Disseminate communication strategy amongst stakeholders	Within year 1	-
		1.2.4 Produce materials and messages on AMR in various local languages for 15 community radio stations across the country	Within year 1	-
1.3	Conduct regular public awareness campaigns and community engagement meetings on AMR	1.3.1 Conduct one day stakeholders engagement meeting with county authorities, line ministries, civil societies organizations, religious groups and partners on AMR at county level	Within year 1	107,500.00
		1.3.2 Conduct stakeholders engagement meeting with district authorities (commissioners, educational officers, traditional Leaders, paramount and clan chiefs, women and youth groups, religious leaders, CHVs Supervisors, Securities and partners on AMR (district level)	Within year 1	
		1.3.3 Orient gCHVs to conduct monthly community awareness at household level to promote sanitation, hand hygiene and IPC to control AMR	Within 5 years	3,465,000.00
		1.3.4 Organize activities to raise awareness during World Antibiotic Awareness Week	Within 5 years	21,500
		1.3.5 Print and disseminate hand hygiene posters for use by patient and healthcare workers mainly in hospitals	Within in year	45,000.00
		1.3.6 Conduct regular mass media awareness on AMR		200,000
1.4	Enhance AMR capacity in pre-	1.4.1 Conduct a workshop to update health education messages on AMR for school curriculums	Within 1 years	750

	service institutions (human, animal, environmental, food production and food safety workforce)	1.4.2	Conduct a workshop for regulatory bodies to amend their Acts to include AMR and IPC	Within 1 years	76,494.00
		1.4.3	Organize meetings with professional boards to incorporate AMR into their pre-service curriculum	Within 5 years	7,000
		1.4.4	Train professional educators at different levels on AMR issues	Within 2 years	10,500
		1.4.5	Update CHAs training curriculum to include hand hygiene and AMR	Within 2 years	3,000
		1.4.6	Improve microbiology curriculum to include AMR detection education and training in pre-service laboratory institutions	Within 1 year	-
		1.4.7	Reproduce food safety standards for AMR key stakeholders in the 15 counties	Within 1 year	4,888
		1.4.8	Participate in the revision of nutrition policy for Liberia to include AMR	Within 1 year	-
		1.4.9	Distribute food safety standards for AMR key stakeholders in the 15 counties	Within 1 years	-
1.5	Enhance AMR capacity in-service institutions (human, animal, environmental, food production and food safety workforce)	1.5.1	Develop in-service AMR orientation package	Within 2 years	-
		1.5.2	Print and disseminate in-service AMR orientation package to MOH, MOA, and other sectors.	Within 2 years	50,000.00
		1.5.3	Incorporate AMR into in-service training for midlevel health workers	Within 2 years	-
		1.5.4	Adopt and adapt relevant food safety standards	Within 1 years	-
		1.5.5	Print and distribute food safety standards for AMR key stakeholders in the 15 counties		

STRATEGIC OBJECTIVE 2: STRENGTHEN KNOWLEDGE AND EVIDENCE BASE THROUGH AMR SURVEILLANCE

Table 9: Strategic objective 2 operational plan

No	Interventions	Specific activities	Time-frame	Cost (USD
2.1	Strengthen lab AMR capacity	2.1.1 Training of lab staff at 8 sentinel sites (in human, animal and environment health)	Within 5 years	117,010
		2.1.2 Conduct facility-based mentorship for laboratory staff at sites	Within 5 years	513,240
		2.1.3 Procure essential equipment and supplies for antibiotic residual testing for AMR surveillance	Within 5 years	882,209
		2.1.4 Strengthen laboratory capacity to conduct AMR HCA surveillance	Within 5 years	42,785
		2.1.5 Participate in GLASS, including capacity building of lab personnel for data management for sharing on various platforms (national, regional and global)	Within 5 year	456, 210
		2.1.6 Develop a manual of SOPs for AMR surveillance in the context of One Health	Within 2 years	45,621
		2.1.7 Established Quality Assurance System for AMR	Within 2 years	42,785
		2.1.8 Conduct in-county and external quality Assurance of reference lab	Within 5 years	15,000
		2.1.9 Train laboratory staff on QMS in the context of One Health	Within 5 years	3,000
2.2	Establish a surveillance system for AMR in human health	2.2.1 Install Laboratory information management system (LMIS)	Within 2 years	150,000
		2.2.2 Identify and establish sentinel sites for healthcare- associated infections (HAI) surveillance system including surgical site infections (SSIs)	Within 2 years	23,776
		2.2.3 Establish surveillance for environmental pollution/hazard	Within 1 years	1,804,758
		2.2.4 Identify priority organisms, samples and testing panels	Within 2 years	-

		2.2.5	Train clinicians, veterinarians and environmental technicians on appropriate sample collection and submission	Within 1 year	1,126,590
		2.2.6	Document the AMR HCA profile to inform policy development/review	Within 5 years	-
		2.2.7	Establish AMR active surveillance system	Within 1 year	185,925
2.3	Establish a surveillance system for AMR in animal health	2.3.1	Conduct a country situational analysis of drug use in animal health (animal owners/traders) and make recommendations with respect to establishing animal health surveillance system	Within 1 years	600,000
		2.3.2	Strengthen veterinarian lab capacity to confirm AMR in animal health through procurement of reagents, laboratory consumables including Culture Media (antibiotic disk)	Within 5 years	902,379
		2.3.3	Conduct one day workshop of 75 participants, including environmental technicians to develop and validate AMR laboratory detection and reporting plan	Within 5 years	38,247
		2.3.4	Conduct 5-days sessions to train 261 health workers, livestock officers, environmental technicians and laboratory aides on AMR samples collection and Laboratory Technicians on the use of specialized diagnostics techniques and laboratory equipment	Within 5 years	
		2.3.5	Collect and transport food samples to the laboratory for analysis to monitor antibiotics residue in meat products at the slaughterhouses in country; meet inspectors at slaughterhouses on a monthly basis	Within 5 years	182,400
		2.3.6	Monitor antibiotic residues in animal feed, pesticide residue in honey, in aquaculture and food products etc; Laboratory analysis on samples collected monthly	Within 5 years	-

2.4	Establish an integrated AMR surveillance system	2.4.1 Establish an AMR central coordinating unit (NPHIL/MOH)- office operational cost	Within year 1-5	142,000
		2.4.2 Develop an integrated AMR surveillance plan	Within year 1	-
		2.4.3 Print and distribute the AMR surveillance plan	Within year 1	-
		2.4.4 Establish a centralized data management system for regular sharing of AMR data between MOH, NPHIL, MOA, FDA and EPA (local consultancy)	Within year 1, 3 & 5	-
		2.4.5 Train personnel on data management and reporting		225,318
		2.4.6 Harmonize laboratory methodologies and data reporting for characterization of AMR organisms with relevant drug combinations in hospitals		-
		2.4.7 Harmonize surveillance for antimicrobial resistance with antimicrobial utilization on farms	Within 5 years	-
2.5	Establish an early warning system to determine risk factors of AMR	2.5.1 Adopt international standards for AMR early warning	Within 3 years	-
		2.5.2 Train/sensitize lab techs, clinicians and vets on identification and evaluation of risk	Within 3 years	150,212
		2.5.3 Compile and provide information on identified risks	Within 5 years	-

STRATEGIC OBJECTIVE 3: REDUCE THE INCIDENCE OF INFECTION THROUGH EFFECTIVE SANITATION, HYGIENE AND IPC MEASURES

Table 10: Strategic objective 3 operational plan

No	Interventions	Specific activities	Timeline	Cost (USD
3.1	Orient healthcare workers (HCWs) on the National IPC Guidelines	3.1.1 Ensure AMR is embedded within the IPC TWG (based at QMU)	Within 1 year	-
		3.1.2 Printing of National IPC guidelines	Within 1 year	-
		3.1.3 Conduct a four-day orientation workshop for facility and county IPC focal persons (56) on National IPC Guidelines	Within 1 year	Done!
		3.1.4 Orientate all healthcare workers at each facility on the National IPC guidelines	Within 2 year	438,468
		3.1.5 Monitor implementation of the National IPC guidelines at health facilities	Within 5 years	247,900
3.2	Strengthen community level prevention	3.2.1 CHAs organize community hygiene/sanitation awareness with key stakeholders	Within 5 years	-
		3.2.2 Celebration of global handwashing day in schools by holding special program	Within 5 years	225,000
		3.2.3 Commemorate global handwashing day using social media	Within 5 years	-
		3.2.4 Meet with business/marketing associations to highlight importance of handwashing and waste management in their respective settings	Within 5 years	-
		3.2.5 Undertake food inspection of foods and food products for public consumption		382,470
		3.2.6 Update/develop community waste management protocol to include AMR	Within 2year	-

		3.2.7 Train waste technicians (solid and liquid waste) and environmental engineers in community waste management protocol	Within 2 years	433,825
		3.2.8 Meet with superintendent, CHO, county livestock officers, and development superintendent to advocate for building standardized community toilets and public waste bins to control organic and human waste	Within 2 years	5,895
		3.2.9 Develop Water Safety Plans (WSP) for 15 counties, including printing, validation, orientation, dissemination and monitoring) of water safety plans	Within 5 years	300,000
		3.2.10 Print water safety plans for 15 counties	Within 1 year	-
		3.2.11 Develop and validate community level water safety plans	Within 5 years	15,000
		3.2.12 Disseminate and monitor adherence to water safety plans, including household level for 15 counties	Within 5 year	37,752
		3.2.13 Monitor adherence to WSPs in 15 counties	Within 5 year	7,074
		3.2.14 Provide support to LWSC and Public Works to increase access to safe drinking	Within 5 years	-
3.3	Strengthen IPC in health care facilities	3.3.1 Establish alcohol based hand rub (ABHR) production plants at selected facilities	Within 5 years	7,522,135
		3.3.2 Advocate with key stakeholders for the establishment of plant for the production of gaseous chlorine to enhance the treatment of drinking water	Within	-
		3.3.3 Print and disseminate hand hygiene posters at health facilities, schools and food centers	Within 5 years	30,000
		3.3.4 Commemorate global hand hygiene day using social media	Within 1 year	-
		3.3.5 Perform Hand hygiene audits at hospitals (public and private)	Within 5 years	235,950

		3.3.6	Finalize and validate safe management of health care waste guidelines	Within 1 year	30,000
		3.3.7	Print and distribute safe management of health care waste guidelines	Within 1 year	50,000
		3.3.8	Orient HCWs on safe management of health care waste guidelines	Within 1 year	-
		3.3.9	Ensure screening, isolation and referral pathway for epidemic prone diseases are in place at health facilities	Within 2 years	-
3.4	Strengthen animal health and agricultural practices	3.4.1	Update/develop farm biosecurity guidelines for different categories of animal farms, slaughter (abattoirs) facilities, and agriculture facilities	Within 5 years	56,250
		3.4.2	Develop and validate safe waste management guidelines (including sanitation and hygiene) for animal facilities and farms	Within 1 year	56,250
		3.4.3	Hold a one day validation workshop for safe waste management guidelines for animal facilities and farms	Within 1 year	3,000
		3.4.4	Orientate facilities and farms workers in the waste management guidelines	Within 5 years	375,530
		3.4.5	Monitor the implementation of safe waste management guidelines for animal facilities and farms	Within 5 years	256,710
		3.4.6	Printing and distribution of safe management guidelines for animal facilities and farms	Within 5 years	10,000
		3.4.7	Adopt and implement standards published in OIE and Codex Alimentarius code of practice to minimize AMR	Within 2 years	7,500
		3.4.8	Train famers in standard animal husbandry practices to reduce need to use antimicrobial agents	Within 5 years	150,212
		3.4.9	Undertake regular checks on sanitation and hygiene on animal facilities and farms	Within 5 years	7,074

		3.4.10 Undertake regular checks on animal feeds for contamination	Within 5 years	-
		3.4.11 Develop/update standards for farm infrastructure that promotes infection prevention in animal handling facilities and farms	Within 2 years	5,250
		3.4.12 Establish manure/animal waste processing plant for fertilizer production	Within 5 years	-
		3.4.13 Develop guidelines for infection prevention materials for animal facilities and farms	Within 2 years	12,000
		3.4.14 Develop recommendations for use of vaccines as a method of preventing infections in animals and reducing antimicrobial use	Within 5 years	750.00

STRATEGIC OBJECTIVE 4. OPTIMIZE THE USE OF ANTIMICROBIAL MEDICINES IN HUMAN AND ANIMAL HEALTH

Table 11: Strategic objective 4 operational plan

No	Interventions	Specific activities	Time-frame	Cost (USD
4.1	Develop and enforce legislation on prescriptions for combating AMR	4.1.1 Establish and develop TOR for Antimicrobial Medicines Taskforce in the context of One Health	Within 1 year	-
		4.1.2 Conduct a 2- day workshop to develop a legislation on the use of antimicrobial agents in human, animals, plants and the environment	Within 1 year	76,494
		4.1.3 Validate a legislation on the use of antimicrobial agents in human, animals, plants and the environment	Within 1 year	2,150
		4.1.4 Print and disseminate updated Public Health Law with AMR components	Within 1 year	15,000

4.2	Reflect AMR in key documents (National Medicine Policy, Standard Treatment Guidelines, Essential Medicine List 2016)	4.2.1	Revise National Medicine Policy to include AMR	Within 2 year	-
		4.2.2	Print and distribution of revised National Medicine Policy	Within 2 years	20,000
		4.2.3	Update the National Drug Formulary to include AMR	Within 2 years	-
		4.2.4	Printing and distribution of revised National Drug Formulary	Within 3 years	10,000
		4.2.5	Revise the Standard Treatment Guidelines to include AMR	Within 3 years	-
		4.2.6	Printing and distribution of STG	Within 2 years	70,000
		4.2.7	Conduct TOT for professionals to promote responsible prescribing practices, dispensing and administrative principles for antimicrobials	Within 2 years	229,482
4.3	Establish AMR stewardship program for selected facilities	4.3.1	Develop antimicrobial stewardship working manual and procedures	Within 2 year	-
		4.3.2	Print and distribute antimicrobial stewardship working manuals in the context of One Health	Within 2 year	70,000
		4.3.3	Train HCWs on antimicrobial stewardship in the context of One Health	Within 3 years	751,060
		4.3.4	Facilitate AMR stewardship programs in selected healthcare facilities	Within 3 years	751,060.00
		4.3.5	AMR TWG to review and provide feedback to facility AMR stewardship programs	Within 3 years	-
		4.3.6	Scale up stewardship programs	Within 5 years	-
4.4	Establish an antimicrobial prescription monitoring system	4.4.1	Develop AMR prescription reporting system in the context of One Health (animal, human health)	Within 3 years	-
		4.4.2	Validate prescription reporting form	Within 2 years	-
		4.4.3	Printing reporting form	Within 2 years	-
		4.4.4	Disseminate prescription reporting form	Within 2 years	-

		4.4.5	Monitor and evaluate implementation of AMR prescription reporting system (supportive supervision)	Within 2-5	117,900
4.5	Establish a monitoring system for non-prescribed antimicrobials	4.5.1	Develop monitoring system for non-prescribed antimicrobials in collaboration with line ministries and the security sector	Within 5 years	7,500
		4.5.2	Re-establish and reinforce the implementation of penalties for illegal selling of antimicrobials	Within 5 years	235,800
		4.5.3	Reinforce the post marketing surveillance at the LMHRA	Within 5 years	276,267
		4.5.4	Collaborate with state security to reinforce the confiscation of illegal sale of antimicrobials and expired medicines	Within 5 years	375,530
		4.5.5	Reinforce the border security for illegal sale and importation of AM medicines	Within 5 years	5,632,950
		4.5.6	Collaborate with ECOWAS through WAHO to combat counterfeiting drugs	Within 5 years	-
		4.5.7	Develop and print SOP for identification and monitoring of non-prescribed antimicrobials	Within 3 years	10,000
		4.5.8	Disseminate SOP for identification and monitoring of non-prescribed antimicrobials	Within 3 years	-
4.6	Strengthen the LMHRA drug quality control lab	4.6.1	Procure essential commodities for the LMHRA QC Lab in one health context.	Within 5 years	1,443,806
		4.6.2	Training and mentorship of LMHRA drug quality control lab technicians	Within 5 years	99,160
		4.6.3	Training in physico-chemical drug quality control	Within 5 years	99,160
		4.6.4	Quality control training in microbiology of drugs	Within 5 years	99,160
		4.6.5	Training in quality control of medical devices	Within 5 years	99,160
		4.6.6	Training in quality control of cosmetics	Within 5 years	99,160

4.7	Establish/strengthen animal drug regulatory body to address AMR	4.7.1	Revise and update Animal Health Law to include AMR and update legislation for control and use of veterinary drugs (trade, use, importation, etc)	Within 2 years	3,750
		4.7.2	Identify and activate animal health regulatory body group	Within 2 years	-
		4.7.3	Monitor implementation of Animal Health Laws which includes AMR	Within 5 years	185,925
4.8	Strengthen EPA to address AMR	4.8.1	Monitor implementation of Environmental law which includes AMR	Within 5 years	185,925
4.9	Collaborate with WAHO and ECOWAS focal persons to combat counterfeit drugs	4.9.1	Conduct periodic coordination meetings with WAHO on combating counterfeit drugs (including supportive supervision)	Within 5 years	117,010
		4.9.2	Implement defined activities from coordination meetings held to combat counterfeit drugs	Within 5 years	-

STRATEGIC OBJECTIVE 5: ENSURE SUSTAINABLE INVESTMENT THROUGH RESEARCH AND DEVELOPMENT

Table 12: Strategic objective 5 operational plan

No	Interventions	Specific activities		Time-frame	Cost (USD
5.1	Establish a multi-sectoral research agenda on AMR	5.1.1	Establish an AMR Investment, Research and Development (R&D) Taskforce and develop TOR	Within 1 year	-
		5.1.2	Build human resource capacity in AMR R&D	Within 1 year	25,000
		5.1.3	Establish ethical and regulatory mechanisms for AMR R&D, in collaboration with national ethical and regulatory bodies	Within 1 year	45,000
		5.1.4	Develop guidelines for invitro/invivo diagnostics	Within 2 years	750
		5.1.5	Develop policy and strategy (guidelines) for national AMR R&D	Within 1 year	10,000

		5.1.6	Promote LMHRA standards for all research products to include therapeutics and vaccines	Within 5 years	25,000
		5.1.7	Hold one day workshop to validate policy and strategy for AMR R&D	Within 1 year	2,150
		5.1.8	Print and disseminate policy and strategy for AMR R&D	Within 1 year	5,000
		5.1.9	Engagement meeting with relevant stakeholders to identify current gaps in knowledge (i.e. research capacity gaps analysis) and potential research areas	Within 5 years	25,000
		5.1.10	Identify and train early career researchers on grant writing with emphasis on AMR R&D	Within 2 years	25,000
		5.1.11	Establish a center of excellence for AMR research with focus on one health	Within 2 years	25,000
		5.1.12	Conduct AMR-related research project (e.g. detecting pesticide residues in honey) with One Health approach	Within 5 years	25,000
		5.1.13	Establish/support a platform for sharing AMR research findings annually	Within 5 years	25,000
5.2	Establish Public-Private Partnerships (PPP) for AMR R&D	5.2.1	Conduct multi-sectoral coordination and AMR TWG consultative meetings and develop TOR	Within 5 years	23,000
		5.2.2	Conduct monthly AMR TWG to meetings to discuss key issues including research	Within 5 years	23,000
		5.2.3	Hold joint annual AMR review meetings with PPP including private sector and NGOs to orient them on AMR activities including research	Within 5 years	23,000
		5.2.4	Establish and promote regional and international collaboration for AMR R&D	Within 5 years	50,000

5.3	Establish funding mechanism for AMR R&D	5.3.1	Advocate and lobby for funding from government and partners (including pharmaceutical companies) to support AMR-related research	Within 1 year	-
		5.3.2	Post calls for funding opportunities onto institutional websites and mailing list of stakeholders	Within 2 years	-
		5.3.3	Identify and twin local laboratories with foreign laboratories to support research in AMR, and research exchange programs to transfer skills and mentorship	Within 5 years	240,000
		5.3.4	Develop AMR related research proposals/grants using one health approach	Within 1 year	-
	Total				**$29,527,564**

Risk Analysis

Implementing such a comprehensive plan has its risks; it is important to be aware of these and to have mitigation strategies in place to address them. These are described in table 13.

Table 13: NAP for AMR risk identifications and mitigations

Strategic objectives	Risk Identification	Risk Mitigation
1.0 Improve awareness and understanding of AMR through education and training	● High costs related to some media campaigns.	● Adapt existing awareness materials e.g. WHO and OIE WAAW materials to the Liberia context with funding and assistance from the development partners.
	● Unavailability of prime-time slots on television.	● Consolidate PR budgets of participating Ministries to secure prime-time slots.
	● Lack of ownership and commitment by one or more Ministries/stakeholder.	● Official inter-Ministerial launch of the NAP on AMR
	● Lack of ownership and commitment by stakeholders.	● Include AMR awareness activities in the Ministry's Strategic Plans and Annual Performance Plans
	● Refusal of professional councils to amend scopes of practice.	● Identify influential professionals, academics and thought leaders to serve as AMR champions and advocates.
	● Resistance to curriculum review by training institutions and Universities.	● Lobby professional councils to make such content mandatory to scopes of practice.
	● Curriculum review process is not undertaken annually and is protracted.	● Include such content in adhoc presentations by "AMR focal persons of different sectors". ● Host AMR-related symposia and conferences.

	● Competing training priorities and budgets.	● Schedule training in tandem with the official launch of the NAP; include such training in training plans funded through the human resources budget.
	● Possible lack of expertise in certain components of Veterinary AMR.	● Adapt existing open source content to the Liberia context. ● Develop partnerships with academic institutions and industry.
	● Lack of time/interest and high workloads.	● Identify AMR champions and advocates to communicate the AMR message at facility level
2.0 Strengthen knowledge and evidence base through surveillance	● Inadequate human, infrastructural and operational resources within hospitals with laboratories for sentinel sites	● Source investment from development partners such as the Fleming Fund/USAID to set up infrastructure.
		● Undertake domestic resource mobilization.
		● Secure a dedicated budget vote for NAP implementation from MFDP.
	● Inadequate technical capacity with the requisite training to undertake laboratory testing for AMR	● Develop technical capacity via training plans funded through the human resources budget.
	● Competing priorities.	● Use existing GLASS/Fleming Fund/ EUCAST/CLSI guidelines to develop SOPs suited to the Liberia context
	● Budget austerity measures preclude dedicated budget vote.	● Leverage funds from existing budgets of relevant Ministries.
		● Undertake domestic resource mobilization.
		● Secure funds from external development partners.
3.0 Reduce the incidence of infection through	● Inadequate human, infrastructural and operational resources.	● Include IPC implementation in the Ministry Strategic Plans and Annual Performance Plans.

effective sanitation, hygiene and IPC measures	● Inadequate technical capacity to implement IPC.	● Initiate Train-the-Trainer programs. ● Develop technical capacity training plans funded through the human resources budget. ● Leverage the Clinical Services vote to improve infrastructure and implement standard precautions ● Leverage the water and sanitation vote.
	● Lack of knowledge and uptake by farmers and food producers.	● Sensitize farmers on the animal welfare and economic benefits of such practices.
	● Lack of resources to implement such measures country-wide.	● Institute a participatory approach to guideline development and implementation. ● Include biosecurity in the MOAFS Strategic Plans and Annual Performance Plans. ● Enforce legislation/regulations related to control of animal diseases.
	● Lack of national biosecurity policy/guidelines for producers	● Include biosecurity in the MOAFS Strategic Plans and Annual
4.0 Optimize the use of antimicrobial medicines in human and animal health	● Competing priorities	● Adapt international good practice to the Botswana context.
		● Develop technical capacity via training plans funded through the human resources budget.
	● Priority supply chain not approved.	● Include AMR commodities in cognate priority supply chains such as those for tuberculosis and HIV.
	● Inadequate human and operational resources.	● Develop technical capacity training plans funded through the human resources budget.

		● Leverage existing infectious disease, medical microbiology, pharmacy & IPC human and operational resources to initiate ABS programs.
	● Inadequate representative surveillance data	● Institute sentinel surveillance programs.
		● Collate and analyze existing data from passive and research-based surveillance.
	● Lack of coordination and communication.	● Formally launch guidelines in healthcare facilities.
	● Unavailability of in-country experts and data to develop and STG implement guidelines.	● Adapt international guidelines to the Liberia context.
		● Institute surveillance programs to ensure evidence-based STGs.
		● Formally launch guidelines in the food production industry and amongst famers
	● Refusal of farmers and food producers to keep or share records of medicines utilization	● Introduce a mandatory document quality management system.
	● Protracted process for the introduction review and amendment of regulations and policies on AMR ● Lack of an enforcement workforce. ● Weak inspectorate services. ● Inadequate technical capacity. ● Insufficient legal counsel.	● Enhance technical legal capacity ● Improve the inspectorate services
	● Lack of political will	● Liberia is signatory to the UN Political Declaration and WHA 68.7 on the GAP on AMR.
	● Austerity measures preclude an additional budget vote.	● Undertake domestic resource mobilization.
		● Source external funds from development partners.

5.0 Ensure sustainable investment through research and development	● Lack of engagement and commitment by one or more Ministries/ stakeholders.	● Identify influential professionals and academics to advance this initiative.
	● Absence of a collaboration culture.	● Initiate research-related Memoranda of Understanding
	● Lack of interest in postgraduate qualifications and research	● Credentialing with higher degrees should be linked to workplace rewards such as increased remuneration and promotion.

Resource Mapping and Mobilization

To date, several key stakeholders are providing support to AMR-related activities in the country (table 14).

Table 14: Partner mapping

No	Partners	Areas of interventions (technical, financial)	Key focus	Status (e.g. ongoing, not status)
1.	U.S. Pharmacopeial Convention	Technical	Support for the Liberia Medicines Health Regulatory Authority (LMHRA). Technical assistance in assessment of quality assurance and quality control in Liberia; strategic planning; guidelines and SOP for regulation of pharmaceutical products in Liberia; training of quality control lab personnel. Promoting the Quality of Medicine (PQM)	Ongoing (thru Sept 2019)
2.	G2G - Bilateral Program with MOH	Technical, Financial	Integrated Management of Childhood Illnesses (IMCI) and Integrated Community Case Management (ICCM); Infection Protection & Control (IPC); Expanded Package of Health Services (EPHS);	Ongoing (thru Sept. 2021)
3.	Maternal and Child Survival Project (MCSP)/Johns Hopkins Program for International Education in	Technical: Restoration of Health Services (RHS) Expanding Malaria Services (EMS)	IMCI, IPC IMCI	Ongoing thru Sept 2019 Ongoing thru Sept 2019

	Gynecology and Obstetrics (JHPIEGO)	Human Resources for Health (HRH)	Pre-service training of midwives and laboratory technicians	Ongoing thru Sept 2018
4.	USAID: FAO/ECTAD	Technical	Animal health surveillance, diagnostics, strategic planning, curriculum development, capacity building/workforce development: MOA/CVL	Ongoing
5.	USAID: Predict2 (Eco-Health Alliance)	Technical	Bio-surveillance of wild viruses, some capacity building thru local NGO	Ongoing
6.	USAID:P&R (DAI: Development Alternative International	Technical - facilitation; strategy development	One Health	Closing Nov. 2018
7.	USAID: Infectious Disease Detection & Surveillance (IDDS)	Technical	Infectious diseases detection & surveillance, and related laboratory strengthening activities including: multisectoral strategic planning and integration of public health and animal health laboratory and epidemiological information; capacity building of One Health laboratory workforce; zoonotic surveillance; Strengthen biosafety, improve quality assurance, sample and data collection and analysis to prevent AMR; support regional networking laboratory activities and training.	New - TBD
8.	GIZ	Technical - facilitation; strategy	Establishment of AMR sentinel system in south east based on regional reference lab at Harper (JJ Dossen). Antimicrobial stewardship projects at County Hospitals in south east (GK, ML, RG). Support to central level in policy development.	Ongoing

		development, financial		
9.	USAID: Procurement and Supply Management (PSM)/Chemonics	Technical	Supply Chain, strategic technical assistance; support to the Central Medicine Store (CMS).	Ongoing
10.	USAID: Project Last Mile (PLM)	Technical	Supply Chain, strategic planning/organizational support to the CMS	Ongoing
11.	NPHIL: REDISSE, World Bank	Technical and Financial	Research (Detection of AMR in Diarrhoea)	Ongoing
12	GOL/NPHIL	Technical, strategy development	Research (Detection of AMR in Paediatric Diarrhoea)	Ongoing
13.	WHO	Technical and Financial	AMR, IPC/WASH, Epi-surveillance, Laboratories	Ongoing
14.	CDC /ACCEL	Technical and Financial	AMR, IPC/WASH – strengthening AMR detection capacity (e.g. culture and sensitivity testing) at Redemption and JFD.	Ongoing

As noted from the above, there are limited resources which have as yet not been committed. Cognizance of this, the NAP on AMR is the responsibility of the government and will be funded through the following mechanisms which will be led by the AMR pillar to:

- Work in collaboration with the Ministry of Finance and Development Planning (MFDP) to ensure the provision of funding for the implementation of the NAP on AMR.
- Lobby for a dedicated budget for the implementation of the NAP on AMR.
- Leverage existing, cognate budgets within and across Ministries by consultation and collaboration, e.g. budgets allocated for vaccination, IPC, medicines procurement etc.
- Prioritize the NAP on AMR in line Ministries budgets annually.

- Undertake domestic resource mobilization. For example, the County governments will provide budgets for the implementation of the NAP within their jurisdictions.
- Source external funds/grants/loans from development partners, including the UN agencies, EU, Fleming Fund, USAID, CDC, private pharmaceutical companies on the basis of a comprehensive business plan.

Monitoring and Evaluation Plan

The goal of the AMR NAP M&E plan is to establish a system that is robust, comprehensive, fully integrated and well-coordinated to guide monitoring of the implementation of the AMR NAP and evaluate impact. The objective of the AMR NAP M&E plan is to provide a framework for tracking progress and demonstrating results of the AMR NAP over the short and medium term. The Monitoring and evaluation (M&E) plan includes the sub-activities, performance indicators, targets, baselines, data source, frequency of collection and responsible entity (table 15). Monitoring should take place bi-annually and be led by the AMR unit. Evaluation of the implementation of the NAP AMR should take place at half way through the timeframe (last quarter of 2020) and at the end of Year 5 (mid- 2022).

Table 15: Monitoring and Evaluation plan

Liberia AMR NAP: Monitoring & Evaluation Plan						
Sub-activity	**Performance Indicator**	**Target**	**Baseline**	**Data collection source**	**Frequency of data collection**	**Responsible entity**
Objective 1: Improve awareness and understanding of AMR through education and training						
1.1 Conduct and disseminate AMR integrated knowledge, attitude and practice (KAP) behavioural survey to guide training and education						
1.1.1 Establish a risk communication and education taskforce	Task force formed with list of members and TOR	1	No	AMR TWG	Once	AMR TWG and partners
1.1.2 Organize a working committee to develop KAP survey questionnaire	Questionnaire for KAP developed	1	No	AMR TWG	Once	AMR TWG and partners

1.1.3	Recruit collectors for KAP survey	List of data collectors recruited	1	No	AMR TWG	Once	AMR TWG and partners
1.1.4	Conduct one day orientation workshop for data collectors in Monrovia	Training report with # of participants	1	No	AMR TWG	Once	AMR TWG and partners
1.1.5	Pre-test KAP survey tool in Monrovia	KAP pre-test report	1	No	AMR TWG	Once	AMR TWG and partners
1.1.6	Roll out KAP survey in 4 regions in Liberia	KAP survey roll out report	4	No	Rollout report	Once	AMR TWG and partners
1.1.7	Hire a local consultant to analyze KAP pre-test survey data and roll out data	Local consultant hired and analyzed KAP pre-test survey data	1	No	AMR TWG	Once	AMR TWG and partners
1.1.8	Print and disseminate copies of validated KAP survey reports to relevant sectors and key stakeholders	# KAP survey reports printed and disseminated	100	No	Health Promotion Unit	Once	Health Promotion (MoH), NPHIL and partners
1.1.9	Develop and distribute IEC materials on BCC materials such as billboards, posters, flyers, banners on optimal antimicrobial use and AMR, targeting diverse stakeholders in human, animal, plant and environmental health.	# of billboards produced and distributed	15 in each county (225)	No	Health Promotion unit	Once	Health Promotion (MoH), NPHIL and partners
		# of fliers produced and distributed	3000 per county	No	Health Promotion unit	Annually	
		# of posters produced and distributed	3000 per county	No	Health Promotion unit	Annually	

1.2 Develop and disseminate a comprehensive communication strategy for AMR for various stakeholders						
1.2.1 Develop a communication strategy for AMR NAP informed by the results of the KAP survey	Communication strategy	Validated communication strategy	No	Health Promotion unit	Once	AMR TWG and partners
1.2.2 Disseminate strategy among stakeholders	# of stakeholders aware of AMR communication strategy	100	No	key stakeholders interview	Once	AMR TWG and partners
1.2.3 Produce materials and messages on AMR in various languages for 15 community radio stations across the country	# of AMR communication messages available in different dialects	15	No	Health promotion unit/radio stations	Once	Health Promotion (MoH), NPHIL AMR TWG and partners
	# of AMR communication messages available in Simple English	2	No	Health promotion unit/radio stations	Annually	
1.3 Conduct regular public awareness campaigns on AMR						
1.3.1 Conduct stakeholders' engagement meeting with county authorities, line ministries, civil societies organizations, religious groups and partners on AMR at county level	# engagement meeting reports with participants listing	15	No	Health Promotion Unit	Once	AMR TWG and partners

1.3.2	Conduct stakeholders engagement meeting with district authorities (commissioners, educational officers, traditional Leaders, paramount and clan chiefs, women and youth groups, religious leaders, CHVs Supervisors, Securities and partners on AMR at the district level)	# District engagement meeting reports	91	No	Health Promotion Unit	Once	AMR TWG and partners
1.3.3	Conduct monthly awareness through the CHAs at household levels to promote hand hygiene and IPC to control AMR	# CHA reports with AMR activities included	?	No	CHA/CHSS	Monthly	Community Health (MoH)
1.3.4	Organize activities to raise awareness during World Antibiotic Awareness Week	# AMR awareness week observed with report	5	Yes	Key informants Interview (KII)	Annually	Health Promotion Unit (MoH), NPHIL AMR TWG and partners

1.4 Enhance AMR capacity in pre-service institutions (human, animal, environmental, food production and food safety workforce)							
1.4.1	Conduct a workshop to update health education messages on AMR for school curriculums	# of updated school curricular with AMR contents	100	Yes	School curriculums	Once	Health Promotion Unit, NPHIL AMR TWG and partners
1.4.2	Conduct a workshop for regulatory bodies to amend their Acts to include AMR and IPC	Workshop report with # of regulatory bodies amended acts to include AMR	?	Yes	Regulatory bodies institutions	Once	AMR TWG and partners
1.4.3	Organize meeting with professional boards to incorporate AMR into their pre-service curriculum	# of updated professional boards pre-service curriculum with AMR issues	15	Yes	Professional boards curriculums	Once	AMR TWG and partners
1.4.4	Train professional educators at different levels on AMR issues	# health professional teacher/educators/lectures trained on AMR	50	Yes	Universities, health and vet professional councils	Once	MOE/ Universities, MoH, MOA, NPHIL and partners
1.4.5	Enhance pre-service laboratory institutions microbiology training to include AMR detection	Updated pre-service laboratory curriculum to include AMR detection	1	Yes	Pre-service laboratory curriculum	Once	MOE/ Universities, laboratory Boards/Nursing Boards, Pharmacy Board, LMRHA, LMDC and partners

1.5 Enhance AMR capacity in in-service institutions (human, animal, environmental, food production and food safety workforce)						
1.5.1 Develop in-service AMR orientation package	AMR orientation package	1	No	WHO AMR training package	Once	MOE/ Universities, regulatory bodies and partners
1.5.2 Print and disseminate in-service AMR orientation package to MOH, MOA, other sectors	# AMR orientation package printed and disseminated	50	No	MOH/MOA/other sectors	Once	The Health Promotion Unit, NPHIL and partners
1.5.3 Incorporate AMR into in-service training for midlevel health workers	Updated mid-level health worker training curriculum	1	No	Midlevel training curriculum,	Once	MOE/ Universities, regulatory bodies and partners
1.5.4 Adopt and adapt relevant food safety standards	Updated standards	1	Yes	Liberia CODEX committee standards	Once	AMR TWG and partners
1.5.5 Print and distribute food safety standards for AMR key stakeholders in the 15 counties	# printed and disseminated food safety standards	100	Yes	Liberia CODEX committee standards	Within 4 years	The Health Promotion Unit, NPHIL and partners
1.5.6 Update CHAs training curriculum to include hand hygiene and AMR	Updated CHA training curriculum to include AMR issues	1	Yes	CHA training curriculum	Within 2 years	Community Health Division and partners
1.5.7 Participate in Liberia's nutrition policy revision to include AMR	Updated nutrition policy to include AMR issues	1	Yes	Nutrition unit	Once	MoH and partners

Objective 2: Strengthen knowledge and evidence base through surveillance						
2.1 Strengthen lab AMR capacity						
2.1.1	Training of lab staff at 8 sentinel sites	# lab staff trained	30	No	NRL, LIBR, NSL, Vet. Lab	Biannually	AMR TWG, and partners
2.1.2	Conduct facility-based mentorship for laboratory staff at sites	# sites mentored	30	No	NRL, LIBR, NSL, Vet. Lab	Annually	AMR TWG, and partners
2.1.3	Procure essential equipment and supplies for antibiotic residual testing for AMR surveillance	List of equipment and supplies procured	?	no	NRL, LIBR, NSL, Vet. Lab	Once	NPHIL, MOA, MOH, Ministry of Commerce and Industry (MOCI)
2.1.4	Train lab tech to conduct AMR HCA surveillance	#/% of trained lab tech in microbiology with emphasis in AMR	5	Yes	Training credentials (e.g. certificate)	Twice	Universities, MoH, MOA, NPHIL, EPA, AMR TWG, and partners
2.1.5	Develop a manual of SOPs for AMR surveillance	Manual of procedures (MOP)	Published MOP	Yes	NRL, LIBR, NSL, Vet. Lab	Once	AMR TWG, partners
2.1.6	Conduct in-county and external quality Assurance of reference lab	# quality assurance undertaken	Accredited labs	Yes	NRL, LIBR, NSL, Vet. Lab	Biannually for in county, annually for external	National Lab. TGW and partners

2.1.7	Training of Laboratory staff on QMS	# staff trained in QMS	Accredited labs	Yes	NRL, LIBR, NSL, Vet. Lab	Biannually for in county, annually for external	National Lab. TGW and partners
2.1.8	Install Laboratory information management system (LMIS)	LMIS installation	LMIS installed	Yes	NRL, LIBR, NSL, Vet. Lab	Once	National Lab. TGW and partners
2.1.9	Procure VITEK 2 microbiological analyzer (30 Clinical Parameters) for NRL	List of VITEK 2 equipment procured	2	No	NRL, LIBR, NSL, Vet. Lab	Once	National Lab. TGW and partners
2.2	**Establish a surveillance system on AMR in human health**						
2.2.1	Establish a national AMR surveillance and laboratory taskforce	AMR surveillance and laboratory taskforce formed with list of members and TOR	1	No	AMR TWG	Once	AMR TWG and partners
2.2.2	Identify and establish sentinel sites for healthcare- associated infections (HAI) surveillance system including surgical site infections (SSI)	# of functional HCA sentinel sites	8	No	Reports, site visits	Annually	AMR TWG and partners
2.2.3	Identify priority organisms, samples and testing panels using Global Antimicrobial	List of priority organisms, samples and testing panels identified	1	No	NRL & LIBR and hospitals conducting antimicrobial	Once	Lab. TWG

	Resistance Surveillance System (GLASS) approach				susceptibility testing (AST)		
2.2.4	Train clinicians, veterinarians and environmental technicians on appropriate sample collection, packaging and submission	Training report with # of clinicians, veterinarians and environmental technicians trained	?	No	Training certificate	Once	MOA, MOH, NPHIL ARM TWG & partners
2.2.5	Document the AMR HAI profile to inform policy development/review	AMR HCA profile report	5	No	AMR TWG	Annually	MOH, NPHIL ARM TWG and partners
2.2.6	Establish AMR active surveillance system	AMR active surveillance system established	1	No	NRL and LIBR	Once	AMR TWG and partners
2.3 Establish a surveillance system for AMR in animal health							
2.3.1 Conduct a country situational analysis of drug use in animal health (animal owners/traders) and make recommendations with respect to establishing animal health surveillance system		Drug use in animal health CSA report	1	No	Animal owners/ traders	Once	MOA, NPHIL, AMR TWG
2.3.2 Strengthen veterinarian lab capacity to confirm AMR in animal health through procurement of reagents and laboratory		List of reagents and lab. consumables, including culture media procured	?	?	NRL/LIBR	Once	MOA, AMR TWG and partners

consumable, including: Culture Media (antibiotic disk)						
2.3.3 Conduct one day workshop of 75 participants to develop and validate AMR laboratory detection and reporting plan	Workshop report with # of participants	AMR lab detection and reporting plan validated	No	LIBR	Once	AMR TWG and partners
2.3.4 Conduct 5-day sessions to train 261 health workers, livestock officers, laboratory aides on AMR samples collection and Laboratory Technicians on the use of specialized diagnostics techniques and laboratory equipment	# trained on sample collection, diagnostic techniques, lab equipment	261	No	Training certificates	once	MOA, AMR TWG and partners
2.3.5 Collect and transport food samples to the laboratory for analysis to monitor antibiotics residue in meat products at the slaughter houses in country; meet inspectors at slaughterhouses on a monthly basis	# food samples analyzed	?	No	NRL and LIBR, National Standard Lab (NSL)	Monthly	MOA, NSL
2.3.6 Monitor antibiotic residues in animal feed, pesticide residue in honey, in aquaculture and food	# animal feed, pesticide samples analyzed	?	No	NSL, Agriculture Vet. Lab	Monthly	MOA, AMR TWG and partners

products etc; Laboratory analysis on samples collected monthly						
2.4 Establish an integrated AMR surveillance system						
2.4.1 Establish an AMR central coordinating unit (NPHIL/MOH)	AMR unit established	1	No	MOH/NPHIL	Once	AMR TWG and partners
2.4.2 Develop an integrated AMR surveillance plan	Approved Integrated AMR surveillance plan	1	No	AMR unit	Once	AMR TWG and partners
2.4.3 Print and distribute the AMR surveillance plan	# copies printed and disseminated	100	No	AMR unit	Once	AMR TWG
2.4.4 Establish a centralized data management system for regular sharing of AMR data between MOH, NPHIL, MOA and EPA (local consultancy)	Centralized AMR data system established	1	No	NRL and LIBR,	Once	AMR TWG/NRL, LIBR
2.4.5 Train personnel on data management and reporting	# of personnel trained	?	No	NRL, LIBR	Once	AMR TWG/NRL, LIBR
2.4.6 Harmonize laboratory methodologies and data reporting for characterization of AMR organisms with relevant drug combinations in hospitals	# of laboratories with harmonized reporting methodologies	11	6	NRL and LIBR, Vet. Lab, NSL	Once	AMR TWG/NRL, LIBR
2.4.7 Harmonize surveillance for antimicrobial resistance with antimicrobial utilization on farms	Harmonized surveillance for AMR on farms	?		NRL and LIBR, Vet. Lab, NSL	Once	MOA, AMR TWG and partners

2.5 Establish an early warning system to determine risk factors and drivers of AMR and impact on public, animal health and the economy						
2.5.1 Adopt international standards for AMR early warning	Copy of the standard	Adopted standards	No	NRL, LIBR, NSL, Vet. Lab	Once	National Lab. TWG and partners
2.5.2 Sensitize lab techs, clinicians and vets on identification and evaluation of risks	# staff sensitized	?	No	NRL, LIBR, NSL, Vet. Lab, EPA Lab	Once	National Lab. TWG and partners
2.5.3 Compile and provide information on identified risks	# risks identified routinely	Risks events identified	No	NRL, LIBR, NSL, Vet. Lab, EPA, AST Lab.	Annually	National Lab. TWG and partners
Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention control measures.						
3.1 Orient healthcare workers (HCWs) on the National IPC Guidelines						
3.1.1 Ensure AMR is embedded within the IPC TWG at QMU	QMU activities report with AMR components	52	No	AMR TWG/ MoH QMU	Weekly	IPC TWG, QMU and partners
3.1.2 Establish a AMR IPC and WASH Taskforce	AMR IPC and IPC WASH TWG formed with list of members and TORs	1	No	AMR TWG	Once	AMR TWG
3.1.3 Printing and distribution of National IPC guidelines	# copies of national IPC guidelines printed and distributed	1000	No	MoH QMU	Once	QMU (MoH) and partners
3.1.4 Conduct a 4 - day orientation workshop for facility and county IPC focal persons on National IPC Guidelines	Training report with #/% of facility and county IPC focal persons oriented on the National IPC guidelines	65	No	MoH - QMU	Once	QMU (MoH) and partners

3.1.5	Orientate all healthcare workers at each facility on the National IPC guidelines	Training report /% facility IPC focal persons oriented on IPC guidelines	14,913 (SQS raining report)	No	MoH - QMU	Once	QMU (MoH) and partners
3.1.6	Monitor implementation of the National IPC guidelines at health facilities	#/% facilities implemented National IPC guidelines	800	Yes	MoH - QMU	Annually	QMU (MoH) and partners
3.1.7	Integrate IPC contents in curriculum for all health training institutions	# of revised curricula in health training institutions that reflect IPC	Updated curriculum	Yes	Health training institutions	Once	AMR TWG, Universities, MOH, MOA, MOE, partners
3.2 Strengthen community prevention							
3.2	CHAs organize community handwashing awareness meeting with key stakeholders	#/% of CHAs reporting on hand hygiene community awareness activities	?	Yes	CHAs monthly report/MoH	Bi-annually	Community Division (MoH) and partners
3.3	Celebrate global handwashing day in schools by holding special program	#/% of schools celebrating global handwashing day	?	No	School reports/MoH, MoE	annually	MOE, QMU/MoH and partners
3.4	Commemorate global handwashing day using radio including social media	# radio/social media	?	No	Local radio, social media/MoH	Annually	QMU/MoH and partners
3.5	Meet with business/marketing associations to highlight	# of meetings held with business/marketing	List of participants	No	Meeting report, MoH	Once	Community Division (MoH) and partners

	importance of handwashing and waste management in their respective settings	associations and number of participants					
3.6	Undertake inspection of foods and food products for public consumption	# of facilities with foods and food products inspected	?	Yes	Inspection reports, MOCI, NPHIL	Annually	MOCI, NPHIL, MoH and partners
3.7	Update/develop community waste management protocol to include AMR	Community waste management protocol updated/developed	Community waste management protocol updated	Yes	Community waste management protocol, NPHIL	Once	NPHIL, MoH, LWSC, EPA and partners
3.8	Train waste technicians (solid and liquid waste) and environmental engineers in community waste management protocol	#/% of waste technicians and engineers trained	?	Yes	Training certificates, NPHIL, MoH, LWSC	Once	DEOH, MoH, LWSC and partners
3.9	Meet with superintendent, CHO, county livestock officers, and development superintendent to advocate to build standardized community toilets and public waste bins to control organic and human waste	Meeting report	15	No	Meeting report, AMR TWG	Once	NPHIL, MoH, MOA, EPA, LWSC and partners

3.10 Develop and validate Water Safety Plans (municipal water system) for 15 counties	# of WSP completed	15	No	DEOH NPHIL	Once	NPHIL, LWSC and partners
3.11 Print and disseminated WSP (municipals water system) for 15 counties	# of WSP printed and distributed	50	No	DEOH NPHIL	Once	NPHIL, LWSC and partners
3.12 Develop and validate community levels WSP	Community WSP developed and validated	1, 000	No	DEOH NPHIL	Once	NPHIL, LWSC and partners
3.13 Disseminate and monitor adherence of communities to WSPs	#/% of communities and counties implementing WSPs	1, 000	No	DEOH NPHIL	Quarterly	NPHIL, LWSC and partners
3.14 Provide support to LWSC and Public Works to increase access to safe drinking	Reports	15	Yes	DEOH NPHIL	Annually	NPHIL, LWSC and partners
3.15 Conduct periodic water safety monitoring at household level	# of houses	20?	No	DEOH NPHIL	Monthly	NPHIL, LWSC and partners
3.3 Strengthen IPC in health care facilities						
3.3.1 Establish alcohol based hand rub (ABHR) production plants at selected facilities	#/% facilities producing ABHR	5	No	MoH	Once	QMU/MoH and partners
3.3.2 Advocate to key stakeholders and donors to establish plant for producing gaseous chlorine	# of plants gaseous chlorine plant	1	No	MoH	Annually	QMU/MoH and partners

	to enhance drinking water treatment						
3.3.3	Print and disseminate hand hygiene posters at health facilities	# of posters printed and disseminated	1,500	No	Health facilities	Annually	QMU/MoH and partners
3.3.4	Print and disseminate hand hygiene posters at health facilities, schools and food centers	# of posters printed and disseminated	1,500	No	Health facilities	Annually	QMU/MoH and partners
3.3.5	Commemorate global hand hygiene day using radio and social media (May 5)	# radio programs with hand hygiene talks	5	Yes	Health promotion unit	Annually	QMU and Health Promotion Unit/MoH and partners
3.3.6	Perform Hand hygiene audits at hospitals (public and private)	# of audits performed	840	Yes	QMU	Quarterly	National QMU, County Quality Management, Team and partners
3.3.7	Finalize and validate safe management of health care waste guidelines	Finalized guidelines	Validated guidelines	Yes	DEOH	Once	NPHIL, LWSC and partners
3.3.8	Print and distribute safe management of health care waste guidelines	# printed and distributed guidelines	1,000	No	DEOH	Once	NPHIL, LWSC and partners
3.3.9	Orient Healthcare workers on safe management of	# HCWS oriented	800	No	DEOH	Once	NPHIL, LWSC and partners

	health care waste guidelines						
3.3.10	Ensure screening, isolation and referral pathway for epidemic prone diseases are in place at health facilities	# facilities with screening, isolation amenities		Yes	MOH	Annually	MOH, NPHIL
3.4 Strengthen animal health and agricultural practices							
3.4.1	Update/develop farm biosecurity guidelines for different categories of animal farms, slaughter facilities, abattoirs and agriculture facilities	# biosecurity guidelines developed	0	No	MOA	Once	NPHIL, MoH, MOA, EPA and partners
3.4.2	Develop and validate safe waste management guidelines (including sanitation and hygiene) for animal facilities and farms	# of animal health safe management guidelines developed, validation report	1	No	MOA, NPHIL	Once	MOA, EPA , NPHIL, MoH, and partners
3.4.3	Printing and distribution of safe management guidelines for animal facilities and farms	# guidelines printed and distributed	1,000	No	MOA	Once	MOA, EPA , NPHIL, MoH, and partners

3.4.4	Orientate facilities and farms workers in waste management guidelines	Report with list of participants	?	No	MOA	Once	MOA, EPA , NPHIL, MoH, and partners
3.4.5	Monitor implementation of safe waste management guidelines for animal facilities and farms	# of supervision conducted with report	?	No	MOA	Quarterly	MOA, EPA , NPHIL, MoH, and partners
3.4.6	Adopt/implement standards published in OIE and Codex Alimentarius code of practice to minimize AMR	# Code of practice	1,000	?	MOA	Annually	MOA, EPA , NPHIL, MoH, and partners
3.4.7	Train farmers in standard animal husbandry practices to reduce need to use antimicrobial agents	# farmers trained	?		MOA	Once	MOA and AMR TWG
3.4.8	Undertake regular checks on sanitation and hygiene on animal facilities and farms	# facilities and farms checked for proper hygiene and sanitation	?		MOA		MOA and AMR TWG
3.4.9	Undertake regular checks on animal feeds for contamination	# feed samples checked			MOA		MOA and AMR TWG
3.4.10	Develop/update standards for farm infrastructure that promotes infection	Guidelines developed/updated	1		MOA	Once	MOA, AMR TWG and partners

	prevention in animal handling facilities and farms						
3.4.11	Develop guidelines for infection prevention materials for animal facilities and farms	Guidelines developed/updated			MOA		MOA AMR TWG and partners
3.4.12	Develop recommendations for use of vaccines as a method of preventing infections in animals and reducing antimicrobial use	Vaccine recommendations developed					AMR TWG, MoH/EPI and partners
Objective 4: Optimize the use of antimicrobial agents medicines in human and animal health.							
4.1 Develop and enforce legislation on prescriptions for combating AMR							
4.1.1	Establish a AMR Antimicrobial Medicines Taskforce in One Health context	TWG formed with list of members and TOR	1	No	AMR TWG	Once	AMR TWG
4.1.2	Conduct a 2-day workshop to develop a legislation on the use of antimicrobial	Updated Public Health Law with combating AMR section	1	Yes	Law Library	Once	Pharmacy Board, AMR TWG and partners

	agents in human, animals, plants and the environment						
4.1.3	Validate a legislation on the use of antimicrobial agents in human, animals, plants and the environment	Validated Public Health Law with combating AMR section	1	Yes	Law Library	Once	Pharmacy Board, AMR TWG and partners
4.1.4	Print and disseminate updated Public Health (PH) Law with AMR components	#/% printed and disseminated PH Law to key stakeholders and implementers	100 copies	Yes	key stakeholders and implementers interview	Once	Pharmacy Board
4.2 Reflect AMR in key documents (National Medicine Policy, Standard Treatment Guidelines, Essential Medicine List 2016)							
4.2.1	Update National Medicine Policy to include AMR	National Medicine Policy updated	1	Yes	LMHRA	Once	Pharmacy Board/MoH, AMR TWG and partners
4.2.2	Print and distribution of revised National Medicine Policy	# of copies printed and distributed	2, 000	Yes	LMHRA	Once	Pharmacy Board/MoH, AMR TWG and partners
4.2.3	Update the National Drug Formulary to include AMR	National Drug Formulary updated	1	Yes	LMHRA	Once	Pharmacy Board/MoH, AMR TWG and partners
4.2.4	Printing and distribution of revised National Drug Formulary	# of copies printed and distributed	2,000	Yes	LMHRA	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners

4.2.5	Update the Standard Treatment Guidelines to include AMR	STG updated	1	Yes	LMHRA	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.2.6	Printing and distribution of updated STG	# of copies printed and distributed	2,000	Yes	LMHRA	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.2.7	Conduct TOT for professionals to promote responsible prescribing practices, dispensing and administrative principles for antimicrobials	# of professionals trained	20	Yes	MOH/LMRA	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.3 Establish AMR stewardship program for facilities							
4.3.1	Develop antimicrobial stewardship working manual and procedures in the context of One Health	MOP developed	1	No	MOH and partners	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.3.2	Print and distribute antimicrobial stewardship working manual	# of copies printed and distributed	1,000	No	AMR TWG	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.3.3	Train HCWs on antimicrobial stewardship	# of HCWs trained	100	No	MOH/AMR TWG	Twice	Pharmacy Board/MoH,

						LMRHA, AMR TWG and partners
4.3.4	Establish AMR stewardship programs in selected facilities	# of AMR stewardship programs	3	No	Selected facilities	Once	Pharmacy Board/MoH, LMRHA, Universities, AMR TWG and partners
4.3.5	Review and provide feedback to facility AMR stewardship programs	# of feedback provided	3	No	AMR TWG	Quarterly	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.3.6	Scale up stewardship programs	# of AMR stewardship programs	15	Yes	AMR TWG/ facilities	Annually	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.4 Establish an antimicrobial prescription monitoring system							
4.4.1	Develop AMR prescription reporting system and mechanism for human health (One Health) context	AMR prescription reporting form and mechanism developed	1	No	MOH	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.4.2	Validate prescription reporting form	Prescription form validated	1	No	LMHRA/MOH	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.4.3	Print and distribute reporting form	# forms printed and distributed	2,000	No	LMHRA/MOH	Annually	Pharmacy Board/MoH,

						LMRHA, AMR TWG and partners
4.4.4	Monitor and evaluate implementation of AMR prescription reporting system (supportive supervision)	# forms reviewed and feedback given to prescriber	?	No	LMHRAMOH	Bi-annually	Pharmacy Board/MoH, LMRHA, AMR TWG and partners
4.5	**Establish a monitoring system for non-prescribed antimicrobials**						
4.5.1	Develop monitoring system for non-prescribed antimicrobials in collaboration with line ministries and the security sector	Non-prescribed antimicrobials monitoring system established	1	No	LMHRA, MoH, MOA		Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities
4.5.2	Re-establish and reinforce the implementation of penalties for illegal selling of antimicrobials	Implemented penalties for illegal selling of antimicrobials	?	No	LMHRA, MoH, MOA	Quarterly	Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities
4.5.3	Reinforce the post marketing surveillance at the LMHRA	Post-marking surveillance conducted	?	No	LMHRA, MoH, MOA	Quarterly	Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities

4.5.4	Collaborate with state security to reinforce the confiscation of illegal sale of antimicrobials and expired medicines	Confiscation of illegal sale of antimicrobials and expired medicines reinforced	?	No	LMHRA, MoH, MOA, Justice Ministry	Monthly	Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities and Justice Ministry
4.5.5	Reinforce the border security for illegal sale and importation of antimicrobial medicines	Report of borders on illegal sale and importation of antimicrobial medicines	49	No	Ministry of Justice (MoJ)		Pharmacy Board/ MoH, LMRHA, AMR TWG and regulatory authorities and MoJ
4.5.7	Collaborate with ECOWAS through WAHO to combat counterfeiting drugs	Counterfeit drugs identified	?		LMRHA, MoH		Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities MoJ
4.5.8	Develop and print SOP for identification and monitoring of non-prescribed antimicrobials	Copies of SOP			LMHRA, MoH		Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities and MoJ
4.5.9	Disseminate SOP for identification and monitoring of non-prescribed antimicrobials	Report			LMHRA	Once	Pharmacy Board/MoH, LMRHA, AMR TWG and regulatory authorities

4.6 Strengthen the LMHRA drug quality control lab						
4.6.1 Procure essential commodities for the LMHRA QC Lab	Commodities procured			LMHRA	Annually	LMRHA, Pharmacy Board/MoH, AMR TWG and regulatory authorities
4.6.2 Training and mentorship of LMHRA drug quality control lab technicians	# of lab technicians trained			LMHRA, MoH, MOA	Annually	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.6.3 Training in physico-chemical drug quality control	Lab technicians/staff trained			LMHRA, MoH, MOA	Annually	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.6.4 Quality control training in microbiology of drugs	Lab technicians trained			LMHRA, MoH, MOA	Annually	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.6.5 Training in quality control of medical devices	Lab technicians trained			LMHRA, MoH, MOA	Annually	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.6.6 Training in quality control of cosmetics	Lab technicians trained			LMHRA, MoH, MOA	Annually	LMRHA, Pharmacy Board, MoH, AMR

						TWG and regulatory bodies
4.7 Establish/strengthen animal drug regulatory body to address AMR						
4.9.1 Revise and update Animal Health Law to include AMR and update legislation for control and use of veterinary drugs (trade, use, importation, etc)	Updated Animal law		Yes	LMHRA, MoH, MOA	Once	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.9.2 Identify and activate animal health regulatory body group	Animal health regulatory body activated		No	LMHRA, MoH, MOA	Once	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.9.3 Monitor implementation of Animal Health Laws which includes AMR	Report		No	LMHRA, MoH, MOA	Quarterly	LMRHA, Pharmacy Board, MoH, AMR TWG and regulatory bodies
4.10 Strengthen EPA to address AMR						
4.10.1 Monitor implementation of Environmental law which includes AMR	Reports		No	LMHRA, MoH, EPA	Quarterly	LMRHA, Pharmacy Board, EPA, MoH, AMR TWG and regulatory bodies

4.8 Collaborate with WAHO and ECOWAS focal persons to combat counterfeit drugs						
4.9.1 Conduct periodic coordination meetings with WAHO and ECOWAS on combating counterfeit drugs (Supportive supervision)	Meetings reports				Quarterly	MOH, NPHIL
4.9.2 Implement defined activities from coordination meetings held to combat counterfeit drugs	# of activities implemented				Quarterly	
Objective 5: Ensure Sustainable Investment Through Research and Development						
5.1 Establish a multi-sectoral research agenda on AMR						
5.1.1. Establish an AMR Investment, R&D taskforce and develop TOR	AMR R &D taskforce with TOR developed	1	No	AMR TWG	1	AMR TWG, OHTC and partners
5.1.2. Human resource capacity building in AMR R&D	# of persons trained in AMR-related research from different sectors (human, animal, plant and environment)	?	No	AMR TWG	1	AMR TWG, OHTC and partners
5.1.3. Establish ethical and regulatory mechanisms for	AMR research ethics developed	1	No	AMR TWG	1	AMR TWG, OHTC and partners

	AMR research and development						
5.1.4.	Develop policy and strategy for national AMR R&D, including invitro/invivo diagnostics	Policy and strategy for national AMR research and development with invitro/invivo diagnostics components	1	No	AMR TWG, LMHRA	1	AMR TWG, OHTC, LMHRA and partners
5.1.5.	Engagement meetings with relevant stakeholders to identify current gaps in knowledge and potential research areas	Report	1	No	AMR TWG	1	AMR TWG, OHTC and partners
5.1.6.	Promote LMHRA standards for all research products to include therapeutics and vaccines	Report	60	No	AMR TWG	Monthly	AMR TWG, OHTC and partners
5.1.3	Hold one day workshop to validate policy and strategy for AMR research	Workshop report	1	No	AMR TWG	1	AMR TWG, OHTC and partners
5.1.4	Print and disseminate ARM research protocols	# of copies printed and distributed	1000	No	AMR TWG	1	AMR TWG, OHTC, Research & Ethic Committees, and partners
5.1.5	Engagement meeting with relevant stakeholders to identify current gaps in	Meeting minutes	1	No	AMR TWG	Twice	AMR TWG, OHTC, Research & Ethic

	knowledge (i.e. research capacity gaps analysis) and potential research areas						Committees, and partners
5.1.6	Identify and train early career researchers on grant writing with emphasis on AMR R&D	# of trainees	?	No	AMR TWG	Annually	AMR TWG, OHTC, Research & Ethic Committee, and partners
5.1.7	Establish a center of excellence for AMR research with focus on one health	List of centers for excellence in AMR research	15	No	AMR TWG	Annually	AMR TWG, OHTC and partners
5.1.8	Conduct AMR-related research project (e.g. detecting pesticide residues in honey) with One Health approach	# of AMR/one health related concept research and articles published on AMR	375	No	AMR TWG	Annually	AMR TWG, OHTC, Research & Ethic Committee, and partners
5.1.9	Establish a platform for sharing AMR research findings annually	# of platforms established/symposia held	5	No	AMR TWG/OHTC	Annually	AMR TWG/OHTC and partners
5.1.6	Identify PHD students to undertake research (no cost implication)	# of PhD candidates	5	No	AMR TWG/OHTC	Annually	AMR TWG/OHTC and partners
5.1.7	Purchase vehicle for the operationalization of AMR activities in Liberia	Vehicle purchased	1	No	AMR TWG/OHTC	Once	AMR TWG/OHTC and partners

5.1.8	Vehicle maintenance and lubricant for routine operation	Maintenance report	60	No	AMR TWG/ OHTC	Monthly	Drivers and or designee
5.2 Establish Public-Private Partnerships (PPP) for AMR R&D							
5.2.1	Conduct multi-sectoral coordination and AMR TWG consultative meetings and develop TOR	Consultative meetings held with report		Yes	MR TWG/ OHTC	Quarterly	AMR TWG/ OHTC and partners
5.2.2	Conduct monthly AMR TWG to meetings to discuss key issues (including AMR research)	Meetings held with report	60	No	MR TWG/ OHTC	Monthly	AMR TWG/ OHTC and partners
5.2.3	Hold joint annual AMR review meetings with PPP including private sector and NGOs to orient them on AMR activities including research	Meetings held with report	5	No	MR TWG/ OHTC	Annually	AMR TWG/ OHTC and partners
5.2.4	Establish and promote regional and international collaboration for AMR R&D	Regional and international collaborations developed	?	No	MR TWG/ OHTC	Annually	AMR TWG/ OHTC and partners
5.2 Establish funding mechanism for AMR Research & Development (R&D)							
5.3.1	Advocate and lobby for funding from government	# proposals funded by amount (report)	10	**No**	AMR TWG/ OHTC	Bi-annually	AMR TWG/ OHTC and partners

	and partners (including pharmaceutical companies) to support AMR-related research						
5.3.2	Post calls for funding opportunities onto institutional websites and mailing list of stakeholders	# of research funding posted	10	**No**	AMR TWG/ OHTC	Bi-annually	AMR TWG/ OHTC and partners
5.3.3	Develop AMR related research proposals/grants using one health approach	# of AMR-related research proposals developed and grants applied for	?	No	AMR TWG/OHTC	Bi-annually	AMR TWG, OHTC and partners
5.3.4	Identify and twin local laboratories with foreign laboratories to support research in AMR, and research exchange programs to transfer skills and mentorship	# of MOUs and twinning partnerships	**15**	**No**	AMR TWG/ OHTC	Annually	AMR TWG/ OHTC and partners

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Annex 1: NAP on AMR Technical Working Group and Contributors

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