



Ministry of Environment 

The National Climate Change Adaptation Plan of Jordan - 2022



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Forward by the Minister of Environment



I am happy to present to all our partners from public institutions, academic organization, private sector, civil society, local communities and media, in addition to all concerned citizens this key policy document which is the National Climate Change Adaptation Plan (NAP).

This NAP document has been developed throughout a long process of scientific research and national consultation meetings in addition to contributions from several national and international experts that were mobilized through a collective contribution from public, private, civil and academic institutions. This effort resulted in a comprehensive assessment of climate change impacts on developmental sectors in Jordan, and how to address such impacts through a multisectoral developmental plan that is based on key national developmental priorities.

Evidence and observations have proven in the last few years that the impacts of climate change on Jordan and the world are not only predictions about the future but they are a living reality. This reality can be observed through increased temperatures, more drought incidence, reduction of overall annual rainfall and increase of desertification process. Climate Change can also be documented through the increase of extreme weather events like flashfloods which are considered in Jordan to be of the most notorious in terms of risks to human lives and infrastructure.

Such clear evidence reiterates that addressing climate change is the key entry point for achieving sustainable development in Jordan as all economic and development sectors will be impacted by climate change. This approach requires that climate change adaptation measures and plans are integrated in all strategies, plans and projects at the national level. In case of absence of climate considerations, such plans will have shortcomings in its attempts to address economic challenges. It is a realistic misfortune that climate change can indeed degrade many sectoral plans and ambitions for economic growth and prosperity.

As we look forward to the partnership with national and local institutions to mobilize financial and human resources for implementation of the NAP, we realize that we face unprecedented challenges at the developmental level that requires unconventional responses. The Covid 19 pandemic has caused a shift in the allocation of financial developmental resources into health related dimensions and social safety nets at the expense of other developmental challenges including climate change.

Such financial and developmental challenges do not mean that climate change impacts will wait until the response to the Pandemic is over, in fact climate change will exacerbate the intensity of challenges resulting from the pandemic and will require us all to achieve a paradigm shift in the philosophy of development in Jordan for a transition to green growth and green recovery models of development that enhance responsiveness to climate change challenges. This transition

is globally supported, as most international donors and developed countries have announced in the last few years deep structural changes in their developmental approaches to commit to addressing climate change impacts. The UNFCCC COP26 in Glasgow in 2021 was a pivotal moment for reiterating international solidarity to address climate change with many initiatives resulting from COP26

The collective international response towards Covid 19 pandemic has proven that international cooperation based on national developmental priorities and commitment to the values of international community in protecting common rights is the most effective gateway to address global scale challenges like climate change which is considered as a short term and medium term risk that is no less in impact than Covid 19.

At the national level, the NAP provides a comprehensive roadmap for all relevant sectors to design programmes, projects and measures that enhance resilience against climate change. It has been taken into high consideration that NAP will align to key national developmental plans like Jordan Vision 2025, the National Green Growth Plan, the NDC action plan in addition to recent sectoral strategies. The NAP has been considered as the main input for the adaptation section of the updated NDCs for Jordan, that was submitted to UNFCCC prior to COP26.

The NAP document is published by the Ministry of Environment in its mandate as national focal point for climate change

planning, but the implementation responsibility has a wide scope that reaches all relevant ministries and national institutions. It is imperative to realize that any successful implementation of the NAP is not only the responsibility of the government, but also depends on the effective engagement and partnership of a wide range of stakeholders, including local institutions, civil society, private sector, research and academic institution and international development partners.

This document is the outcome of the combined efforts of a multitude of national experts supported by international experts within the context of a strategic cooperation framework with the Federal Government of Germany through BMZ, and in cooperation with GIZ, where focus was placed on aligning national priorities with international commitments. In this context, I would like to express my gratitude for the Government of Germany and for all other international partners supporting sustainable development in Jordan.

We are navigating forward in a world that is continuously changing in all its environmental, developmental and economic dimensions. We need to be capable of adapting to such changes, and this NAP document represents a key tool in such adaptation efforts.

Minister of Environment

Dr. Muawieh Khalid Radaideh
MINISTER OF ENVIROMENT

Acknowledgment:

The National Adaptation planning process in Jordan was implemented in a highly participatory manner. The process was strategically managed by the Ministry of Environment under the guidance of Their Excellencies Dr Saleh Al Kharabsheh; Mr Nabil Masarweh and Dr Muawieh Al Radaideh. The process was followed up and supported continuously by the Secretary Generals of the Ministry of Environment Eng Ahmad Al Qatarneh and Dr Mohammad Al Khashashneh. All the activities for the preparation of the NAP document were technically supported and steered by the Climate Change Directorate (CCD) at the Ministry of Environment. Special thanks are extended to Director Belal Sahqareen. Highly effective technical review, organization and support was provided by Eng. Sarah Al Haleeq, Head of Adaptation section at CCD. Special thanks are extended to all staff of the CCD at the Ministry of Environment.

The NAP document could not have been developed without the technical input and rich feedback provided by all members of the National Committee on Climate Change and all other stakeholders who were engaged the consultation process.

The technical development of the NAP document was coordinated by two consulting firms. At the global level, the key outline and content related to global NAP guidelines and the development of the NAP institutional setup, mandate, NAP roadmap, financing strategy, M & E and communication strategy was conducted by Acclimatise led by team leader Maribel Hernandez, and supported by

Timo Leiter, Will Bugler, Sinta Dewi, Virginie Fayolle and Serena Odianose.

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Executive Summary

This is the first Climate Change National Adaptation Plan (NAP) of Jordan. This plan complements the efforts of the Ministry of Environment to address climate change in the country's development policy framework. So far, various policy documents have been developed by the ministry including the Climate Change Policy document, Jordan's communication reports, sectoral climate action plans, National Green Growth Action Plans and the NDCs.

The NAP document was prepared based on the Climate Vulnerability Assessment of the Third National Communication Report, and adopts the values and principles of the NAP Framework. It provides a clear vision for adaptation and identifies measures to be addressed in various sectors to guide institutions from different sectors such as governmental, academic, CBOs, and private sectors entities to implement adaptation initiatives, develop partnership relations and synergies with each other, to reach the required adaptation goals.

Climate-related hazards affected Jordan, such as the extreme temperature droughts, flash floods, storms, and landslides. These hazards are increasing in frequency and intensity year by year due to climate change. Flooding has caused serious implications in the last years where lives have been lost, and several square kilometers of agricultural lands were destroyed in addition to the sever damages to infrastructure. Landslides and erosion problems have occurred as well, and they were concentrated on the steep slopes of mountains and wadis. The impact of climate

change affect various sectors including agricultural, coastal, biodiversity, urban, society, water, and health sectors. Therefore, adaptation planning with defined options and measures are required to mitigate its effects, and build resilient communities and ecosystems.

Jordan seeks to continuously build adaptive capacity to reduce the country's vulnerability through implementing comprehensive adaptation measures with consideration for gender aspects and the needs of the most vulnerable groups.

This NAP was developed to mainstream climate change adaptation in the development planning processes within all relevant sectors in Jordan. The process of preparing the NAP document went through a number of steps to ensure the effective participation of various institutions and experts and under the leadership of the Ministry of Environment as it is the competent and responsible authority for climate change in Jordan. The process was initiated by the National Committee on Climate Change, which is authorized to create a platform for policy and implementation coordination for climate actions in Jordan.

The document has addressed various sectors following the Third National Communication Report, and these are the sectors of agriculture, water, urban systems, biodiversity & ecosystems, coastal, health and socio-economic. Each sector was reviewed in terms of its vulnerabilities, and a list of adaptation measures were provided. The adaptation measures were organized through various

programmes at sectoral levels and specific programmes linking between adaptation and mitigation. The implementation of this NAP document will follow six strategic objectives which are: i) strengthen institutional framework, governance, policies, strategies and legislations, ii) support the coordination mechanism between public, private community-based organizations and other relevant stakeholders and ensure mainstreaming NAP in their strategies Jordan, iii) improve knowledge, awareness and communication tools for an effective NAP implementation process in Jordan, iv) build a dynamic and sustainable funding instrument for NAP implementation in Jordan, v) support research and capacity building programs in the climate adaptation field, and vi) develop a data management system for climate change adaptation.

Supporting sections were provided to the NAP document including a financing strategy, which will work to evaluate the financial needs for climate change adaptation and continue developing and leveraging existing financing options, including existing national sources of funding whilst fully exploiting emerging international financing opportunities from external sources (including bilateral and multilateral). In addition, the communication strategy of NAP was described with an ultimate aim to foster consensus on climate threats and the need for action to address them, and facilitate effective prioritization of NAP activities across government, in order to provide a favorable enabling environment and mobilize domestic and international resources (public and private) to support adaptation.

Gender and youth mainstreaming was

tackled in the document as well to ensure a gender sensitive document, and as youth represents future decision makers and key stakeholders whom will aid the implementation of adaptation measures, enhance resilient and decrease vulnerabilities toward climate change. Mainstreaming climate change adaptation into planning and budgeting within all vulnerable sectors and at all pertinent levels was a major part provided in the document. Jordan is also analyzing the possibility of mainstreaming climate change adaptation in the elaboration of Environmental and Social Impact Assessments of projects, to make sure that climate change is not affecting the economic and technical feasibility of the projects and that the project will not increase climate vulnerability of populations, ecosystems and economic activities.

Monitoring and Evaluation (M&E) of adaptation aims to track progress in implementing adaptation interventions, and/or measuring how these interventions are reducing vulnerability, improving adaptive capacity, and supporting the overall well-being of populations affected by the impacts of climate change. The main purpose of MRL system of the NAP process in Jordan is to assess and report on progress made on addressing climate change in line with national goals and objectives of the NAP process, in order to support learning, transparency and accountability. The Directorate of Climate Change in the Ministry of Environment will be in charge of the overall oversight of the MRL framework. It will organize participatory reviews of the progress on the implementation of the NAP process with key national, sectoral and local stakeholders.

List of Acronyms

Acronym	Meaning
AWG	Adaptation Working Group
BMU	German Federal Ministry for Environment, Nature Protection and Nuclear Safety
BMZ	German Federal Ministry for Economic Cooperation
CAF	Cancun Adaptation Framework
CCD	Climate Change Directorate
CoP	Conference of Parties
FAO	Food and Agriculture Organization
GCF	Green Climate Fund
ICARDA	International Centre for Agricultural Research in the Dry Area
IPCC	Intergovernmental Panel on Climate Change
JMD	Jordanian Meteorology Department
MCDA	Multi-Criteria Decision Analysis
MoEnv	Ministry of Environment
MWI	Ministry of Water and Irrigation
NAP	National Adaptation Plan
NBA	Nature Based Adaptation
NARC	National Agricultural Research Center
NCCC	National Committee on Climate Change
NCSCM	National Center for Security and Crises Management
NDA	National Designated Authority
NDC	Nationally Determined Contribution
NDCP	NDC Partnership
SDGs	Sustainable Development Goals
SNAP	Stocktaking for National Adaptation Planning
SNC	Second National Communication
TNC	Third National Communication
UNFCCC	United Nations Framework Convention on Climate Change
WUF	Water Use Efficiency

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Chapter One

The National Climate Change Adaptation Plan



Wadi Al Bottom- abazraq

1.1 Global Context of the Adaptation Plans

Adaptation is defined as the *adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts*. This term refers as well to *changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change*. The Paris Agreement on Climate Change in 2015 has identified the global goals on adaptation, which include enhancing the adaptive capacity, resilience and reducing the vulnerability in order to contribute to sustainable development. Therefore, parties to the Agreement shall engage in adaptation planning and implementation through developing their National Adaptation Plans (NAP), vulnerability assessments, monitoring and evaluation, and economic diversification. All Parties should, as appropriate, communicate their priorities, plans, actions, and support needs through adaptation communications, which shall be recorded in a public registry. The Agreement will improve the understanding of climate change and the transparency of actions by establishing a new transparency framework. In this context, Parties should provide information related to climate change impacts and adaptation.

The National Adaptation Plan is considered as a continuous, progressive and iterative process, which follows a country-driven, gender-sensitive, participatory and fully transparent approach. It was established to “enable Parties to formulate and implement NAPs as a means of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs”. Successful adaptation not only depends on governments but also on the active and sustained engagement of multi-stakeholders at national, regional, and

international levels where public, private, civil society and other relevant stakeholders are involved.

Although funding for adaptation plans and actions has been increasing in the past few years, the cost of required adaptation measures at national and transboundary levels to address deep impacts of climate change and resolve climate risks are getting more expensive. National Adaptation Plans are key policy tools to mobilize institutional and financial support to address the urgent needs for adaptation. The importance of NAPs is now more evident in the phase of recovery from Covid 19 pandemic as the fallout from the pandemic has significantly influenced the ability of countries to plan for, finance and implement adaptation actions. While countries struggle with the acute outcomes of Covid 19, long-term impacts of climate change are happening now.

1.2 Climate Change Profile in Jordan

Jordan is located in West Asia region, and characterized by dry to semi-dry climate conditions with an annual precipitation that falls under 50 millimeters in most areas. Jordan faces several challenges with the need to import of 98% of its energy; while severe aridity and water scarcity make it environmentally sensitive to climate change. Climate-related hazards are affecting Jordan, such as extreme temperatures, droughts, flash floods, storms, and landslides. These hazards are increasing in frequency and intensity due to climate change. Flooding has caused serious implications in the last years where lives have been lost, and several square kilometers of agricultural lands were destroyed in addition to sever damages to infrastructure. Landslides and erosion problems have occurred as well, and they were concentrated on the steep slopes of

mountains and wadis. Climate change affects various sectors including agricultural, coastal areas, biodiversity, urban systems, society, water, and health sectors, where adaptation options are required to mitigate its effects. The Ministry of Environment (MoEnv) is the focal point to the United Nations Framework Convention on Climate Change (UNFCCC).

Although, the Ministry was established in 2003, but the Government of Jordan had initiated its efforts toward climate change since 1999, where it was the first developing country that has submitted the Initial National Communication to the UNFCCC including a comprehensive vulnerability analysis. Efforts towards climate change have continued where the second national communication report (SNC) was submitted in 2009, covering key vulnerable sectors in the country and relevant adaptation issues and actions. In addition, the first comprehensive adaptation programme covering water, agriculture, health and education under the title “Adaptation” to Climate Change to Sustain Jordan’s MDG Achievements” was implemented over the period 2009-2011. Moreover, the first National Climate Change Policy framework for adaptation was developed in 2013 with three key policies and strategic documents which are: (i) the National Climate Change Policy (2013) (ii) the Third National Communication to the UNFCCC including downscaling climate projections for the first time in Jordan (2014); and (iii) its Intended Nationally Determined Contributions (iNDCs) (2015).

In 2014, the Ministry of Environment has established the Climate Change Directorate (CCD) to act as the focal point of the UNFCCC. The CCD is leading Jordan’s National Committee on Climate Change (JNCCC), in implementing legal instruments, policies, and strategies related to climate change. In February 2016, Jordan developed an initial implementation roadmap for its

NDC based on a comparative assessment with other NDCs and the outcomes of the Paris Agreement. However, the adaptation component of the NDC as such does not contain a sufficient level of details to allow for successful implementation. Jordan is planning to revise its NDCs in 2021 and this provides a great opportunity to link this NAP document to the revised NDCs. In 2017, Jordan joined the NDC Partnership (NDCP) and it has developed its NDCP action plan in early 2019. The MoEnv has conducted a prioritization process for NDC action plan.

In addition, the National Adaptation Plan (NAP) process was officially launched in 2017, with the support of BMZ through SV Klima and GIZ Jordan. The NAP process has proposed an enhanced institutional coordination structure for NAP that is awaiting official approval by the Government, has identified priority actions to be taken in the NAP process through a national stocktaking exercise. Other activities in 2017 included a study on the alignment of NAP process with existing national planning and budgeting processes and a national stakeholders’ workshop on the integration of gender and vulnerable groups in the NAP process. Activities in 2018 included the development of a NAP M&E system and a NAP financing and implementation strategy through a robust participatory approach.

In 2019, the MOEnv declared the climate change bylaw No. 79 for the year 2019 to ensure full engagement of all partners and stakeholders including both technical and decision makers. The bylaw set the procedures for climate change projects, to be ratified by the national climate change committee that include stakeholders from all governmental entities and NGOs including private sector and public communities. Jordan has developed its draft Second Biennial Assessment Report (SBUR) in 2020 and will undertake its Fourth National Communication (FNC) exercise in 2021.

1.3 National Mandate

One of the initial steps for any NAP process is to establish the national mandate, which entitles the policies and legal instruments issued by the national government to guide action on adaptation. These include establishing clear responsibilities that encourage cross-sectoral participation, and exploring potential sharing of lessons learned and best practices.

National mandate is defined as “An act, directive, executive order, or policy issued by the national government to guide action on adaptation “. This includes establishing clear responsibilities for government agencies (lead agency, coordination, reporting, etc.) and all other stakeholders involved in the process. In addition, creating a national mandate could take a long time, thus other activities may be initiated to lay the groundwork

Therefore, the Government of Jordan has established its national mandate through the endorsed Climate Change bylaw Number 73 for the year 2019. In addition, the National Climate Change Policy of the Hashemite Kingdom of Jordan 2013-2020 represents an integral part of the national mandate. The Climate Change Directorate at the MoEnv will supervise, implement, regulate and monitor the adaptation actions at sectoral level to achieve the following objectives: Reduce vulnerability to the impacts of climate change by building the adaptive capacity and resilience.

Promote the integration of climate change adaptation perspectives into policies, programmes and strategies.

1.4 The NAP Objectives

The MoEnv intends within its NAP development to contribute to achieving a pro-active, climate risk-resilient country,

that assure an increased resilience of its communities and institutions, natural ecosystems, water and agricultural resources in the path towards sustainable and climate-resilient development. Jordan seeks to continuously build adaptive capacity by reducing the country’s vulnerability through implementing comprehensive adaptation measures with consideration for gender aspects and the needs of the most vulnerable groups”. Therefore, the NAP objective is to *mainstream climate change adaptation in the development planning processes to enhance climate resilience and adaptive capacities and, reduce climate vulnerability within all relevant sectors in Jordan*”.

The plan was developed through a participatory approach characterized by strong commitment of various stakeholders, and aimed to:

- Identify, prioritize and implement strategic and programmatic adaptation measures to enhance Jordan’s resilience and adaptation planning process that are mainstreamed into sectoral planning and budgeting systems.
- Mainstream gender, children and young people and other vulnerable groups (especially refugees) considerations, to increase their adaptive capacity and strengthen the economic stability of the most affected populations in Jordan
- Provide a functional coordinating framework to guide national stakeholders and development partners through climate resilient decision-making processes
- Encourage and facilitate strategic investments in Jordan’s climate-resilient development including the mobilization of national, international, public and private finance through a flexible financing strategy

- Provide baseline for robust monitoring, review and learning framework to ensure that expected outputs, outcomes and impacts are achieved, and the NAP process is adjusted through the integration of lessons learnt
- Support the Government of Jordan (GoJ) to achieve its national priorities provided at “Jordan 2025– A National Vision and Strategy”, “Jordan Economic Growth Plan (2018 – 2022)”, Nationally Determined Contributions (NDCs), and the “National Green Growth Action Plan for Jordan (2020)” as well as the international obligations set in the Multilateral Environmental Conventions (MEAs), Sustainable Development Goals (SDGs).

1.5 The NAP Approach

The NAP process was guided by the UNFCCC ‘*Technical guidelines for the national adaptation plan process*’. The process of preparing the NAP document went through a number of steps to ensure the effective participation of various institutions and experts and under the leadership of the Ministry of Environment as it is the competent and responsible authority for climate change in Jordan. The process was initiated by the National Committee on Climate Change (NCCC), which was originally formed in 2001, and re-formulated in 2019 after the issuance of the climate, change bylaw Number 79 for the year 2019. The committee, which is authorized to create a platform for policy and implementation coordination for climate actions in Jordan, has developed the institutional set up of the NAP project.

This was followed by creating an Adaptation Working Group (AWG) in 2018 to bring together key institutions that are addressing climate adaptation challenges but are not all members of the NCCC. This group is a mixture of international development partners, civil society organization, civil society and

environmental activists as well as interested private sector institutions and groups. The contribution of this group was essential to increase the scope of involvement and generation of new ideas and approaches to address NAP priorities. This NAP document is based on several pillars including the i) institutional framework, ii) knowledge, technology and financing, and iii) resilience of the most vulnerable communities and sectors. The document underwent several reviews by experts in climate change, and the collective efforts have resulted in the development of this plan.

The main activities and steps conducted within the NAP process were the following:

- Stocktaking of adaptation in Jordan by applying GIZ’s “Stocktaking for National Adaptation Planning” (SNAP) tool, aiming at identifying the baseline for the elaboration and implementation of the NAP process in Jordan.
- Analysis of existing planning and budgeting cycles and identification of potential entry points for mainstreaming climate change adaptation into Jordan’s development and budget planning processes, using GIZ’s NAP Align tool.
- Analysis of gender aspects and the situation of vulnerable groups, including children youth and refugees with regard to the impacts of climate change and providing guidelines for the integration of these considerations into national climate change policies and the adaptation planning process.
- Preparation of the ‘Stocktaking of NDC Adaptation Measures and stakeholders’ mapping in Jordan’ report which addressed key strengths and gaps in adaptation content of Jordan’s NDCs compared to global best practice, while mapping and conducting a capacity assessment exercise of key stakeholders in climate change adaptation in Jordan.

- The outline of the NAP document was agreed upon during a workshop organized by GIZ and MoEnv. Once the NAP document outline was agreed through this participatory approach with stakeholders, the process of drafting the text of the document was initiated.
- Identification and prioritization of sectoral adaptation options using a participatory approach. Focus group meetings (water and agriculture, ecosystems and biodiversity, urban resilience and disaster risk management, socioeconomic and health) were conducted in order to come up with an updated vulnerability analysis for each sector, to develop an adaptation impact chain for each sector and to identify adaptation programmes and measures for each sector.
- Development of a sound and comprehensive climate finance strategy and guidelines for the effective implementation of the

NAP process, including a draft roadmap.

- Development of a flexible Monitoring, Reporting and Learning (MRL) framework to assess the progress and impacts of the implementation of the NAP process.
- Elaboration of the Communication Strategy for the NAP process in Jordan.
- Drafting and validation of the NAP document with all relevant stakeholders.

During 2020, the finalization phase for the NAP document was disrupted via the impacts of the Covid 19 pandemic, which caused delays in functionality of consultation meetings and diverted political attention towards addressing urgent socio-economic impacts of the pandemic. The NAP document review process included a section on the required integration between NAP implementation and post Covid 19 green recovery plan that is explained in Chapter 4



Zarqa Valley

Chapter Two

Climate Projections and Related Risks

This chapter presents past observed data, climate change projections and potential climate impacts on key vulnerable sectors according to the Third National Communication Report of Jordan (TNC, 2014) and other sources (studies analyzing climate risks and vulnerabilities in Jordan).



Wadi Araba

2.1 Past Observed and Projected Climate Data

The exposure assessment presented in the TNC identified the main climate change-related hazards (e.g. droughts, floods, heat waves, cold waves, increasing temperature, increasing aridity, etc.) through an analysis of past extreme events and trends, and through climate modelling and downscaling of future climate and environmental conditions, against various scenarios.

Climate hazards were approached using a set of climatic indices that were considered the most relevant to each of the selected sectors. For each index, climate projections were obtained for the years 2035, 2055 and 2075 by applying cutting-edge dynamic and statistical downscaling techniques for the very first time in Jordan.

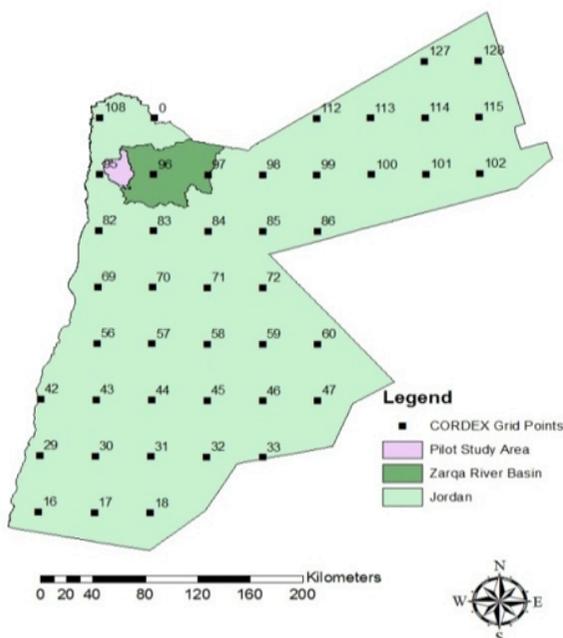


Figure (2.1) The AFRICA CORDEX domain grid points covering Jordan

Based on long historical data obtained from Ministry of Water and Irrigation (MWI) and Jordanian Meteorology Department (JMD), climatic variables are changing significantly at both national and station level indicating that climate change is becoming more apparent. Both Mann-Kendall rank trend test and linear regression trends indicated that the annual precipitation tends to decrease significantly by time in a rate of 1.2 mm per year until 2100.

On the contrary, the mean, maximum and minimum air temperature tends to increase significantly by 0.02, 0.01, and 0.03 °C/year, respectively. Dynamic downscaling was undertaken using Africa (Coordinated Regional Climate Downscaling Experiment (CORDEX) Domain, in which 43 grid points with 50 km resolution were crossed throughout the country (Figure 2.1).

Nine different GCM-RCM within two RCPs (4.5 and 8.5) were used to assess future projections as compared to reference historic data (1980-2010). Climatic indices were extracted, processed, and debased using delta and quantile-quantile scientific techniques. The selected climatic variables were precipitation, mean temperature, maximum temperature, minimum temperature, wind speed and direction, relative humidity, class A evaporation, drought indices at 3 and 6 months basis, number of consecutive dry days, number of heavy rainfall days, and snow depth. The reference model that was close to the median from all nine models was SMHI-NCC-NorESM-LR. This model was used to interpolate the climatic indices at 1km resolution using combined statistical projections at the stations level (Delta method) and geo-statistical interpolation using digital elevation model (DEM).

Climate change exposure to these hazards was assessed as a combination of likelihood of the hazard, geographic magnitude and confidence. The IPCC definitions were used to assess the exposure. A qualitative approach was used to assess the likelihood of the hazard e.g.) rare, unlikely, possible, likely, and extremely likely) based on the probability of occurrence of the event per year, while the degree of confidence was assessed based on the processing of a multi-model ensemble (i.e. very high, high, medium, low and very low confidence) (Table 2.1).

All models predict a warmer climate with strong confidence to increase in temperature. RCP 4.5 scenario, and +4°C [3.8- 5.1°C] under RCP 8.5. Figures below present the results for the mean, minimum and maximum annual temperature, for the three time horizons considered and under RCP 4.5 and 8.5 scenarios.

In addition, the dynamic projections predict a drier climate with medium confidence. In 2070-2100, the cumulated precipitation could decrease by 15% [-6% to -25%] using RCP 4.5 scenario and by - 21% [-9% to -35%] under RCP 8.5. The decrease would be more marked in the western part of the country (Figures 2.2, 2.3, 2.4, and 2.5).

Table (2.1) Scoring scales for exposure (likelihood, geographical magnitude and confidence)

Score				
1	2	3	4	5
Event is not expected to occur, but it is possible (there is less than five percent probability of occurrence per year <5%)	Less than 5% of the area is affected	Event or change less likely than not, but still possible (33-66% probability of occurrence per year)	Event or change likely to occur (66-95% probability of occurrence per year)	Event or change very likely to occur (>95% probability of occurrence per year)
Less than 5% of the area is affected	Less than 5% of the area is affected	33-66% of the area is affected	66-95% of the area is affected	>95% Of the area is affected
Less than 5% of the area is affected	Low: 2 out of 10 chance	Medium: 5 out of 10 chance	High confidence: 8 out of 10 chance	Very high > 9 out of 10 chance

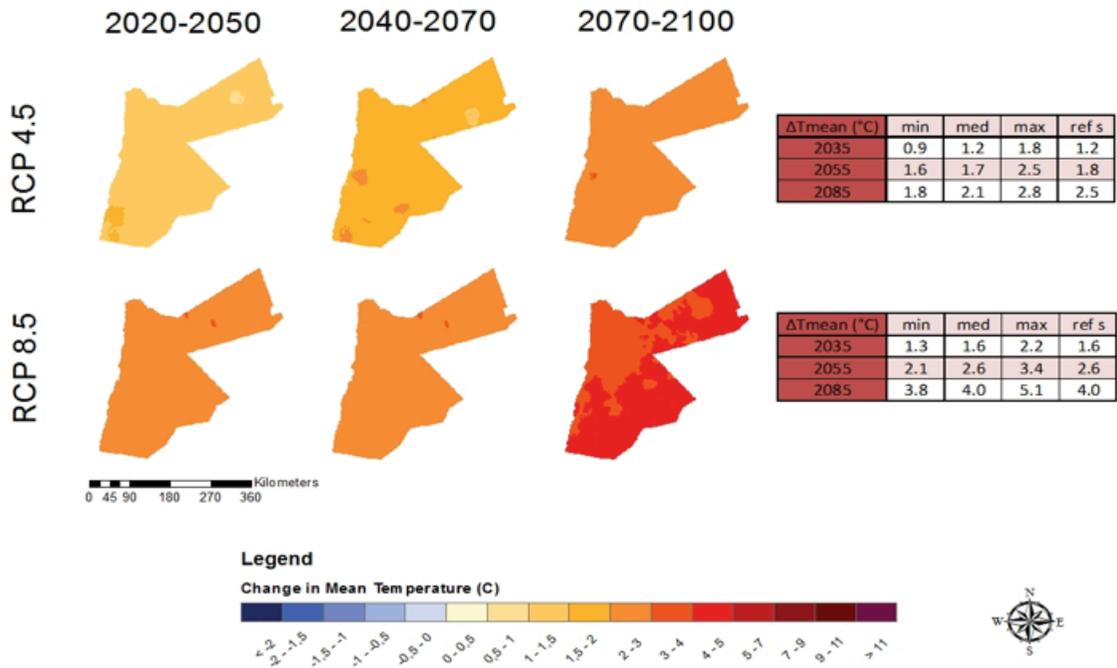


Figure (2.2) Changes in annual mean temperature (°C) over Jordan, reference model, for 2035, 2055 and 2085 times-horizons and for RCP 4.5 and 8.5

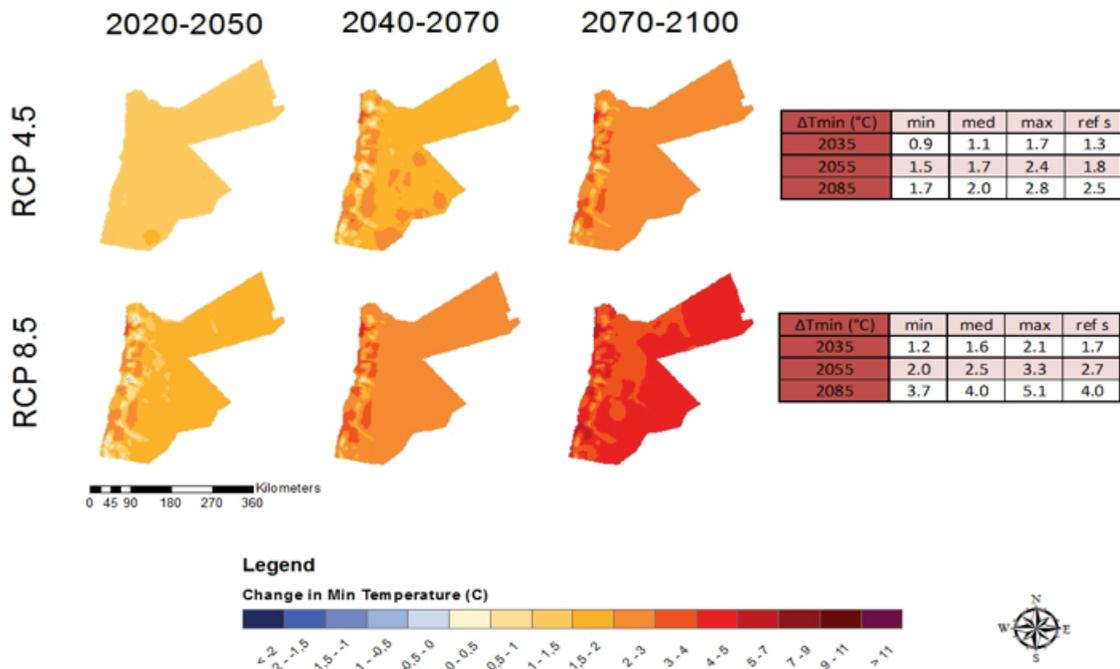


Figure (2.3) Delta annual minimum temperature (°C) over Jordan, reference model, for 2035, 2055 and 2085 times-horizons and for RCP 4.5 and 8.5

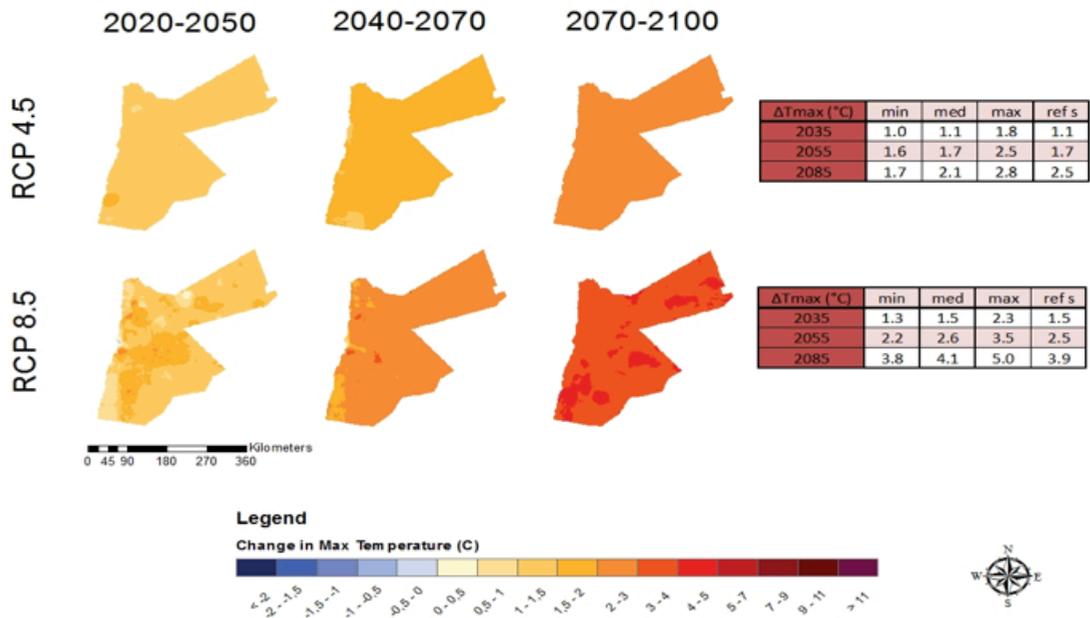


Figure (2.4) Changes in annual maximum temperature (°C) over Jordan, reference model, for 2035, 2055 and 2085 times-horizons and for RCP 4.5 and 8.5

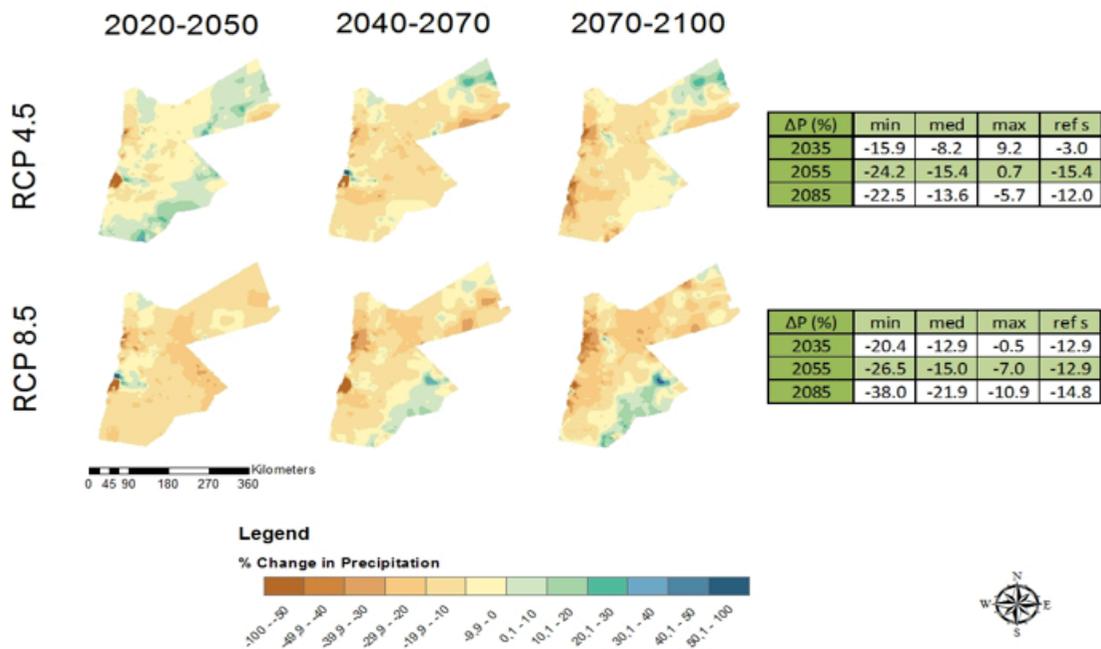


Figure (2.5) Changes in annual precipitation (mm) over Jordan, reference model, for 2050, 2070 and 2100 times-horizons and for RCP 4.5 and 8.5.

The future projections indicated a warmer summer, drier autumn and winter with medium confidence. The warming would be more significant in summer, and the reduction of precipitation more important in autumn and winter than in spring, with for instance median value of precipitation decrease reaching -35% in autumn in 2070-2100.

The dynamic projections predict more heat waves with high confidence and the analysis of summer temperature, monthly values and the inter-annual variability reveal that some thresholds could be exceeded. For instance, in pessimistic but possible projections, for a summer month, the average of maximum temperature for the whole country could exceed 42-44°C.

Table (2.2) Summary of the Climate Projections as per the results of the dynamic downscaling

Trend	Details	
A Warmer Climate	All models converge to an increase in temperature. In 2070-2100, average temperature increase could reach +2,1°C [+1,7 to +3,2°C] under RCP4.5 and +4°C [3,8- 5,5°C] under RCP 8.5	
A Drier Climate	In 2070-2100, the cumulated precipitation could decrease by 15% [-6% to -25%] in RCP 4.5, by - 21% [-9% to -35%] in RCP 8.5. The decrease would be more significant in the western part of the country	
Warmer Summer, drier autumn and winter	The warming would be more important in summer, and the reduction of precipitation more important in autumn and winter than in spring, with for instance median value of precipitation decrease reaching -35% in autumn for the period 2070-2100	
More Heat Waves	The analysis of summer temperature, monthly values and the inter-annual variability reveals that some temperature thresholds could be exceeded. For instance, in pessimistic but possible projections, for a summer month, the average of maximum temperature for the whole country could exceed 42-44°C .	
More Droughts	The maximum number of consecutive dry days, evaporation, and SPI analyses indicated increase. The occurrence of snow would strongly decrease. This will complicate water management.	
Intense Precipitations	The number of days with heavy rain (>10 mm) does not evolve significantly but not on a regional scale and thus did not evolve significantly	
Highly Confidence	Moderate Confidence	Low Confidence

The future projections also indicate more droughts, where the maximum number of consecutive dry days would increase in the reference model of more than 30 days for the 2070-2100 period. In contrast, annual values still show possible heavy rainy events at the end of the century. More intense droughts would be (partly) compensated by rainy years, in a context of a general decrease of precipitation. Potential evaporation would increase.

(Table 2.2). Finally, the future projections indicate no trend for intense precipitations or strong winds with low confidence. The number of days with heavy rain (>10 mm) does not evolve significantly, nor does the maximum wind speed or the direction of winds.

2.2 Climate Change Vulnerability

Climate Change vulnerability is defined as the “degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including climate variability and extremes”. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity”. Based on this, the TNC of Jordan adopted a methodology, which considers the vulnerability of a particular system as a highly contingent upon four main components (Figure 2.6 below):

The magnitude of its exposure to climate change hazards, Degree of sensitivity to the hazard, The resulting amount of impact and Its level of adaptive capacity.

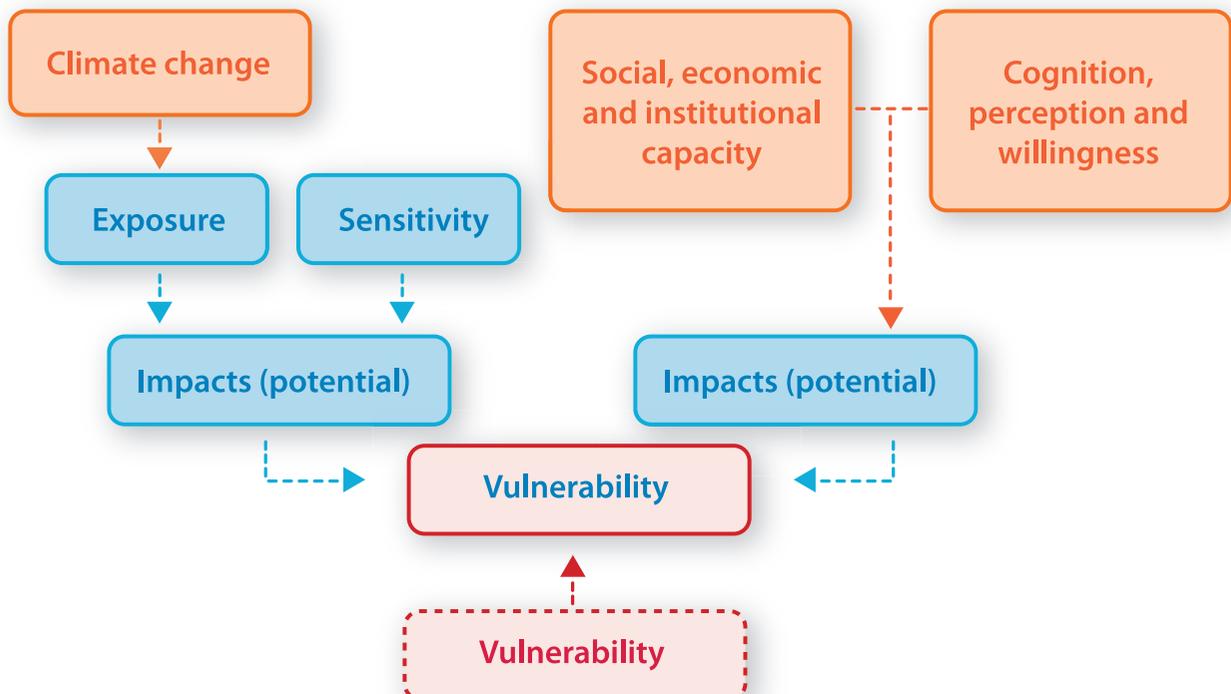
Therefore, the relationship between the four pre-mentioned dimensions is expressed by the following conceptual formula:

$$\text{Vulnerability} = [\text{Exposure to climate stimuli} \times \text{Sensitivity} = \text{Impact}] / \text{Adaptiv}$$

2.3 Vulnerability sectors

Many ecological, economic and social sectors in Jordan are vulnerable to climate change. The National Adaptation Plan has defined seven sectors, following the TNC, 2014 in order to identify their vulnerability and adaptation options, and these are the agricultural, water, urban, biodiversity, coastal, social and economic development and health sectors. The following illustrate the impacts of climate change on these sectors.

Figure (2.6): The Vulnerability Conceptual Framework (Schröter et al., 2004)



■ 2.3.1 Agriculture Sector

Agricultural production is closely tied to climate, making agriculture one of the most climate-sensitive of all economic sectors. In fragile –modest Jordanian agricultural sector, the climate impacts are immediate and are considered as an important challenge because the majority of the rural population depend either directly or indirectly on agriculture for their livelihoods.

The main climate related hazards to the agriculture sector are represented by temperature increase, rainfall decrease and the shift in rainy season and seasonal alterations, heatwaves and extreme events especially the heavy rainfall and droughts. These risks will potentially lead to several impacts on the agricultural sector such as the reduction of rain-fed and irrigated crops productivity, livestock and beekeeping production. In addition, it will lead to a decline in land fertility and surface for agriculture and cattle. Therefore, the agriculture sector is considered one of the most climate-sensitive of all economic sectors

Climate change impacts on the agricultural sector are unevenly distributed, where the rural poor will be disproportionately affected because of their greater dependence on agriculture, their relatively lower ability to adapt, and the high share of income they spend on food. Climate impacts could therefore undermine progress that has been made in poverty reduction and adversely impact the economic growth in vulnerable rural areas. In addition, it will affect food security and specifically quality, quantity and the accessibility to food resources leading to food insecure communities. The expected impacts of climate change, particularly reduced agricultural productivity and water availability threaten livelihoods options that depend on natural resource management and keep vulnerable people insecure. Poor

families and households are the most vulnerable group to the impacts of climate change and deserve the priority the in design of appropriate adaptive measures.

A significant increase of irrigated areas in Jordan have been witnessed from 27.8% in 1995 to 39,1% in 2016, and a shift on farming systems with an important decrease of field crops which are usually rainfed was also recognized. The change in land use patterns from rainfed to irrigated agriculture and the decrease in the field crops cultivated lands illustrate the capacity of Jordan's agricultural sector to adapt to the evolving climatic conditions through investing in irrigation techniques and changing its farming systems. In addition to the TNC V & A analysis, other studies carried out in Jordan described the following potential impacts of climate change on the agricultural sector.

Field crops, such as wheat and barley, were found to be highly sensitive to climate change impacts driven by the reduction in time available for assimilation of dry matter and lower water availability. It was projected that a decrease in yield varying from 7% to 21% for wheat and from 18% to 35% for barley due to shorter duration of crop growth. In terms of olive production, the potential decrease in yield derived from climate change impacts varies from 5% to 10% with high evidence on the oil quality reduction.

Climate change will probably affect growth and production of tuber and root crops, but the possible impact of climate change has not yet been studied for most species of this crop group. Potato yields are particularly sensitive to high-temperature stress because tuber induction and development can be directly inhibited by even moderately high temperature. It is anticipated that a 1°C or 2°C increase in temperature will decrease yields by 5 and 10%, respectively. For many vegetable crops, high temperatures may decrease quality parameters, such as size,

soluble solids and tenderness. It is anticipated that a 1°C or 2°C increase in temperature will decrease vegetables yield by 5 and 10%, respectively.

Similarly, orchards are highly sensitive to climate change. Using the appropriate varieties could help avoid the adverse impacts of temperature increase such as less flower bud induction, higher fruit drop, faster volume growth of fruit, earlier maturation, less total soluble solids and fruit reaches insipid and dry states earlier. In addition, planting trees that have high tolerance to higher temperatures such as dates would prevent loss of productivity due to global warming. On the one hand, it is anticipated that a 1°C or 2°C increase in temperature will not have a negative impact on an average year if the right varieties or tree types are used. On the other hand, however, extreme weather could have a rather severe impact.

In terms of rangelands, vegetation change will probably be more closely coupled to changes in soil resources than to immediate physiological responses of plants to CO₂ concentration or temperature. The increase in evapotranspiration (ET) rate and decrease in precipitation in drier systems such as the arid and semiarid rangelands of Jordan would reduce productivity.

There was no clear direct impact to climate change on food consumption pattern. However, climate change would indirectly affect food consumption patterns by reducing yield of the strategic crops and rangelands contribution to livestock sector, which would increase the prices, and change patterns of consumption and the sources of nutrients.

The increase in the net irrigation requirements and the reduction in crop yield would result in reducing water use efficiency (WUE). The 1°C increase and the 10% decrease in precipitation would result in decreasing the WUE for all crops planted in Jordan. The decrease in WUE would range

from 2% to 15%, with an average of 9%. An increase in temperature by 2°C and a decrease in precipitation by 20% in 2050 would worsen the situation and would reduce the average WUE by 17%.

In terms of drought, several studies had proven the increase incidence of drought events in Jordan. Literature indicates that the country will face frequent non-uniform drought periods in an irregular repetitive manner. Drought severity, magnitudes and lifespan will increase with time shifting from normal to extreme levels. The generated maps indicated the presence of two drought types, local drought acting on one or more geographical climatic parts and national drought, of less common but more severe, that extends over the whole country. These droughts will negatively affect the Jordanian agriculture system. The International Centre published a Drought Atlas for Jordan for Agricultural Research in the Dry Area (ICARDA) in 2014. The atlas provides insights on the expected impact of climate change and drought on the length of the growing period, increase drought in addition to providing background information of the expected threats, upon which technologies can be built to increase climate change adaptation measures.

Shifts in cropping patterns: Climate Change impact on Crop Production and Food Security can be illustrated by the changes in production induced by the impacts of climate change (10% reduction by year 2050) and the trends of land use change in each area. This suggests possible shifts in cropping patterns to cope with the problem of water shortage in the country. Apparently, banana and alfalfa would be seen as the main crops with highest water consumption among the irrigated crops.

■ 2.3.2 Water Sector

The main climate related hazards to the water sector are represented by reduced

precipitation, maximum temperature, increase, drought/dry days and evaporation. The increased evaporation and decreased rainfall will lead to several impacts on the water sector such as less recharge and therefore less replenishment of surface water and groundwater reserves, which will result in serious soil degradation that could lead to desertification in the long term. Increased evaporation of surface water will also reduce its quality increasing its salinity and decreasing its oxygen content as well increasing the pollution levels. Impacts on the agricultural sector are expected due to the lack of sufficient water, which will affect the income incurred and the ability of families and farmers to adopt adaptation measures to climate change. The impacts of climate change on water demands are increasing with population growth, economic development and refugee's influx. Jordan's water sector is extremely vulnerable to climate change, especially to temperature increase, decrease in precipitation and increase of evapotranspiration.

Rajsekhar and Gorelick (2017) assessed the increasing drought in Jordan taking into account the climate change and cascading Syrian land-use impacts on reducing trans-boundary flow. They have investigated drought analysis on all major basins in Jordan with a focus on Yarmouk river basin using two key aspects of Jordan's freshwater vulnerability related to droughts. These included the multiple manifestations of future high temperature in conjunction with low precipitation by exploring three types of drought and the combined impact of climate change-induced future hydrologic droughts and land-use changes in upstream Syria on Jordanian water resources.

Watershed simulations of future trans-boundary Yarmouk-Jordan River flow from Syria show that Jordan would receive 51 to 75% less Yarmouk water compared to historical flow. Recovery of Syrian irrigated

agriculture to pre-conflict conditions would produce twice the decline in trans-boundary flow as that due to climate change. In Jordan, the confluence of limited water supply, future drought, and trans-boundary hydrologic impacts of land use severely challenges achieving freshwater sustainability. Hence, Jordan cannot afford to be sanguine about the devastating consequences of droughts given pre-existing regional vulnerabilities due to conflicts, immigration, dependence on trans-boundary river flow, and limited mitigation options.

Climate data pooled from eight models for three periods (2020–2050, 2040–2070, and 2070–2100) suggest that there is significant increase in temperature and hence in evaporation. In addition, the data suggest reduced precipitation and hence, drought. This significant change in the potential evaporation will apply further stress in the availability and distribution of the water resources in Jordan as well as in the study area. Therefore, several adaptation strategies were provided including the rooftop water harvesting where 100 square meters can easily harvest 32 cubic meters per year. On the other hand, floodwater harvesting at macro-catchment can collect considerable amounts of water in small dams across intermittent rivers and Wadis. Moreover, wastewater treatment and reuse in the agricultural sector, grey-water reuse, declination and increasing Efficiency of irrigation technologies are all part of the adaptation strategies.

■ 2.3.3 Urban Sector

The main climate related hazards to the urban sector are represented by severe wind, increased or decrease in temperature, heavy rainfall, snow and drought events. Vulnerabilities increase when infrastructure utilities and systems are subject to multiple stresses, beyond climate change alone; especially for those that are located in areas vulnerable to extreme weather events, as

well as areas stressed by age and those near particularly climate-sensitive environmental features, such as coastlines, rivers, storm tracks and vegetation. However, further studies are still required to understand the impact of climate change on urban sector in Jordan. In large urban areas where systems are interdependent, ripple effects may surface as one system shuts down causing disturbances in the flow of other systems, services, economic and social aspects of everyday life. The urban systems are vulnerable to extreme weather events that are becoming more intense, frequent, and/or longer lasting due to climate change. It is also vulnerable to climate change impacts on regional infrastructures (that are outdated and threatened) on which they depend for daily subsistence, and it will be affected by disruptions occurring in relatively distant locations due to linkages through national infrastructure networks and the national economy. These effects will be especially problematic for parts of the population who have the higher vulnerability because of their limited coping capacities.

Jordan has been affected by many types of climate related disasters (flash floods, landslides, rock falls and droughts) which are becoming more frequent events that cause losses of lives and costs millions of economic losses every year in different parts of the country. Disasters Inventory in Jordan showing that during the last three decades, flash floods in Jordan resulted in the death of 110 people and affected hundreds of thousands more, with economic loss of hundreds of US Dollars.

■ 2.3.4 Biodiversity and Ecosystem Sector

Jordan has three distinct ecological systems: (i) Jordan Valley which forms a narrow strip located below the mean sea level, and has warm winters and hot summers with irrigation mainly practiced in this area; (ii) the western highlands where rainfall is relatively

high and climate is typical of Mediterranean areas; and (iii) the arid and semiarid inland to the east (estimated to cover over 80% of the total area), known as the “Badia”, where the annual rainfall is below mm. Badia is an Arabic word describing the open rangeland where Bedouins (nomads) live and practice seasonal grazing and browsing.

The main climate related hazards to the biodiversity and ecosystems sector are represented by changes in maximum temperature, precipitation, length of dry season and evapotranspiration. The assessment was based on assessing 13 vegetation types in Jordan, which are the Pine forests, Deciduous Oak forests, Ever Green Oak forests, Juniper forests, Steppe, Mediterranean Non-forests, Hammada, Saline, Tropical, Sand Dune, Acacia Rocky Sudanian, Mudflat and Water vegetation types. Results of the vulnerability assessment conducted in the TNC for terrestrial ecosystems showed that the highest vulnerable ecosystems are forests (especially in the north) and fresh water (especially in Jordan rift valley), which highlighted the priority to perform adaptation interventions within these two ecosystems. However, a more detailed and updated vulnerability assessment for ecosystems and ecosystem services in Jordan is highly needed.

■ 2.3.5 Coastal Areas Sector

The main climate related hazards to coastal sector are represented by sea surface temperature, precipitation, and CO₂ concentration in seawater. Extreme rainfall events or droughts in the upstream terrestrial areas will lead to serious run off and flooding events that will affect the coastal areas and marine life at Aqaba. The northern parts of Aqaba are the most vulnerable regions for flashflood hazards since they are located downstream from areas of major wadis, which discharge water into the Gulf of Aqaba, and will affect areas that contain most of the town residential expansion.

The increase in water temperature will increase the ability of certain alien species to be established at the Gulf of Aqaba. In addition, the warming of the ocean water temperature could affect a variety of population characteristics such as breeding and survival ability, which might lead to the threatening of species and habitats, or even extinction. In addition, increased temperature will increase stratification, change circulation, increase coral bleaching and mortality, limit species migration and increase algal blooms. An increase in mean sea surface temperature will cause changes as sea temperature and CO₂ concentration favor algal blooms in combination with increased nutrient run-off, which could lead to critical changes in ecosystems and species diversity.

Increased CO₂ fertilization will lead to decreased seawater pH or “increased sea acidification” which will lead to negative impacts on coral reefs “bleaching” and other pH sensitive organisms. In addition, fertilization will increase CO₂ productivity in coastal systems. For the assessment of coastal areas, four main determinates were identified including sea level rise, extreme rainfall events or droughts in upstream terrestrial areas, which are connected to run off, and flooding, sea surface temperature and CO₂ concentrations. The impact of climate hazards on coastal areas could have socioeconomic effects where any sea level raise or any changes to the sea surface temperature and CO₂ concentration level at the Gulf of Aqaba, then, potential property losses might occur due to the loss of terrain, biodiversity and ecosystems.

It could be important to pay attention to the geographical situation of infrastructure such as hotels and factories with respect to the Gulf of Aqaba and seashores as it might be damaged. In addition, other socioeconomic effects might be occurred such as increase risk of diseases, economical losses in means of tourism attraction level due to the loss

of biodiversity, ecosystem and its goods and services, loss of fisheries or changing its distribution along the coast of the Gulf of Aqaba

■ 2.3.6 Health Sector

The main climate related hazards to health sector are represented by temperature and precipitation. The scale of health impacts from climate change will depend primarily on the size, density and wealth of the population. Exposure to heat or cold waves could have impacts on mortality rates, communicable diseases and non-communicable diseases. Based on the National Climate Change and Health Adaptation Strategy and Action Plan, which was developed by the Ministry of Health in 2012, six climate-sensitive health issues were identified including air-borne and respiratory diseases, water and food-borne diseases, vector-borne diseases, nutrition, heat waves, and occupational health.

Climate change effects on respiratory diseases will includes chronic respiratory diseases such as bronchial asthma. The increase in temperature due to climate change is likely to be associated with increased survival and abundance of microorganisms; thus, increased water and food-borne diseases. The expected decrease in precipitation will lead to decreased availability of water, which may lead to the consumption and use of unsafe (contaminated) water for drinking and other uses, causing many water and foodborne diseases. Flooding will cause epidemics of water and food-borne diseases. The spread of these diseases after floods results primarily from contamination of water caused by disruption of water purification and sewage disposal systems. However, the secondary effects of flooding, including crowding and subsequent focal-oral spread of gastrointestinal pathogens, may also contribute to spreading of water and food-borne diseases. Vector Born Diseases risk is expected to increase by

increasing temperature. Areas with scarce water like the Eastern Desert will become an area of higher risk due to water harvesting projects. Water projects will certainly have impacts on the intermediate hosts or vectors responsible for the transmission of malaria, schistosomiasis and leishmaniasis. Access to nutritious food is expected to be reduced; dietary quality and eventually quantity declined, and micronutrient malnutrition (or hidden hunger) increased as indirect impacts of climate change. The expected increase of heat waves due to climate change will cause an increase in a spectrum of disorders such as sunburn and fatigue, heat rash, heat cramps, heat syncope, heat exhaustion, and heat stroke. The most serious of these are heat exhaustion and heat stroke, which can lead to death. In addition, exposure to hot weather may exacerbate existing chronic conditions.

Climate change is expected to alter outdoor workers' exposure to solar ultraviolet radiation to cause a range of health impacts. The greatest burdens result from UVR-induced cortical cataracts, cutaneous malignant melanoma, and sunburn. Heat stress due to high temperature and humidity can lead to an increase in deaths or chronic ill health after heat strokes. Both outdoor and indoor workers are at risk of heatstroke. Indoor (chemical industries) workers and farmers may be exposed to higher levels of air pollutants due to increased temperatures. Many recent studies have linked the emergence of Covid 19 outbreak with the impacts of climate change and the closer associations between humans and animals as well as degradation of habitats. It is expected that diseases that are more infectious can emerge due to climate change impacts. This threat needs to be addressed seriously at national and global levels.

■ 2.3.7 Socioeconomic Sector

The TNC, 2014 provided an analysis to determine the expected impacts of Climate Change on local communities and

their adaptive capacities by employing socioeconomic and adaptation analysis tools on the pilot area composed of four villages in the Amman- Zarqa Basin. The study used income assessment as a main critical indicator to the sensitivity of local community to the climate change.

Results showed that the communities in Subeihi and Bayoudah areas will suffer severe effects due to climate change and it is expected that they will lose 10% to 20% of their income due to the decrease of their crop yields' productivity. Farmers above 60 years are less affected than others by external factors, due to local knowledge and experience in agricultural practices. However, communities of Seehan will suffer an insignificant impact due to the advanced agricultural experiences they have as well as the diverse income resources. The community in Al-Irmemeen was an exception among the other communities where younger farmers (between 20-40 years) have reported higher income level from agriculture compared with older age groups.

The reason behind this is that the dominant production system is irrigated agriculture and farmers used modern technology and protected agriculture. Despite of the results obtained from the analysis mentioned above, but the socio-economic impacts of climate change are not well addressed with a special attention from relevant research and policy related activities that are performed locally.

The vulnerability of a society to climate risks such as drought, for instance, depends on several factors such as demography, technology, policy, social behavior, land use patterns, water use, economic development, and diversity of economic base and cultural composition. Individual (or household) vulnerability is determined by the access to financial resources and the diversity of income sources, as well as by social status of individuals or households within a community.

Chapter Three

Sectoral Adaptation Programmes and Measures



- Photos: © M. Ammar

The proposed adaptation programmes and measures in the NAP document have been categorized based on various vulnerable economic sectors. For each sector a strategic objective was developed. Under each sector, a few strategic programmes were proposed with each programme coded with a number that relates to the sector. The programmes are flexible and open to many measures that can be implemented as either:

1. Policy based measures.
2. Technology based measures.
3. Social mobilization based measures.
4. Nature based measures.
5. Economic development based measures.

The programmes and measures proposed in NAP are flexible enough to be implemented by different organizations, networks and communities. The NAP document should act as a policy reference point for such measures, which can be developed under various socioeconomic and environmental settings and incorporated into various sectoral and economy wide plans and policies.

It is imperative to realize that the successful implementation of NAP is not the responsibility of the government alone but depends also on the active and sustained engagement of a variety of stakeholders including local actors, civil society, private sector, academic and research institutions and international development partners.

3.1 Water Resources Management

Sectoral Strategic Objective: Enhancing sustainable water demand and supply through climate resilient measures

Programme W1: Integrating Climate adaptation and resilience in policy and institutional reforms in the water sector

This programme aims at using the opportunity of current and future reforms in the water sector to introduce a structural approach for climate resilience at the legal, policy and institutional levels. Key measures to be applied under this programme include:

1. Structural integration of climate change impacts and adaptation in the new National Water Masterplan.
2. Strengthening the human, technical and administrative capacities of the Climate Change Directorate at Ministry of Water and Irrigation and related Authorities.
3. Adopting a vulnerability approach to determining priority geographical areas and communities for water, sanitation & hygiene (WASH) interventions that aim to expand and improve systems to adapt vulnerable communities to potential climate change impacts.
4. Adopting risk-informed programming as an adaptation planning tool at Ministry of Water level.

Programme W2: Improved water demand management and reducing gap between water demand and supply

This programme aims to tackling the main challenge in the water sector, which is enhanced water demand management, and reducing the gap between available water resources threatened under climate change conditions, and ever-increasing demand from various development sector. Addressing this challenge should be implemented within a climate resilient approach. Key measures to be applied under this programme include:

1. Reducing non-revenue water loss in domestic and irrigation water supply systems through rehabilitation and maintenance of water networks and enforcement of law.
2. Enhancing water storage capacity in natural dams and water retention systems.

3. Reducing groundwater use for irrigation and enhancing water recharge technologies including managed and artificial groundwater recharge mechanisms
4. Continue with treated wastewater reuse in Jordan Valley and Highlands as a water augmentation tool to save freshwater

Programme W3: Improving adaptive capacity of water utilities

This programme aims at introducing climate resilience methodologies to improve adaptive capacities of water utilities including wastewater treatment plants, water desalination plants and water distribution utilities. Protecting water utilities from adverse impacts of climate change, and reducing their environmental impacts is a major objective for enhancing the sustainability of water infrastructure in Jordan. Key measures to be applied under this programme include:

1. Conducting climate-proofing studies for existing water utilities and integration of climate proofing tools for planned water utilities through developing climate resilient water safety plans, Environmental Impact Assessment and other legally binding environmental management tools.
2. Creation of map for flash flood prone area as a tool for risk assessment to guide decision makers about the proper location for establishing new water utilities.
3. Enhancing performance and efficiency of water utilities through technological improvements and capacity development for reducing water loss.
4. Enhancing community engagement and stakeholder management approaches through WASH, to strengthen social cohesion and trust between community and water utilities in

service delivery and community climate adaptation initiatives.

5. Adoption of Climate Resilience Water Safety and Security Planning as a tool to identify adaptation measures at utility level.

Programme W4: Improved efficiency in water use for sustainable development:

Water is a key resource for all developmental activities especially agriculture, industry and healthcare. In a future where climate change will multiply the expected scarcity of water resources due to increased population growth and economic development, it is essential that water efficiency measures become a necessary approach in water management to enhance climate resilience and improve productivity of water use. Key measures to be applied under this programme include:

1. Promote water-harvesting techniques at all levels of economic development and water use (buildings, agriculture, industry, etc...) based on suitable local conditions.
2. Introducing water saving technologies in irrigation schemes such as drip, micro-spray, and night irrigation with careful consideration of environmental impacts on soil salination.
3. Enhancing the use of water efficiency technology at household and business levels in urban and rural settings
4. Enhancing the adaptive capacity of small farmers in Jordan Valley through water user associations for increasing use of reclaimed water for irrigation purposes.
5. Increasing community awareness, behavioral change and adoption of water conservation measures through WASH centered community behavioral change initiatives.

Programme W5: Improving contribution of non-conventional water resources to the national water budget:

This programme aims to increase the contribution on non-conventional water resources for augmentation of freshwater resources for irrigation, industrial and domestic use. This contribution will help to save more freshwater resources for drinking and sanitation practices that are associated with life at a warmer and more disease prone world. Key measures to be applied under this programme include:

1. Promote the use of non-conventional water sources especially treated wastewater for non-domestic water use
2. Increasing of the number and scope of use of decentralized wastewater treatment plants in rural areas.
3. Promote desalination programmes for drinking water and irrigation
4. Promote rainwater harvesting in urban areas from rooftops and greywater reuse both at the institution level and at household level to support vulnerable households and communities
5. Encouraging water-substitution arrangements for decentralized wastewater treatment solutions at clusters and sub-district levels

Programme W6: Improving rainfall early warning systems and reducing flood risks

The programme aims at addressing one of the major acute threats of climate change in Jordan which is represented by the increasing frequency of flashfloods due to heavy and erratic rainfall that caused immediate risks on lives, livelihoods, economic assets and infrastructures. With such phenomena expected to increase in the future it is

important to address this risk systematically. Key measures to be applied under this programme include:

1. Improving meteorological capacities in forecasting of long term and short term weather conditions to enhance decision making regarding managing climate related extreme weather risks.
2. Improving flood resilience through food risk management measures, by enhancing flood mitigation infrastructure and measures to respond effectively to floods.
3. Development of flood risks maps for all urban and rural areas in Jordan and identification of hotspots that require continuous monitoring, improved infrastructure and emergency operations.
4. Developing supportive tools to provide insight and support advocacy into balancing water demand and supply in a sustainable way using principles of risk, competing uses, water security and assurance of supply
5. Identifying technological solutions to reduce climate-change induced evaporation of major surface water basins.

Programme W7: Supporting watershed and basin level management of water resources including transboundary water

This programme aims at managing surface and ground water resources using watershed management scope, which includes all environmental elements, and conserving ecosystem services provided by the watershed, which are threatened with climate change impacts especially reduced precipitation and increased temperatures. The strategic objective is to conserve and restore such watersheds. Key measures to be applied under this programme include:

1. Identifying the vulnerability of surface water basins to climate change and developing required adaptation measures.
2. Identifying the vulnerability of groundwater basins to climate change and developing required adaptation measures.
3. Rehabilitation and restoration of key watersheds in Jordan for enhanced retention of surface water and recharge to groundwater.
4. Improving the quality of surface and groundwater by enforcing laws to prevent dumping/pollution and/or incentives for cleanup and restoration of watersheds and basins.
5. Ensuring a reliable supply of water to protect and restore critical water-related ecosystems, including forests, wetlands, rivers, aquifers and lakes.
6. Developing pragmatic management plans for transboundary watersheds, which are shared with neighboring countries and not sustainably or effectively protected by political agreements.

3.2 Agriculture and Food Security

Sectoral Strategic Objective: Enhancing the sustainability and productivity of agriculture and improving food security through climate resilient measures

Programme A1: Integrating Climate resilience in the policy and institutional reforms in agricultural sector

This programme aims at introducing a structural approach for climate resilience in the agricultural sector at the legal, policy and institutional levels with special focus on the Ministry of Agriculture. Key measures to be applied under this programme include:

1. Develop and implement a climate change agriculture resilience investment plan
2. Provide economic incentives for climate change mitigation and adaptation programmes at farm levels.
3. Activation of land use laws to prevent urban expansion on agricultural lands.
4. Modification of policies and implementation of action plans with emphasis on socio-economic strategies intended to meet the agricultural impacts of climate change.
5. Enhancing the capacities of climate change related unit and directorates at Ministry of Agriculture and NARC.

Programme A2: Improving drought management systems

This programme aims at improving the institutional and technical capacities of public institutions mandated with drought detection and management in Jordan to be able to provide early warning systems of incoming drought and enhancing readiness and responsiveness to drought events. Key measures to be applied under this programme include

1. Enhancement of the effectiveness of the drought management system available currently in the Ministries of Water and Agriculture with direct linkages to climate change adaptation and resilience.
2. Strengthen the financial resources available for compensation of farmers after drought
3. Incentive and subsidy programmes to prevent the collapse of animal production in drought condition
4. Use of farmers' indigenous knowledge and tradition to adapt to climate change under drought conditions

Programme A3: Improving irrigation system efficiency

Enhancing the efficiency of irrigation systems is the most important objective of a climate resilient agriculture in Jordan. This programme aims to enhance this effectiveness through various interventions at policy and practice levels. Key measures to be applied under this programme include

1. Develop a soil-water-plant monitoring programmes (e.g. crop/environment forecasting, RS and GIS, lysimetric, etc)
2. water harvesting techniques, maximizing treated waste water re-use in agriculture, improving water use efficiency and the augmentation of drip irrigation in irrigated areas
3. Improving soil water storage and retention to maximize plant water availability by maximizing infiltration of rainfall
4. Use of supplemental irrigation from harvested rainwater in the critical stages of crop growth achieved through on farm rainwater harvesting and management system
5. Reduce soil erosion through community management, use of Ecosystem based Adaptation (EbA) measures and harvesting of rainwater amongst small farmers in rural areas

Programme A4: Shifting to water efficient crops

This programme aims at supporting eventual and necessary gradual shift to the use of water tolerant crops and using efficient irrigation and cultivation technologies in appropriate agricultural lands and suitable timeframes. Key measures to be applied under this programme include

1. Introduce and diversify tolerant crop with high productivity and capable of

withstanding in drought, saline, heat and conditions (Climate-smart agriculture)

2. Modification of crops planting and harvesting dates through the production and promoting an agro-climatological calendar

Programme A5: supporting hydroponic and other water tolerant agricultural productivity systems

This programme aims to enhance the contribution of reduced water needs technologies with special focus on hydroponic agriculture by providing adequate regulations, technologies and capacities to spread the use of this technology in Jordan. Key measures to be applied under this programme include

1. Promote the use of conservation agriculture (e.g. organic, biodynamic, zero and minimum/ conservation tillage, fallow practices, etc)
2. Formation of community cooperatives responsible about the use of range land and the grazing right
3. Increasing forage-livestock system, production and preservation
4. Dissemination of conservation agriculture to increase wheat and barley production in dry areas using improved varieties

Programme A6: Enhancing productivity of rangeland management

This programme aims at introducing climate resilient rangeland management options in the Jordanian Badia and other semiarid rangelands to protect rangeland productivity through sustainable use options and community participation. Key measures to be applied under this programme include

1. Supporting diversification of livelihoods and income in rangeland areas
2. Improving sustainable management of grazing reserves

3. Identification of best locations for implementation of Hima concepts in rangeland and arid land management

Programme A7: Improving sustainable productivity of food chains

This programme aims to improve the contribution of agricultural sector to food security and self-sufficiency under climate change conditions and against emergency conditions. The programme targets the agricultural production and marketing value chain to ensure the continuity of affordable and sufficient food production to domestic markets while adapting to climate related challenges. Key measures to be applied under this programme include

1. Promoting efficiencies in the food chain and the reduction of post-harvest losses and food waste in a sustainable manner, increasing the efficiency of nitrogen use, improving livestock productivity

3.3 Biodiversity and Ecosystem Services

Sectoral Strategic Objective: Using nature based adaptation and green infrastructure to enhance climate adaptive capacity in ecosystems and protecting ecosystem services

Programme B1: Increasing the scope of ecosystem based adaptation and climate-based planning in protected areas and special conservation areas:

This programme aims at introducing and enhancing Nature Based Solutions (NBS) for climate change adaptation and sustainable use of ecosystem services. This would include the identification and implementation of appropriate Ecosystem Based Adaptation (EbA) tools especially in Protected Areas and Special Conservation Areas under adequate management before replicating these solutions in other areas in Jordan. Key

measures to be applied under this programme include:

1. Conducting a comprehensive review of the National Network of Protected Areas. The revision will aim at identifying /validating climate-vulnerable ecosystems, extending conservation efforts in PA surroundings and designing buffer zones as deemed necessarily for strengthening the adaptive capacities of key ecological hotspots
2. Identify and map 'climate-vulnerable' species of flora and fauna and their habitat including connections with the need to control invasive species, and create a national plan and monitoring system to support climate vulnerable species
3. Prepare adaptive management programmes for climate sensitive habitats in protected areas and special conservation areas.
4. Protect watersheds and forests to sustain surface water flow and improved groundwater reserves
5. Implement ecosystem-based approaches to adaptation to protect, maintain, and restore degraded habitats with active community

Programme B2: using green infrastructure and community participation for ecosystem rehabilitation and restoration

This programme aims to introduce and implement green infrastructure options for habitat restoration and rehabilitation in climate sensitive areas. Green infrastructure approach is a labor intensive and highly sustainable option that can provide solutions that provide job opportunities while protecting ecosystem services through nature based solutions. Key measures to be applied under this programme include:

1. Restoration programmes of key sensitive

habitats such as forests and coral reefs in the collaboration with NGOs and local communities

2. Strengthen the role of private sector in allocating their Corporate Social Responsibility (CSR) to support green infrastructure measures related to ecosystems and biodiversity adaptation activities
3. Gather, compile, document and analyze the traditional local knowledge on ecosystems and biodiversity in relation to climate forecasting to be used in developing participatory community-based green infrastructure adaptation programmes

Programme B3: Enhancing the adaptive capacity of ecosystem services against extreme and long term climate change impacts

This programme aims to maximize the sustainable use of ecosystem services in key ecosystems and habitats in Jordan to enhance their adaptive capacities to climate change impacts. Key measures to be applied under this programme include

1. Develop a national plan for mitigating forests fires incidents including the identification of hazards, training, resources allocation, awareness and knowledge raising and engagement of civil society organizations
2. Protect wetlands and major watershed areas vulnerable to climate change and enhance law enforcement measures
3. Establish protection measures to ensure minimizing extreme events effects on vulnerable ecosystems
4. Conceptual framework combining silvicultural, ecological and community-based approaches for afforestation & honeybee foraging

Programme B4: Improving conservation measures and enforcement for climate threatened species and habitats

This programme aims at identifying the key climate sensitive habitats and species in Jordan and developing special conservation measures that take into considerations changes in climate conditions and niches of the different sensitive species to protect them from extinction. Key measures to be applied under this programme include:

1. Update and identify key ecosystems that are highly sensitive to climate change
2. Establish a clear research design to target indicator species of fauna, flora and ecosystems in order to better understand the climate effects and apply adaptation measures
3. Develop a recovery and restoration plans for highly threatened ecosystems and species of fauna and flora including the development of clear ex-situ conservation, captive breeding programmes and re-introduction and restoration programmes
4. Strengthen enforcement of planning and biodiversity conservation legal and institutional frameworks, most notably within the Environment Impact Assessment process

Programme B5: Improving conservation measures against emergence and spread of zoonotic infectious diseases

The Covid 19 pandemic has illustrated the high risk of spreading infectious zoonotic diseases from animals to human through direct interaction under conditions of climate change, increased human settlements and interactions with wild species. This programme aims at anticipating and addressing the serious threat arising from the

potential of spreading of zoonotic diseases to human populations due to climate change impacts. Key measures to be applied under this programme include

1. Mapping of all critical habitats that include the presence of species that could act as vectors for zoonotic viral diseases and continuous monitoring of such habitats to minimize the risk of the appearance of more animal transmitted infectious diseases in the future.
2. Improving habitat connectivity by linking existing protected areas and designing new ones in areas identified as possible animal-human interactions.

Programme B6: Improving field research and monitoring of ecosystem vulnerability to climate change

This programme aims at improving the scientific research capacities for observation of ecosystem changes due to climate change and analyzing ecosystem, habitats and species' vulnerability to climate change in Jordan and generating field data as a supportive evidence. These measures implemented under this programme will provide adequate information for decision makers and managers to take the right decisions at the right time. Key measures to be applied under this programme include:

1. Conduct research studies and monitoring programmes on climate change impacts on terrestrial and marine ecosystems and biodiversity.
2. Strengthen the current capacities of research institutes' for conducting research on climate change impacts on ecosystems and biodiversity at marine and terrestrial parts
3. Establish a comprehensive programme to monitor climate change impacts on key ecosystems and biodiversity with a focus on using technologies such as GIS
4. Conduct research studies on impact of

increased CO₂ on natural ecosystems and biodiversity and its effects on biomass production, and invasive alien species

5. Strengthen national research institutions, universities and other NGOs working in the field of ecosystems and biodiversity conservation for facilitation of multidisciplinary research on climate change impact on this sector
6. Increase and mobilise resources available for the implementation, monitoring and enforcement of the NBSAP

3.4 Health

Sectoral Strategic Objective: Enhancing the adaptive capacity of the health sector to address climate induced health impacts and emerging infectious diseases

Programme H1: Improved understanding of the potential risk on health sector due to climate change

This programme aims at enhancing collective knowledge about the potential and observed impacts of climate change on health conditions for individuals and communities. The programme measure should mobilize related institutions and experts to conduct studies and observations of climate impacts on health in terms of changing climate conditions or the emergence of climate related infectious diseases in Jordan. Key measures to be applied under this programme include:

1. Building the needed capacities to conduct health vulnerability assessments
2. Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change
3. Developing climate-informed disease control programmes and surveillance systems using meteorological services to target vector control in time and space

4. Introducing new indicators that are useful for protecting health, such as Air Quality Index, UV index, in cooperation with the relevant institutions
5. Developing new methods and tools for preparing for, coping with, and recovering from outbreaks of climate-sensitive diseases, such as early warning systems based on environmental information

Programme H2: Enhancing the adaptive capacity of the health sector

This programme aims at complementing the national efforts to strengthen the capacity of the health sector to address the impacts of Covid 19 with additional knowledge and capacity to contain the current and expected health impacts resulting from climate change either through extreme weather impacts or the possibility of spreading of climate related infectious diseases. Key measures to be applied under this programme include

1. Establishing an early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold
2. Building the capacity of public health and health care professionals to monitor, diagnose, and treat cases of climate-sensitive health outcomes, even when they change their incidence, seasonality, and geographic range

3.5 Urban Resilience and Disaster Risk Reduction

Sectoral Strategic Objective: Enhancing the resilience of urban structure to climate change impacts and supporting sustainable urbanization

Programme U1: Supporting urban green infrastructure interventions for climate resilience

This programme aims at introducing and applying green infrastructure measures in urban areas to address climate change vulnerability and impact through sustainable interventions at neighborhood levels with community participation. Key measures to be applied under this programme include

1. Preserve natural watercourses in urban areas through streaming flow and exploring the potential for creating new water courses.
2. Introduce climate responsive building techniques and elements to reduce the effect of heat and reduce demand on energy for cooling
3. Ensure that landuse planning in urban areas considers the impacts of climate change and the need to sustain urban ecosystem services
4. Promote Rainwater Harvesting in urban areas from rooftops
5. Establishing recreational parks developed and managed by community-based organizations (CBOs)
6. Providing incentives for rooftop farming in urban areas

Programme U2: Improving readiness for climate related disaster risk reduction in urban areas

This programme aims at enhancing institutional readiness of municipalities and community organization to anticipate and manage climate related disaster and risks, especially in the form of floods in urban areas. Key measures to be applied under this programme include

1. Mapping of flood prone areas in cities and designing alternative runoff routes to minimize risks.
2. Continuous maintenance of rainwater collection and drainage systems to

allow proper drainage in cities in times of flashfloods.

Programme U3: Enhancing community participation at local urban level for climate change resilience

This programme aims at enhancing institutional and coordination conditions to improved community participation in identification and addressing climate change impacts at community level in urban areas. Key measures to be applied under this programme include

1. Use of existing local based organizations and neighborhood networks to identify and respond to climate risks in urban areas based on participatory consultation and supporting joint actions.
2. Mandating urban municipalities to lead community based initiatives for responding to climate risks through institutional restructuring and capacity development.

Programme U4: Improving building efficiency for adapting to increased heat in urban centers:

This programme aims at improving the building resilience to climate change impacts through better insulation, sustainable cooling and energy efficiency measures among other interventions.

The programme requires modifications in building codes and other policy and regulatory approaches to improve efficiency in buildings. Key measures to be applied under this programme include:

1. Promote the use of energy saving devices, and raise awareness on the long-term benefits of energy efficiency and saving devices
2. Amendments to sector policies and regulations, such as building codes, to

reflect climate change risks and direct people towards insulating buildings to reduce energy demand

3.6 Coastal Zone Management

Sectoral Strategic Objective: Improving the social, natural and economic resilience of coastal areas to climate change impacts

Programme C1: Enhancing the sustainable use of marine protected area for climate change adaptation

This programme aims at enhancing management structures and objectives of marine protected areas to improve resilience to climate change as an integral component of its management plans. Key measures to be applied under this programme include

1. Conduct site-specific research on the carrying capacity for critical and marine protected area.
2. Modification of management plan of the Aqaba marine reserve to include climate change adaptation measures.

Programme C2: Support resilience of coral reefs to climate change impacts

This programme aims at increasing the resilience of coral reefs habitats in Aqaba to the observed and potential impacts of climate change including coral bleaching and increasing acidity of marine water. Key measures to be applied under this programme include

1. Increase knowledge of factors determining resilience and adaptive capacity of the Reef ecosystem to climate change.
2. Increase the capacity of Reef managers to maximize reef resilience and adaptive capacity through application of research outcomes

Programme C3: Use of ICZM for enhancing resilience of marine ecosystems

This programme aims at improving the use of Integrated Coastal Zone Management (ICZM) as a tool for marine environment protection as well as increased resilience to climate change impacts in both Aqaba and the Dead Sea. Key measures to be applied under this programme include:

1. Enhance and strengthen awareness programmes on climate change impacts on coastal areas, and empower communities to cope with its adverse effects
2. Identify vulnerable ecosystems to extreme events at the Gulf of Aqaba, and prepare the necessary response and emergency strategies
3. Include climate change requirements in the Environmental Impact Assessment conditions for coastal development
4. Create a central database that includes potential climate change adaptation strategies, plans, programmes and measures applied as well as investments made at Aqaba. This database should be freely accessible by the public and interested organizations
5. Avoid marine pollution from land sources in the Gulf of Aqaba in order to reduce the stress on coral reef and make them less vulnerable

Programme C4: Improving monitoring capacities for the state of marine ecosystems:

This programme aims at improving the existing scientific research and management capacities for monitoring of environmental indicators for the health of marine ecosystems in terms of climate change vulnerability and

impacts. Key measures to be applied under this programme include

1. Enhance current monitoring stations at Aqaba, increase their numbers and ensure a continuous flow of information adding sea level rise to its parameters
2. Strengthen database on coastal areas ecosystems, habitats and species
3. Strengthen the early warning systems
4. Monitor sea level rise along the coast of the Gulf of Aqaba

3.7 Socioeconomic Resilience

Sectoral Strategic Objective: Improving the adaptive capacity of social capital at national and local levels to climate change impacts

Programme S1: Integrating climate resilience in green economic recovery and development plans

This programme aims to integrate climate change adaptation measures and concepts into national economic development recovery plans. NAP programmes and measures will be integrate within the main national development plans including green recovery plans from Covid 19 pandemic, Jordan's resilience plans to address refugee influx and medium term national economic and development plans. Key measures to be applied under this programme include

1. Exploring innovative financing options for addressing climate adaptation and resilience projects and programmes with the reduction of availability of domestic resources.
2. Explore green economy, circular economy and green innovation as a way to create new and sustainable jobs in the growing green sector (energy, water, waste, agriculture etc), especially for young people.

Programme S2: Enhancing local adaptive capacity to climate change impacts through local climate action plans

This programme aims to increase local capacities at institutional and individuals levels to undertake local climate vulnerability analyses and develop, in a community participation approach local climate adaptation plans at municipal and/or governorate levels. Key measures to be applied under this programme include:

1. Engagement of local community in planning and designing of local climate change adaptation plans (community participatory approach)
2. Enhance climate related basic services to rural and vulnerable communities to reduce the negative impact of expected climate change effects
3. Supporting the enhancement of adaptive capacities at local and community levels as a key step in enabling local institutions to allocate resources and knowledge in local adaptation programmes
4. Enhancing the functions and accuracy of early warning systems against floods, droughts and other climate risks in poverty-stricken areas.
5. Inclusion of climate vulnerability and adaptation measures in municipal and regional landuse and masterplans.

Programme S3: integrating climate adaptation into national poverty reduction policies

This programme aims to highlight the importance of addressing climate resilience and climate adaptation measures in socioeconomic development plans with special emphasis on poverty reduction plans and improving services and sustainable livelihoods for communities

in poverty-stricken areas. Key measures to be applied under this programme include

1. Improving the existing social protection system to cope with climate change consequences and serve Jordanian segments of society including the poor, orphans, elderly, abused women and children among other vulnerable groups and individuals
2. Adopting poverty fight programmes fostering providing housing for poor people and supporting micro-projects for poor communities in light of unusual severe seasonal cold and hot weather conditions prevailed in the last decade
3. Developing emergency relief and aid

Programme S4: Mobilization of social capital for climate change adaptation

This programme aims at improving the capacities of all relevant societal groups, organizations and networks which are able to mobilize all societal groups like women, youth, children, political parties, etc... and engaging them in climate resilience and adaptation activities at national and local levels. Key measures to be applied under this programme include

1. Invest in youth as a future decision makers and key stakeholders that will contribute to adaptation to climate change
2. Enhancing capacity of MoSD staff to design and deliver climate resilient services to women and the poor
3. Enhancing leadership capacity of community-based groups (CBOs) to address climate change
4. Developing an inventory of climate resilient traditional techniques in natural resources management in water and agriculture sectors and utilizing traditional knowledge for local adaptation measures.

Programme S5: Integrating climate change impacts and adaptation into education curricula

This programme will ensure that climate change is incorporated from an early age to ensure that communities are equipped to adapt to the impacts of climate change. Key measures to be applied under this programme include

1. Raising awareness and engagement through formal and informal education means in climate change, environment and sustainable development in the community and among children and young people
2. Developing an enhanced, unified, common entry level education curriculum that includes new themes on climate change and environment (Raising Climate and Environmental awareness > contextualized materials for Jordan to be disseminated through a) social media b) informal settlements, c) schools d) youth centers and youth innovation incubators)

3.8 Adaptation Measures with Mitigation Co-benefits

Sectoral Strategic Objective: Addressing climate adaptation and mitigation in an integrated manner that provides co-benefits in various sectors

Programme N1: Increasing the share of Renewable Energy and energy efficiency for overall water supply

This programme aims at addressing one of the main challenges facing the water sector in Jordan, which is the increasing use of energy for water pumping, transfer and desalination. This high-energy intensity causes increasing

GHG emissions from the water sector and it can be managed in a way that provides adaptation measures with mitigation co-benefits. Key measures to be applied under this programme include:

1. Reducing GHG emissions by increasing the percentage of use of renewable energy for generating electricity for wastewater treatment and domestic water pumping and transfer to meet increasing household

demands for drinking and sanitation.

Programme N2: Enhancing reforestation activities for carbon capture and sequestration

This programme aims at enhancing reforestation efforts at national level to increase the capacity for Carbon sequestration and increasing vegetation cover and ecosystem integrity. A national combined programme for reforestation should also estimate precisely the GHG reduction potential of all reforestation measures. Key measures to be applied under this programme include

1. Stabilization of degraded soil at risk of land slide and erosion through reforestation programs that can sequester carbon
2. Improved forest management and protection, and the development of sustainable ecosystem services can help in avoiding deforestation or reforestation
3. Unsustainable use of wood and charcoal for fuel and cooking can be mitigated through avoided deforestation.
4. Trees plantation in urban areas can result in carbon sequestration as well as reducing urban heat stress.

Programme N3: Replacing GHG emissions practices with sustainable use of resources in agriculture sector

This programme will explore all potential measures that can replace GHG emitting activities in several development sectors with special emphasis on agriculture that reduce GHG emissions and enhance adaptive capacities to climate change impacts. Key measures to be applied under this programme include

1. Promote the use of biological controls and IPM practices in agricultural production and limiting pesticide use
2. Enhance the use of energy efficiency and renewable energy sources in mechanized agricultural production
3. The use of drought and pest resistant seeds, or implementation of organic farming methods may require lower levels of fertilizer inputs, resulting in higher productivity and lower net emissions per unit output from agriculture.
4. Adaptation programs for agriculture frequently have a high gender integration due to the creation of micro-finance and employment in the rural economy.



Chapter Four

Enabling Factors for NAP Implementation



Amman

4.1 NAP Implementation Strategic Objectives

In addition to the sectoral vulnerability analysis (chapter 2) and sectoral adaptation measures (chapter 3), the NAP process has identified key strategic objectives at the institutional and systematic levels that should be achieved to ensure proper NAP implementation in Jordan.

Based on the main institutional, technical and human capacity needs and gaps prioritized during the NAP consultation process,

a participatory identification of key strategic objectives for the implementation of the NAP document in Jordan was done.

A draft roadmap for the implementation of the NAP process was developed in a participatory manner for the six identified strategic objectives. Outputs and Key Performance Indicators (KPIs) are provided in table 4.1 below.

Box 4.1: The 6 main strategic objectives for the implementation of the NAP in Jordan are:

Strategic Objective 1: Strengthen institutional framework, governance, policies, strategies and legislations

Strategic Objective 2: Support the coordination mechanism between public, private community-based organizations and other relevant stakeholders and ensure mainstreaming NAP in their strategies Jordan

Strategic Objective 3: Improve knowledge, awareness and communication tools for an effective NAP implementation process in Jordan

Strategic Objective 4: Build a dynamic and sustainable funding instrument for NAP implementation in Jordan

Strategic Objective 5: Support research and capacity building programmes in the climate adaptation field.

Strategic Objective 6: Develop a data management system for climate change adaptation

Table 4.1: Roadmap for the implementation of the NAP process in Jordan.

Strategic Objective 1: Strengthen institutional framework, governance, policies, strategies and legislations		
#	Outputs	KPIs
1.1	The institutional setup of the MoEnv and other key related ministries is reviewed, upgraded and the NAP is mainstreamed effectively within public institutions.	Institutional setup the climate change considerations within updated institutional setups
1.2	Establishment of the Adaptation technical Group under the provision of the Climate Change regulation and preparation of ToRs for its functions and objectives	Adaptation technical group established and operational
1.3	All strategies, policies, plans, proposals, and monitoring & evaluation systems at sectoral and sub-sectoral levels enables the consideration of NAP, enhance resilience and decrease vulnerabilities toward climate change	Number of strategies, policies or action plans reviewed and included climate change and adaptation measures
Strategic Objective 2: Support the coordination mechanism between public, private, community-based organizations and other relevant stakeholders and ensure mainstreaming NAP in their strategies plans		
2.1	Increased coordination between various parties in implementing NAP.	Number of joint efforts established

2.2	Relevant stakeholders incorporate climate change and risks into their strategic and business plans	Number of sectoral and organizational strategies, policies or action plans which include climate change adaptation as an objective
Strategic Objective 3: Improve knowledge, awareness and communication tools for an effective NAP implementation process in Jordan		
3.1	Jordan's population is more aware about climate change and adaptation measures, and they adopt voluntary actions to minimize the risks of climate change	Number of community initiatives to address climate change impacts
3.2	Key decision makers in public and private organizations recognize the importance of adaptation to strengthen resilience and decrease vulnerability, and issue resolutions to adopt its measures effectively	Number of decisions supporting climate change adaptation
3.3	An outreach and communication strategy is developed and implemented effectively to inform public and relevant stakeholders about climate change risks and role of adaptation to address its consequences	Outreach and communication strategy developed and operational
Strategic Objective 4: Build a dynamic and sustainable funding instrument for NAP implementation in Jordan		
4.1	Efforts to mobilize and scale up financing sources (national and international) is strengthen and efficiently institutionalized to implement climate change adaptation and mitigation priorities	Number of funds mobilized for climate change adaptation in Jordan
4.2	Line ministries consider climate change adaptation in their annual budgeting, institutional capacities, and management	Budget of line ministries in Jordan that consider climate change
Strategic Objective 5: Support research and capacity building programmes in climate adaptation field.		
5.1	The capacities of the academic entities, researchers, students and professionals in adaptation to climate change are empowered	Curriculum developed with climate change within and number of research published
5.2	Research activities in climate change adaptation and resilience are funded by universities and academic institutions	Number of funded adaptation research in universities
5.3	Publishing of peer reviewed research papers in key scientific journals assessing climate vulnerability, climate projections and adaptation responses in Jordan	Number of published research cited by IPCC and other global research organizations and networks
5.4	Research toward climate change is competently integrated in decision making process and is contributing positively in achieving the adaptation measures	Decisions based on climate change-based research
Strategic Objective 6: Develop a data management system for climate change adaptation		
6.1	A national database with clear operations of Data Management System (DMS) including all relevant information on climate change and adaptation is available, accessible and updated on a continuous base	National database availability and accessibility
6.2	Data collection, analysis, interpretation, monitoring and reporting are part of the national database	Date collected and accessible
6.3	Supporting scientific research based on climate change data management systems	Number of scientific research papers published about climate change adaptation using national database

4.2 Integration between NAP and Covid 19 Recovery Plans

The Covid 19 pandemic has caused deep disruptions in the development process in Jordan as well as other countries. The immediate and urgent responses by government focused on expanding health services, providing resources for social safety nets and addressing socio-economic impacts of the pandemic on local businesses. It will be essential that any long-term development plan, including NAP should take into consideration the short-term impacts of Covid 19 on relevant development sectors and introduce measures to enhance long-term resilience for both climate vulnerability and related impacts from Covid 19.

At the level of domestic and international development financing, Covid 19 has caused a diversion of priorities from climate related development support into more urgent financing for improved health services and supporting social safety nets. The effect is more evident in the national budget where the new public budget for 2021 with a deficit of JD1.180 billion, accounting for 3.7 per cent of GDP, which is one of the highest in recent years. It is not expected that adequate domestic resources will be available for adaptation related financing, and the gap of financing should be supported through international financing.

The key impacts of Covid 19 on adaptation related sectors could be listed as follows:

1. Increasing the supply-demand gap in domestic water use due to lockdown and more water use at household level for proper Covid 19 safety measures including continuous washing and sanitation and hygiene measures (WASH).
2. Increasing the volume of domestic wastewater and pressure on wastewater treatment and disinfection.
3. Increasing costs of water pumping and maintenance of water utilities.
4. Disruption of normal agricultural production and supply chains and increase demand on locally cultivated food products.
5. Temporary reduction of the impact of mass tourism and hunting on habitats and wildlife.
6. Disruption of normal management operations of natural forests during lockdown time which resulted in accumulation of dry woods that were easily burned in the summer and causing a large number of wildfires.
7. Reduction of income generation for sustainably managed ecotourism activities in protected areas, which constitutes a large percentage of funding resources for protected area management.

A national green recovery plan for addressing the impacts of Covid 19 taking into consideration the elements of climate change adaptation can include the following policy measures of shared priorities at various sectoral and institutional levels.

1. Increasing the percentage of use of renewable energy for generating electricity for wastewater treatment and domestic water pumping and transfer to meet increasing household demands for drinking and sanitation.
2. Mapping of all critical habitats that include the presence of species that could act as vectors for zoonotic viral diseases and continuous monitoring of such habitats to minimize the risk of the appearance of more animal transmitted infectious diseases in the future.

3. Exploring innovative financing options for addressing climate adaptation and resilience projects and programmes with the reduction of availability of domestic resources.
4. Supporting the enhancement of adaptive capacities at local and community levels as a key step in enabling local institutions to allocate resources and knowledge in local adaptation programmes in cases of emergencies related to epidemics and restricted movements.
5. Enhancing food security and self-sufficiency potential in Jordan using climate resilient agricultural programmes that ensure availability and affordability of essential food elements without compromising the well-being of ecosystems and vulnerable habitats.
6. Applying nature based solution and green infrastructure options for climate resilient recovery since such projects are more sustainable and labour intensive.
7. Investments in enhancing the capacity and resilience of the health sector to Covid 10 can by default improve the adaptive capacity of the health sector to the existing and future vulnerability of health to climate change impacts that have been identified in the NAP document, especially early warning health systems.

4.3 NAP Policy Mainstreaming

Mainstreaming climate change adaptation into planning and budgeting within all vulnerable sectors and at all pertinent levels, is one of the main objectives of Jordan's National Adaptation Plan, thereby systematically reducing vulnerability to climate change in the medium and long terms.

In order to ensure the effective integration of climate change considerations into planning and budgeting processes in Jordan, the Ministry of Environment, through the Climate Change Directorate (CCD) will join efforts with the NCCC and other relevant line Ministries, namely (i) the Ministry of Planning and International Cooperation (MoPIC) and the (ii) Ministry of Finance (MoF). The CCD will aim to establish a strong inter-sectoral coordination mechanism that reinforces the commitment and the general recognition from key stakeholders of the importance of mainstreaming climate change adaptation into planning and budgeting processes, while providing them with enough human, technical and financial resources to fulfil their mission in an adequate manner. The most practical platform to support this mainstreaming objective is through establishing the Adaptation technical Group based on the National Climate Change Regulation. The group should develop clear terms of reference and mandate to determine its overall objective for coordination between various institutions and sectors.

The Adaptation Group should focus on the creation, update and accessibility of all relevant climate data and information needed for an effective integration of climate change adaptation at all levels. The coordination mechanism will serve as a place for the exchange of experiences and lessons learned from the incorporation of climate change adaptation into development and budget planning in Jordan.

A participatory exercise was undertaken within the NAP process to identify potential entry points for mainstreaming climate change adaptation into planning and budgeting processes within all relevant sectors and at all pertinent levels. One of the key findings resulting from the exercise was the flexibility of Jordan's planning system, which allows for the revision and adjustment of existing planning documents, without

having to wait for the end of their respective planning cycles. This provides a wide range of opportunities to mainstream climate change adaptation into planning processes in the country.

However, the integration of climate change adaptation into the national and sectoral budgets requires further work to introduce new and homogeneous codes to tag and track adaptation expenses. Furthermore, in order to align the NAP process with national budget procedures, budget priorities should be altered gradually to allow resources to be bounded by multiyear commitments and contracts, which applies to the majority of employees in the public service. Climate change adaptation-oriented projects and programmes will be entered into the budget systematically, while considering the entire budgeting system and its existing interrelations.

The appropriate legislative and regulatory frameworks will also be established for the successful incorporation of climate change adaptation considerations into development planning.

This relates to laws/acts/regulations applying to all vulnerable sectors, as well as regulations for the coordination of the institutional arrangements established within the NAP.

In Jordan, emphasis is given to the integration of climate change considerations at all levels, including the main national strategies, which provide overarching guidance for overall planning activities in the country, namely:

- The **Jordan's Vision 2025**, which is a long-term national vision and strategy, released in 2015. The vision charts a path for the future and determines the integrated economic and social framework that will govern the economic and social policies based on providing opportunities for all. Its basic principles include promoting the rule

of law and equal opportunities, increasing participatory policy making, achieving fiscal sustainability and strengthening institutions. The strategy is based on the identification of a set of goals that Jordan aspires to and identifies procedures and policies that will be adopted to achieve those goals. Within the "Vision 2025" document climate change was stated clearly under the Environment Sector as priority initiative to develop a legislative framework for the organization of climate change to maximize the benefits, minimize the negative impacts and build national capacity. This is considered as a promising entry point to initiate a national dialogue to develop a climate change legislative framework. Furthermore, the Vision 2015 represents an inter-sectoral opportunity to respond to climate change impacts.

- The **National Green Growth Plan for Jordan (NGGP)**: Focusing on six sectors critical to Jordan's development – Energy, Waste, Agriculture, Water, Transport and Tourism – the NGGP operationalizes a novel, yet practical green growth approach government can utilize to implement existing development plans and strategies, including Jordan Vision 2025, in a sustainable way. The NGGP will therefore be critical in catalyzing a transformational shift in Jordan's development pathway. In 2020 the GGGI and the Ministry of Environment have launched six sectoral action plans for green economy. The six action plans were used as a reference point for the development of various sectoral programmes and measures in the NAP document. More in depth structural integration should be explored in the future.

- The **Jordan Response Plan (JRP) for the Syria Crisis** was established to **coordinate**, guide and provide oversight to the preparation, implementation and monitoring of the JRP, which represented a paradigm shift by bridging the divide between short-term refugee and longer-term developmental response within a

resilience-based comprehensive framework. The JRP includes environmental screening tools for ensuring environmental safeguards in proposed projects but did not include specific reference to climate change adaptation or mitigations. It is recommended that future versions of the JRP include a climate vulnerability analysis to ensure that the JRP is sustainable and climate resilient.

• **NDC Action Plan:** Jordan joined the NDC Partnership in 2017 and requested support in five sectors: transport, water, energy, agriculture and health. The Government validated in 2019 a comprehensive project based NDC Action Plan detailing technical assistance and investment needs to deliver measurable and transformational action in those sectors.

The National Climate Change Committee (NCCC) has approved a process of prioritization of the NDC Action Plan and the list was communicated with international partners to document progress on NDC Action Plan. The process of designing the NAP programmes and measures has reviewed the NDC Action Plan and aligned adaptation related measures within NAP document.

• **Jordan's reporting on the SDGs: The NAP** document should be used to align with national reporting on SDGs. Many SDGs are directly related to climate adaptation and have been reflected in the various programmes and measures included in NAP. Table 4.2 Shows the direct relations between climate change adaptation objectives and SDG targets.

Table 4.2: main SDG Goals and targets that are directly related to climate change adaptation

Goals	Targets
1. End poverty in all its forms everywhere	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
2. Zero hunger	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
3. Ensure healthy lives and promote well-being for all at all ages	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
5. Achieve gender equality and empower all women and girls	5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
6. Ensure availability and sustainable management of water and sanitation for all	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
7. Ensure access to affordable, reliable, sustainable and modern energy for all	7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
11. Make cities and human settlements inclusive, safe, resilient and sustainable	11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

13. Take urgent actions to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries 13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt land degradation and biodiversity loss.	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

Finally, Jordan is also analyzing the possibility of mainstreaming climate change adaptation in the elaboration of Environmental and Social Impact Assessments of projects, to make sure that climate change is not affecting the economic and technical feasibility of the projects and that the project will not increase climate vulnerability of populations, ecosystems and economic activities.

4.4 NAP Financing Strategy

Adaptation Financing can be defined as the streamlined capacity of financial and non-financial resources channeled by the public, private or not for profit sector towards vulnerable local communities suffering from the direct and indirect detrimental repercussions of climate change- in attempts to lower the risks and thus the irreversible damage caused by the changes in the climate. A comprehensive understanding of the financing needs is still to be undertaken to meet the country's ambitions. In addition, climate adaptation-related expenditures are currently not tracked in the national budget, so there are no estimates of how much of the national budget goes towards funding climate adaptation-related activities.

Adaptation finance is increasing at a lower rate than adaptation costs (in a context of increasing and accelerating climate change) and therefore the global adaptation finance gap is increasing. The acute and chronic

impacts of Covid 19 have recently shifted scarce national financial resources to the immediate urgency of addressing Covid 19 impacts and lowered the priority of climate adaptation actions.

Jordan is highly dependent on external sources of finance and has been successful in accessing a wide range of bilateral and multilateral sources to finance adaptation including the Adaptation Fund in 2015. Jordan is positioning itself to access the Green Climate Fund (GCF) as the main multilateral public fund dedicated to climate finance. Jordan has received support from the GCF's readiness and preparatory programme, in particular to build the capacity of the Ministry of Environment (MoEnv) as the National Designated Authority (NDA). In addition, this support aimed to develop a pipeline of project concepts and capacity of the stakeholders to develop bankable project proposals, as well as raise awareness amongst private sector about climate-friendly investment opportunities in key sectors.

■ 4.4.1 Opportunities to Adaptation Financing in Jordan

Attracting finance for adaptation should also be considered within the wider development challenges Jordan faces. In particular, improving the investment risk profile of the country should be considered as a priority to improve the risk reward profile and

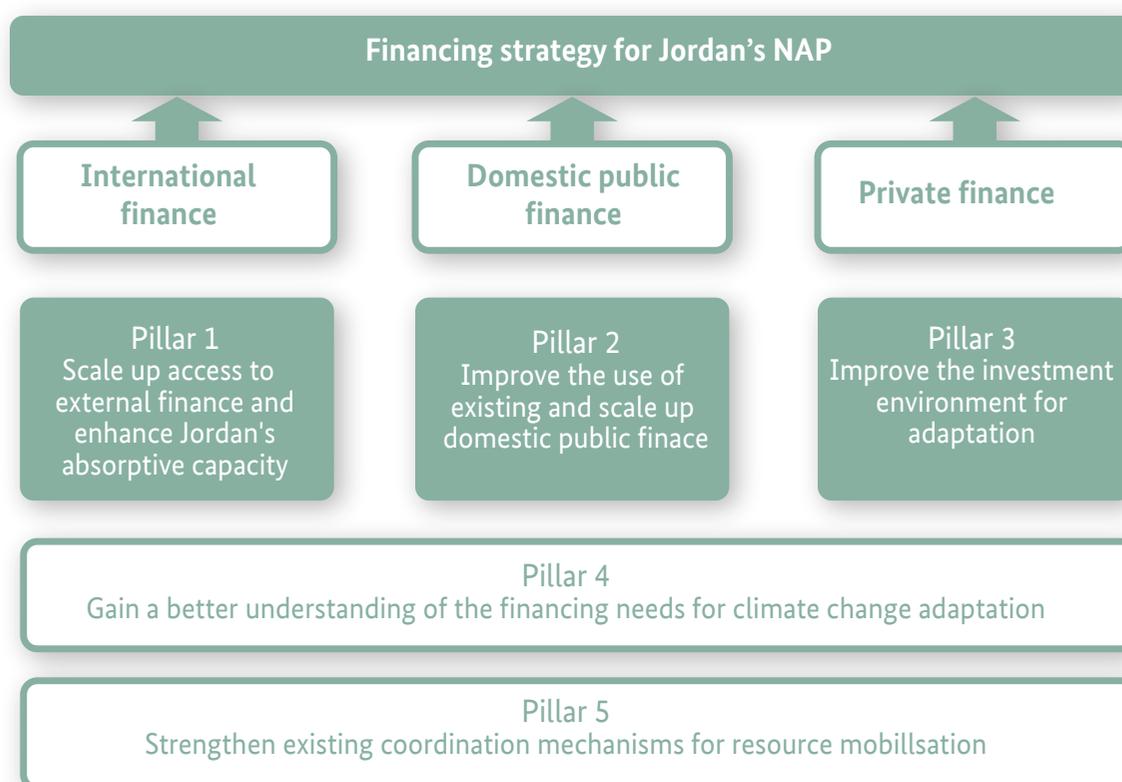
attract private foreign direct investment into adaptation. In order to access adequate funding to finance the implementation of the NAP, Jordan will evaluate the financial needs for climate change adaptation and continue developing and leveraging existing financing options, including existing national sources of funding whilst fully exploiting emerging international financing opportunities from external sources (including bilateral and multilateral).

Jordan will also respond to challenges created by its current investment risk profile to improve the risk reward balance and increase the attractiveness of the country to the international financial markets and private investors.

■ 4.4.2 Proposed NAP Financing Strategy

Based on a review of existing country’s access and untapped opportunities to finance adaptation, the financing strategy for Jordan’s NAP is structured around the following five pillars (Figure 4.1).

Figure 4.1: The pillars for a NAP Finance Strategy To improve the country’s absorptive



capacity, Jordan will develop the human and technical capacity of state and non-state actors to develop, manage and implement a pipeline of investment-grade adaptation projects. Developing and submitting funding proposals requires a deep understanding of specific requirements and access modalities of individual donors and funds. In order to effectively implement its NAP and its identified adaptation measures, Jordan will:

1. Develop an investment plan by identifying priority adaptation measures, costing them up and carrying out an assessment of the most viable funding options for further engagement with relevant stakeholders, including national state and non-state actors;
2. Identify appropriate modalities of access to the most viable funding options identified, by engaging with relevant

multilateral implementing entities, bilateral development partners and multilateral climate funds, to submit potential funding applications on their behalf;

3. Organize annual meetings with relevant multilateral and bilateral climate funds with a view to generate interest in developing a specific project and programme proposal for the implementation of the priority adaptation measures identified through the NAP and identify most viable funding options;
4. Build the capacity of and raise awareness amongst national stakeholders, including state and non-state actors, to access and plan effective and efficient uses of international climate finance. Awareness-raising could include providing information on climate finance sources on the information Centre of the MoEnv and other relevant platforms; and,
5. Develop projects/programmes working closely with the interested national or multilateral implementing entities for the priority adaptation measures with a view to attract finance for their implementation.

■ 4.4.3 Institutional Coordination for External and Domestic Finance

Proper allocation of external financing to NAP priorities requires effective in-country donor coordination mechanisms. For the case of Jordan, the Ministry of Planning and International Cooperation (MOPIC) is taking the necessary measures to benefit from initiatives and programmes launched by donors and international financing institutions. However, more concerted efforts and arrangements should be developed to enhance the coordination of all climate related financing support to Jordan.

In addition to this, in order to scale up existing domestic public finance in the longer term, Jordan will explore the design and use of new economic and fiscal instruments to raise funds and reform incentive systems to change behaviors. For example, some tax exemptions are currently applied to Jordanian companies investing in renewable energy and energy efficiency projects. This approach could also be used for climate adaptation purposes. Furthermore, ensuring the long-term stability of the tax regime will encourage companies' investments on climate change. Using green bonds is another option in Jordan, which requires setting a clear regulatory framework. Currently there is no information available on how adaptation-related expenditure is integrated into the national budgetary process. To complement efforts in terms of mainstreaming of climate change into development planning, a better understanding of existing trends in adaptation-related expenditures is required. To identify entry points for integrating climate change considerations into the budgeting process, Jordan will undertake a public expenditure review.

A public expenditure review provides a useful tool to scale up existing resource allocation/ advantage additional funding and conduct future trend analysis. This will also allow Jordan to better understand whether expenditure is complementary with the NAP and how expenditure relates to the designated role and function of different institutions responsible for managing the response to climate change. It will assess linkages between the NAP, the institutional structures through which policy is channeled, and the resource allocation processes whereby public funding is made available for the implementation of relevant projects, programmes and policies.

Thus, helping to identify best ways to link the NAP to the national budget, so that actions are fully prioritized and costed, as

well as, potential barriers and challenges, such as general weaknesses in public finance management and weakly defined institutional roles and remits that affect governance and limit the implementation of identified priorities. This could help define a way of tagging or tracking adaptation-related expenditures in the national budget. It will include a review of the following:

1. Budget planning processes, including how budget allocations are formulated and approved, as well as assessing whether climate adaptation considerations are integrated in decision-making;
2. Expenditure trends and categories, including estimating how much of the existing budget is spent on adaptation and resilience-building measures and the overall trends in the level of budget allocation to line ministries and other relevant government institutions;
3. Budget financing, considering the level and trends of domestic resources and external funds against expenditure categories. This may bring opportunities to reallocate, shift and optimize internal revenues for adaptation and resilience-building, such as changes in relevant policies and laws; and,
4. Systems to track climate finance received. This may help to strengthen alignment with national priorities.

■ 4.4.4 Mobilization of Private Investments

Private sector engagement in climate change adaptation has been limited so far or it has not been documented yet compared to private sector financing for mitigation actions. Most of the private sector interest and engagement on climate change seems to be in renewable energy projects to generate electricity and sell it to the national grid. During stakeholders' consultations in Jordan's

NAP process, the main barriers that emerged include lack of an enabling environment and market conditions as well as changing regulations, which increase the risk for the private sector. The private sector is however gaining increased awareness of the benefits in engaging in climate change adaptation and has demonstrated interest. The MoEnv, as the National Designated Authority (NDA) for the GCF, has accessed readiness support to increase its own capacity to engage in an effective way and raise awareness amongst private sector about climate investment opportunities.

Through the readiness action, Jordan will raise awareness amongst private sector actors (equity funds, financing institutions, project developers) and industry representatives (trade and bank associations) about climate-related investment opportunities in key sectors. This will include better understanding the challenges towards enhanced private capital involvement in climate-related projects to develop innovative solutions to overcome investment barriers and develop investment-grade projects that can attract financiers. There is also increasing interest from the international development banks and from the financial markets to use PPPs as a vehicle for infrastructure funding. In order to potentially take advantage of this, Jordan will take appropriate actions to ensure its PPP Policy is resilient, to avoid new legal and financial risks, increasing revenue costs and possible demand for additional capital expenditure.

4.5 NAP Communication Strategy

The overall aim of the NAP communications strategy is to “foster consensus on climate threats and the need for action to address them, and facilitate effective prioritization of NAP activities across government, in order to provide a favorable enabling environment

and mobilize domestic and international resources (public and private) to support adaptation”. The specific objectives of the NAP communications strategy include:

Increase the awareness and knowledge of the Government of Jordan, relevant stakeholders and public toward climate change adaptation initiatives and the NAP process through effective communication, education and capacity building.

1. Influencing ideas/changing perceptions among select groups (e.g. convincing the private sector of climate impacts on businesses)
2. Encourage wider participation and involvement in adaptation measures to strengthen the resilient of Jordan to climate change
3. Influence private sector to invest significantly and actively in climate change adaptation

4. Advocate for political commitment among key decision-makers for the NAP process and for prioritizing, managing and resourcing efforts to address climate change adaptation issues.

A strategic approach for communication is how to tailor and deliver key messages for priority audiences through the most appropriate communications channels. Adaptation to climate change requires the active involvement of many stakeholder groups and identifying and profiling these audiences is central to effective communications. Audiences include government decision makers, civil society groups, private sector organizations and the public. Each audience group requires tailored messages designed to resonate with their concerns and priorities, delivered via appropriate communications channels. Therefore, Jordan’s NAP communications is targeting four broad audience groups as represented in table 4.3 below

Table 4.3: Audience groups targeted in the communication strategy including their stakeholders

A1: Public sector stakeholders	A2: Civil society stakeholder	A3: Private sector stakeholders	A4: General Public
Ministers and advisors (executive) Civil servants and departments (bureaucracy) Elected representatives (Legislature) Courts (Judiciary) Political parties Local governments/ councils Security Departments International bodies (World Bank, UN)	Media Religious organizations Schools and Universities Social movements and advocacy groups Trade unions National NGOs International NGOs	Corporations and businesses Business associations Professional bodies Individual business leader Financial Institutions	Schoolchildren/ students. Women and girls Youth Urban professionals Rural workers. Manual workers.

■ 4.5.1 Communication to Public

Public sector stakeholders in Jordan, including government ministries, agencies and institutions will need to be engaged by NAP communications. The levels of knowledge and awareness of the NAP and of climate change adaptation is not even amongst stakeholders within this group, however they remain an important audience because they have a high level of agency to influence policy. NAP communications to audiences within this group will focus on:

1. Raising awareness of the implications of the NAP for specific departments, ministries, agencies and institutions.
2. Promoting the flow of information about the NAP process and its objectives amongst and between government departments, ministries, agencies and institutions, with a focus on knowledge transfer from agencies with high levels of awareness to those with low levels.
3. Engaging those ministries, departments, agencies and institutions that have the highest influence on government policy, notably the ministry of finance.
4. Improving access to information about climate change and its implications.

■ 4.5.2 Communications to Civil Society Organizations

Civil society organizations including NGOs, think tanks, community groups and the media are often more easily engaged on issues of environment and climate change. They also provide a good opportunity for messaging about the NAP to transfer to local communities and the wider public. NAP communications to audiences within this group will focus on:

1. Increasing ease of access to relevant information about climate change adaptation and the NAP process.
2. Stimulating dialogue over climate

change adaptation and its implications for the work of CSOs in Jordan.

3. Providing key messages and communications materials that can inform the work of CSOs.

■ 4.5.3 Communications to Private Sector

The private sector encompasses a wide and varied range of companies and businesses from large multinationals to small businesses. Their knowledge of and willingness to engage with issues related to the NAP will be equally varied. Reaching these audiences will be best achieved by engaging with trusted messengers, either prominent businesses that are leading on climate action or via industry and trade groups. NAP communications to audiences within this group will focus on:

1. Raising awareness of the implications of climate change for key economic sectors.
2. Sharing best practice adaptation actions from leading businesses.
3. Providing information about the objectives of the NAP in relation to various businesses sectors.

■ 4.5.4 Key Messages

It is important to tailor messages specifically to each target audience. Messages should be clear, engaging and designed to elicit a specific action. In general, messages should be concise and in plain language, avoiding technical jargon and acronyms. However, language that is more technical may be appropriate in cases where the target audience is intended to be technical. Possible messages that are relevant to Jordan's NAP communications include:

1. Adapting to climate change is a collective effort and everyone has a role to play.
2. Climate change will have significant impacts on the daily lives of people in Jordan.

3. Climate change will affect business and economy in the country.
4. There are practical steps that can be taken to become better prepared for climate change and its impacts.
5. Adapting to climate change makes economic sense and can have significant positive benefits for society and the economy.

■ 4.5.5 Communications Channels

An important part of successful communication is using the most appropriate channels of communication to reach the target audience. Many possible channels can be used for communicating key messages. These include:

1. Traditional media (television, radio, print newspapers, electronic media)
2. Social media (Twitter, Facebook, Snapchat)
3. Direct digital communications (email, WhatsApp, newsletters)
4. Other direct communication (telephone calls, in person visits, peer-led communications, meetings and events).
5. Targeted print communications (policy briefs, reports).

For greatest impact, the message, format of the communications materials and the communications channel should be selected carefully to complement each other.

4.6 Gender, Youth and Vulnerable groups' Integration

Climate adaptation can especially benefit the poor, who tend to live in areas more vulnerable to climate impacts and practice livelihoods that are more vulnerable. The special gains of adaptation will be greater and more equitable if poor and vulnerable

communities participate in the planning and design of adaptation plans and measures at local and national context.

The UNFCCC urge parties to mainstream gender across all activities related to the NAP process, with the aim of promoting gender equality in decision-making process, decreasing gender-based vulnerabilities, and to ensure that no burden to women specifically occurs due to the implementation of adaptation measures. In addition, part of the NAP process is to increase the adaptive capacity of vulnerable groups for the planning and implementation of policy and actions to deliver resilience benefits across all levels of society.

Climate change affects gender and vulnerable groups are linked largely to socio-economic impacts. It is therefore essential to address the socio-economic impacts of climate change on women and vulnerable groups. The collection, collation and analysis of sex-disaggregated data and information about the situation of vulnerable groups in a climate change context is still a shortcoming. Lastly, one of the key hindrances to work on the linkage of gender and vulnerable groups and climate change adaptation is the lack of sustainable funding, as most of NGOs working on gender and vulnerable groups' issues rely on financial support from external donors.

Climate change has affected and will affect the most vulnerable groups in the country depending on: where they live, their social and economic status and their access to services and knowledge on climate change. Access to decision making was also deemed important. The most vulnerable groups mentioned by participants in the consultation meetings of the NAP process were refugees and the hosting community, small to medium farmers especially farmers of fruit trees, rain-fed farming, livestock herders, children, urban poor, female headed household and disabled

Women have a workload vary from planting, harvesting, dealing with agriculture inputs and tool to food processing. Rural women help in securing food for their families; they manage home gardens to produce vegetables for family use and medical herbs. UN Women (2017) report noted that women in rural areas are more vulnerable to the effects of climate change, particularly because women constitute the majority of the poor and are dependent for their livelihoods on natural resource. In Jordan, almost 9.1% of female-headed households are food insecure or vulnerable to food security, compared to 5.7% of male-headed families.

Some of the key underlying causes of gender-based vulnerability to climate change are:

1. Low socio- economic status and less access to resources: natural (such as land, forestry, water) and financial; especially livelihood assets, which would enable them to cope with and adapt to major shocks and stresses.
2. Living in the rural and marginal environment prone to climate change or an urban environment that lacks of basic urban services. Communities living in a city setting and camps are particularly vulnerable to the adverse effects of water shortage as a main outcome of climate change.
3. The adaptive capacity of some vulnerable communities is low due to limited information on the effects of climate change. For example, the UN Women (2017) study showed that rural women demonstrated a limited knowledge and understanding of climate change at the conceptual and theoretical level, they perceive the negative effects of climate change through their field practices and experience.
4. The UNHCR report (2015) highlighted that with limited access to sustainable

livelihood options, many refugees have entered a cycle of asset depletion; most vulnerable refugees are particularly affected. Many are increasingly adopting negative coping strategies, including a reduction in food consumption, withdrawing children from school and taking on informal or exploitative employment.

5. The lack of awareness raising to the affected population, networking and leadership especially among marginalized women is perceived as the main obstacle to addressing climate change (UN Women, 2017).

Based on the analysis of the current situation and the results of the workshop “Mainstreaming Gender and Vulnerable Groups into the NAP process in Jordan” organized within the NAP process a set of concrete activities has been identified for an effective integration of gender and vulnerable groups concerns within the NAP process in Jordan:

1. Provide technical guidelines, based on the National Machinery to Promote Gender Equality, on how to integrate gender and vulnerable groups in each sector is planning and budgeting for adaptation to climate change.
2. Assess the degree of integration of gender and vulnerable groups’ concerns into existing climate change documents within all sectors and identify potential entry points.
3. Develop and apply “gender and vulnerable groups” sensitive criteria for selecting and prioritizing adaptation options.
4. Ensure data creation and accessibility to all relevant information for mainstreaming gender and vulnerable groups’ considerations into climate change adaptation planning:
5. Collect data and develop gender and

vulnerable groups' analysis for each vulnerable sector.

6. Consider gender and vulnerable groups' in climate change vulnerability assessments and socio-economic scenarios.
7. Target communities that have been identified as particularly vulnerable to climate change and develop specific strategies to empower them.
8. Define gender and vulnerable groups' sensitive indicators for climate adaptation monitoring and evaluation, easy to monitor, report against and showcase in line with UN SDGs.
9. Establish a transparent reporting mechanism and measure the progress and impact of the consideration of gender and vulnerable groups' issues into adaptation planning.
10. Learn from good practices and behavior change and make adjustments where needed.

Moreover, the empowerment of children and young people, for better engagement in climate change actions is crucial since they represent the majority of the population in Jordan. Children and young people are considered a vulnerable group to climate change, and they constitute a major element as future decision makers and key stakeholders which is part of the adaptation measures mentioned earlier. Therefore, youth should be considered through several means including the following directions:

1. Awareness rising: Awareness raising: children and young people need to be aware of climate change science and its impacts on various levels including environmental, social and economic. Therefore, the various entities especially the community-based organizations are responsible to lead youth-based

awareness programs toward climate impacts, identify the ways of youth participation and encourage them to be involved effectively. At the academic level, both school and university education materials should include deep understanding of climate change causes and impacts on society, population, economy, and environment.

- Capacity building and training: strengthen and build the skills and expertise of youth is vital to guarantee their active engagement in the climate change process, and it will also help to identify leaders at the local and national levels. Therefore, it is essential to identify the training path, develop curriculum, secure technical and financial resources and mainstream climate change into formal education and development planning.
- Advocacy and community mobilization: youth empowerment is a key to influence policymakers, if they are equipped with knowledge, skills and capabilities that will allow them to raise their voices and enable them to participate in political and social processes. Direct actions for allowing them this space should also be taken. Young people participating in national processes and climate change negotiations, can contribute to identify issues of climate inaction, and highlights areas of justice and equity in climate movements and enhancing resilience.
- Engaging with institutions: young people should take the opportunity to be engaged with institutions on different levels, to gain experiences and build capacities through the on-job training and networking opportunities. Engaging within the institutions will also aid youth to get the needed exposure through the participation in forums, workshops, networks, and

other means. Having them on-board will require providing them with the space to make official statements, provide their input, raise their voice, and interact with policy makers.

- Adapting policies and strategies to the needs and requirements of children and young people: policies and strategies should be responsive to the needs of children and young people and tailored to recognize the challenges they are facing.
- Financial allocations: in order to be able to engage children and youth effectively in the climate change process, it is necessary to secure, allocate and provide them with the needed funds to either engage them in research, jobs, attending workshops...etc.

4.7 NAP Integration in Research and Education

The following are key policy recommendations derived from the NAP process for the research and education sectors in Jordan to support the implementation of NAP:

1. Start systematically integrating climate change aspects, emphasizing on provisions of national adaptation policies into different grade levels of schools and other relevant components of the academic framework;
2. Enhancing research on climate risks, vulnerability and climate projections using modern reliable models with downscaling approaches
3. Supporting the participation of more Jordanian scientists and experts in IPCC working groups
4. Re-evaluate the curricula aiming at better educating and raising awareness of the students on climate change issues with emphasis on special departments teaching environmental sciences and management and issues related to climate change;
5. Mainstream a comprehensive and progressive climate change science and updated information into existing curricula starting with elementary schools up through secondary schools and universities;
6. There is the need to build a professional network of climate change adaptation experts for technical and vocational training in higher education, as well as for professionals in the public and economic sectors that could benefit from green growth;
7. Support initiatives aiming at improving climate change related education especially those lead by NGOs and the private sector by facilitating all efforts to securing the required financing and providing technical information available;
8. Integration of NAP priorities into the National Scientific Research Fund operated by the Ministry of Higher education.
9. Develop a network of universities that have faculties and programmes related to adaptation to coordinate efforts and enhance the role of such universities in adaptation planning and actions at the national level and local level.
10. Make all relevant climate information available to the public and to researchers through a specialized open access climate information portal in Jordan

4.8 Ecosystem Based Adaptation (EbA), Nature Based Solutions (NbS) and Green Infrastructure

Nature Based solutions (NBS), Ecosystem based Adaptation (EbA) and Green Infrastructure (GI) are three management concepts that have provided high potential in addressing climate change adaptation at national and local levels through sustainable, labour intensive and nature friendly measures. Such approaches are currently at the heart of innovative adaptation actions in the world with many best practices and they have been gradually building momentum in Jordan. Many of the programmes and actions explained in Chapter 4 carry the technical dimensions of these concepts.

EbA was officially defined by the CBD as “the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. It aims to maintain and increase the resilience and reduce the vulnerability of ecosystems and people in the face of the adverse effects of climate change (CBD, 2009). In 2016, nature based solutions were defined by IUCN as “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges affectively and adaptively, simultaneously providing human well-being and biodiversity benefits”. EbA is a well-established concept, embraced by UNFCCC and CBD. The conceptual difference between EbA and NbS is that NbS is used as an all-encompassing umbrella term for ecosystem-based approaches and EbA is a pillar of the broader NbS concept. This means EbA solutions are always NbS but not all NbS are EbA.

EbA measures complement or even substitute purely technological infrastructure

approaches. They tend to offer economic, social and ecological co-benefits and opportunities for the mitigation of greenhouse gas emissions as well as biodiversity conservation, disaster risk reduction and prevention of desertification.

Urban Green Infrastructure (UGI) is an urban planning concept referring to a strategically planned spatially explicit network of natural and semi-natural elements delivering a wide range of ecosystem services contributing to climate change adaptation and mitigation. EbA, NbS and green infrastructure can be implemented at both urban and rural levels.

It is noticeable that in the urban context, the built environment has largely taken over the landscape while the natural environment continues to contract. The first priority always needs to be the preservation of natural habitats and reducing human intervention. However, this is not always possible given the need for urban expansion to adapt to the needs of a growing populace. In this case, it is crucial to expand in the most sustainable way possible. This is where urban green infrastructure comes in. The integration and preservation of natural elements within urban development lowers the carbon footprint of a project and allows these elements to provide us with valuable services that maintain the resilience of the surrounding community.

With the mounting effects of climate change, it is becoming increasingly important to develop more sustainably. Green infrastructure is an effective tool in making this sustainable transformation and making sure that communities remain resilient in the face of extreme weather events. On the adaptation side, green infrastructure utilizes ‘green’ materials and natural materials that can support communities in absorbing the effects of extreme weather events. In traditional gray infrastructure, the effects of climate change have clearly shown that urban settlements are fragile when presented with

events such as flash floods, where people's health, belongings and livelihoods have been threatened. Droughts, sea-level rise, and other climate related occurrences are no different.

Green infrastructure makes communities more durable. It takes into the account the need for integrating natural elements and for a transition towards materials that are able to absorb the shocks caused by some of these events. The use of permeable ground cover materials and natural vegetation allows for better stormwater management through reduced water runoff. Local air is purified through the increase of green cover from trees and shrubs. Additionally, UGI allows natural habitats to persist and improves the health of local biodiversity.

As traditional gray infrastructure is proving to be less durable than originally planned, UGI is able to provide a support mechanism to existing infrastructure. The strain on current infrastructure networks such as urban drainage systems is reduced when the magnitude of water runoff is reduced. UGI interventions provide a cost-effective management solution to these issues since it reduces the need for the expensive infrastructure upgrades required to increase the capacity of existing systems.

UGI is an adaptable approach that can be implemented in different typologies, from roadsides to public plazas and parks. The benefits from these projects are not strictly environmental. There are also various social benefits resulting from UGI due to factors such as improved micro-climates and aesthetics which have positive health outcomes and allow people to enjoy these spaces more. Therefore, it is strongly recommended that UGI principles be adopted in most infrastructure projects through adoption of green materials and integration of natural elements such as trees and bio-swales.

At the rural level, Green infrastructure

describes a network of natural spaces and corridors in a specific region that together form flexible systems that provide areas for recreation, wildlife and biodiversity as well as other environmental services. Planning for green infrastructure supports the maintenance and rehabilitation of healthy ecosystems that are necessary to sustain well-being and functioning relationships to the natural context. Green infrastructure is a network of green open spaces in a specific area. When these elements are linked together, they work together and form a green network, which is known as green infrastructure. Green infrastructure can only be fully functioning as an inter-connective system where open spaces complement each other. There are a few principles that govern green infrastructure interventions, which are:

- **Habitability:** meaning creating a space that provides outdoor habitat for people, flora, and fauna by planning and developing green spaces, restoring the natural processes and planting native species.
- **Interconnectivity:** what is meant by inter-connective is that green infrastructure is most effective in providing benefits when it is part of a physically connected system.
- **Resilience:** is the ability to recover from or adapt to disturbance and change
- **Multi-functionality:** This principle refers to creating environmental, economic and community benefits through green infrastructure. In other words, providing ecosystem services from having multiple and overlapping functions across different systems, such as hydrology, transportation, energy
- **Identity:** This addresses the potential of green infrastructure to contribute to the visual definition of a place and creating a sense of place by providing valued attributes that make a place desirability to live in or visit.

- Return on investment: Green infrastructure can reduce costs and yield positive financial outcomes for governments, institutions, businesses, and citizens. For example, it can reduce gray infrastructure costs and lessen energy consumption. Furthermore, it increases land values, providing a catalyst for economic development.

Planning for EbA, NbS and GI requires system scale approaches to secure the provision of ecosystem services that contribute to adaptation. In many cases, this requires planning and coordination across national or jurisdictional boundaries, creating both a challenge and an opportunity for environmental policy frameworks and transboundary negotiations.

4.9 Local Level Climate Action Planning and Implementation

The implementation of NAP and related adaptation measures/programmes should be done also at the local level. A project has been launched in autumn 2018 to establish the framework and approaches for climate change adaptation planning at the subnational level, which includes guidelines for the integration of climate change adaptation in local development strategies and plans. The project has developed three local climate action plans in Jordan. In this process Jordan is gaining more understanding and expertise in the guidelines for selecting and developing adaptation plans at local level. The project has also developed a detailed guidebook to be used by local level (municipalities, local councils) to develop participatory based climate change local plans.

The guidebook proposes different stages for local climate change development plans, which are:

Formation of local community resilience group: this group should represent key local institutions and experts at the municipal level including community based organizations. Community groups are uniquely positioned to strengthen local resilience because developing effective policies and programmes requires understanding existing local capacities as well as local interests. The community group is selected (or recruited) from a larger set of identified informal and formal stakeholders. The individuals within the group that is recruited should be aware of community interests; connected with groups within the community; they should be influential as well as invested in the outcomes of municipal-led activities.

Baseline assessment: In this step, the committee will gather the most recent climate projection information available from national publications, which are listed in this section. It will gather information on ecological and socioeconomic conditions within the community to better understand demographics, economic drivers, health impacts, ecosystem services, and other issues. The resulting document will be the foundation of effort to identify climate change vulnerabilities based on Historical and Projected Climate Trends. This step should also identify the future climate impacts scenarios based on available meteorological data and other baseline data. Moreover, the baseline assessment step will also include identification of potential climate impacts based on climate vulnerability.

1. Identification of proposed climate actions: Based on the results of step two, the community group together with external experts should agree on goals in line with the NDC, NAP and the national strategies development plans. A list of actions at the local level should be categorized according to the various adaptation sectors (water, agriculture, biodiversity, urban, health, etc.).

2. Endorsement of the Local Climate Action Plan: Once the LCAP has been presented, collaborated on, and officially endorsed by the Ministry of Environment, approved by the Ministries of Local Administration and Ministry of Planning and International Cooperation and the Municipality's City Council.
3. Implementation: An Implementation Modality is the collection of strategies and interrelationships between components of importance to LCAP implementation.
4. Structures and steps.
5. Gender mainstreaming.
6. Circumstances, institutions involved and Actions.

The Implementation Team will begin by reviewing the highest priority vulnerabilities and their associated strategies to determine the timing for implementing those strategies. Any strategies that are both important and inexpensive or relatively easy to implement should be considered for first tier implementation. Other considerations include prioritizing strategies that represent multiple wins across the community or are "no-regrets" strategies. "No-regrets" strategies are those that are important for climate resilience, but are also just good to do even without looking through the climate lens. The implementation steps should also include continuous training of implementation team and conducting monitoring & evaluation tasks.



Madaba

Chapter Five

NAP Monitoring, Review and
Learning (MRL) Framework



Wadi Araba

5.1 Overview

Monitoring and Evaluation (M&E) of adaptation aims to track progress in implementing adaptation interventions, and/or measuring how these interventions are reducing vulnerability, improving adaptive capacity, and supporting the overall well-being of populations affected by the impacts of climate change. As more and more governments move from raising awareness for the necessity of adaptation to developing and implementing adaptation plans and policies, including the National Adaptation Plan (NAP) process, M&E of adaptation at the national level is gaining importance. The importance of having an adaptation M & E system can be expressed in three objectives:

1. Adaptation M&E can support the ongoing management of adaptation interventions by assessing progress and pointing out needs for adjustments.
2. Adaptation M&E can aid learning and exchange about pros and cons, which will help in improving the adaptation actions.
3. Adaptation M&E can provide accountability by demonstrating and reporting on results.

5.2 Key Experience in Adaptation M & E

The experiences gained through projects involving partner organizations working on climate adaptation from national policy to local implementation was summarized in GIZ's submission to UNFCCC Nairobi Work Programme in 2017 and have confirmed a number of important lessons learned:

- There is no one-size-fits all approach to adaptation M&E. Instead, the context and purpose determine which M&E approach is useful and appropriate.
- Adaptation M&E should not start with

indicators. In order to be useful, any development of an adaptation M&E system should first clarify the purpose, information needs and target audience before deciding on the M&E method and associated indicators (Leiter, 2016).

- Repositories of indicators can provide examples, but indicators need to fit the specific context and purpose. Illustrations of possible adaptation indicators have been found useful by practitioners to get ideas, but the formulation of indicators needs to still consider the specific context in order to be useful.
- Country-specific adaptation M&E systems differ from project or programme M&E. National adaptation M&E systems differ substantially between countries because of their different contexts and climate vulnerabilities. They employ different approaches depending on the purpose they are addressing, ranging from monitoring vulnerability over time to tracking the implementation of a climate policy or the collective performance of a portfolio of adaptation projects. Hence, national adaptation M&E systems are generally more diverse than methods used for project M&E, and developing national adaptation M&E systems can be more complex than just upscaling methods familiar from M&E of programmes and projects.

Some of the key challenges about the development of national adaptation M&E systems include:

- Clearly define the specific purpose and scope of their national adaptation M&E system.
- Lack of buy-in from line ministries and relevant government actors can impair the operationalization of adaptation M&E.

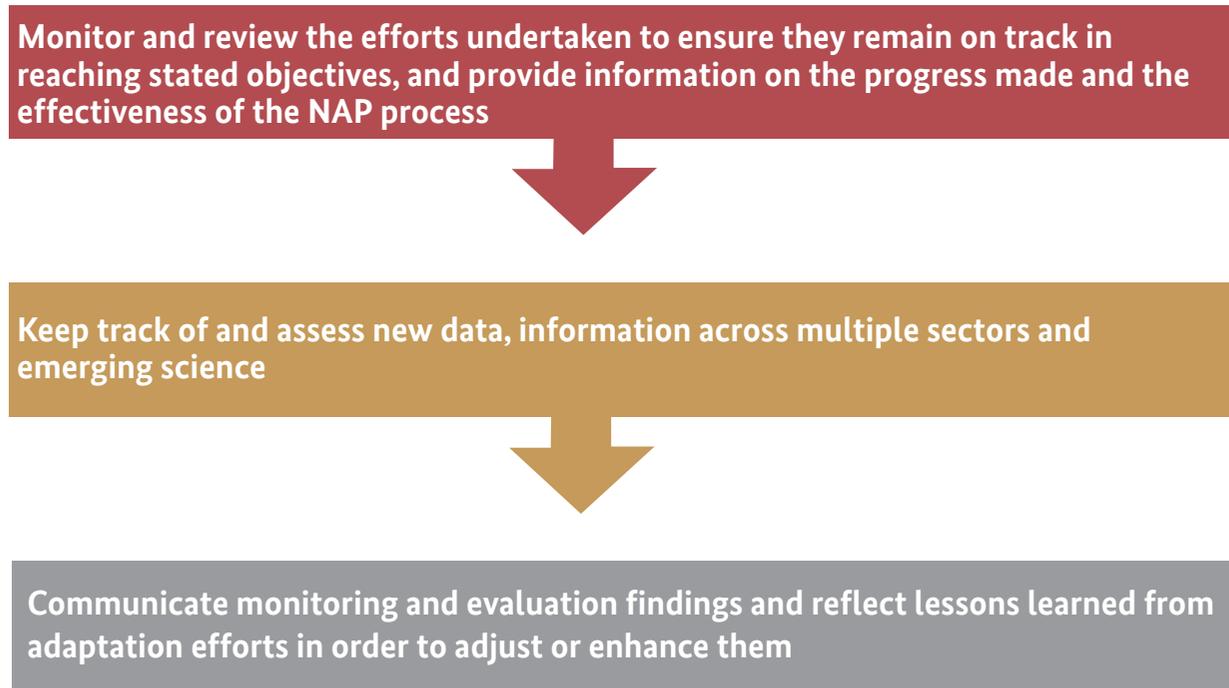
- The process of stakeholder engagement involving many government and non-government entities from national to sub-national level has been very time consuming in most cases and often resulted in multi-year development phases.
- Challenges of data availability and data sharing have also been reported.
- A limited mandate of the institution in charge of the development and coordination of adaptation information can lead to a delay or incomplete implementation of M&E.

5.3 Proposed NAP Monitoring, Review and Learning (MRL) Framework in Jordan

Jordan recognizes the need for the elaboration and implementation of a robust and flexible Monitoring, Review and Learning (MRL) system for the NAP process. In accordance with the UNFCCC NAP Technical Guidelines, and based on the results of a workshop with the Ministry of Environment and relevant stakeholders in the country, the MRL system for adaptation in Jordan is intended.

This requires collecting and assessing information on the NAP process and its contribution to the achievement of the country’s adaptation goals and providing outputs for communication and reporting.

to:Figure 5.1: Proposed M & E framework for adaptation in Jordan.



5.4 Components of MRL System

The main components of the MRL system will include: A framework for monitoring and evaluation of the progress of implementation of NAP process and the achievement of the outcomes, A design to operationalize the framework, including institutional arrangements, outline of specific information to be collected, methods for data collection and analysis, agreements on communication of findings to different target audiences at national, sub-national and international levels, and a synthesis of new information on impacts, vulnerabilities and needs to be used in updating the NAP.

The main purpose of MRL system of the NAP process in Jordan is to assess and report on progress made on addressing climate change in line with national goals and objectives of the NAP process, in order to support learning, transparency and accountability. This includes assessments of: The advancement in implementing specific adaptation policies, plans and/or investments, as well as all options enabling the implementation of adaptation measures or amplifying their impacts, Any outcomes resulting from those actions, i.e. whether adaptation actually leads to a reduction in vulnerability or increase in resilience.

MRL of adaptation in Jordan will be guided by the following principles, which are in line with the overall principles of the NAP process:

- Both process and outcome oriented: The adaptation MRL system in Jordan will assess the implementation of the NAP roadmap and the achievement of the process-related NAP goals. It will also evaluate the contribution of the proposed activities to the achievement of the outcome-related goals of the NAP.

- Gender and vulnerable groups - sensitive approach. The MRL system will focus on ensuring that the NAP process adequately addresses the needs of the most vulnerable groups (incl. gender and refugees' specific needs).
- Accountability and transparency. The MRL framework will emphasize on regular annual progress monitoring and periodic 3-years (mid-term) and 5-years (ex-post) in-depth evaluations to ensure that expected outputs, outcomes and impacts, are being achieved. The results of the MRL process will be used as an opportunity to comply with the transparency commitments of the Paris Agreement.
- Learning and communication. The MRL system will be designed to foster learning and sharing of information from monitoring and evaluation in order to address its purpose of improving adaptation practice in Jordan.
- Linking to relevant Monitoring and Evaluation (M&E) systems: The MRL framework for adaptation will create linkages with other existing Monitoring and Evaluation systems in Jordan, including the M&E system for the Jordan Biodiversity Strategy and Action Plan, the National Water Strategy, the implementation of the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction, among others.

The MRL system will be applied at both the national and sectoral level, mainly. However, emphasis is also laid on the sub-national level, where specific adaptation interventions are being undertaken. Qualitative and quantitative data and analysis from priority adaptation sectors, as identified in Jordan's Nationally Determined Contributions (NDC), will therefore be taken into account, including but not limited to:

- Vulnerability assessments and their respective updates to understand the development of vulnerability over time at the sectoral and local levels;
- Ongoing information from the implementation and results of:
- Relevant strategies, policies and action plans, and their specific adaptation goals;
- Adaptation or adaptation-related actions, within all sectors and at all pertinent levels;
- Baselines and targets for key strategic outcomes
- Adaptation expenditure.

This information might be gathered from a variety of sources including official documents, information from entities in charge of the implementation, insights from stakeholders and beneficiaries of adaptation actions and civil society, among others. The Climate Data Management System to be developed as part of the implementation strategy of the NAP process, will be an essential tool to facilitate the access and use of the information needed for the implementation of the MRL.

The Directorate of Climate Change in the Ministry of Environment will be in charge of the overall oversight of the MRL framework. It will organize participatory reviews of the progress on the implementation of the NAP process with key national, sectoral and local stakeholders.

The results of the review will feed into a report to be generated by the Directorate, made publicly available, and will inform the update of the NAP document. The Directorate will also undertake an assessment of the impacts of selected implemented adaptation activities in the country, based on sectoral data and reports from line Ministries and other governmental entities, and with the support of the technical focus

groups under the NCCC and relevant outside expertise. Public dissemination of lessons learnt will be done through the portal and other dissemination channels used by the Ministry of Environment, building on the communication and awareness-raising strategy developed under the NAP process.

Reporting on adaptation in Jordan should take a close look at developing guidelines for adaptation related Enhanced Transparency Framework (ETF) under the Paris Climate Agreement. Transparency of action refers to information each country has to provide on a regular basis in order to track the progress of implementing NDCs, national greenhouse gas inventory reports and information related to climate change impacts and adaptation. Transparency of support refers to clarity on the support provided and received for mitigation, adaptation, finance, technology development and transfer and capacity-building. Developed countries should provide information on the support they have provided, while developing countries should provide information on support required and received. For many countries, capacity-building support is a vital, yet complex task in the implementation these new requirements.

With the objective of recognizing and resolving the reporting burden in many countries, the Katowice Climate package was approved during the Conference of the Parties to UNFCCC (COP24) in December, 2018. The package provides further guidance on how to make the Paris Agreement operational on topics including NDCs and adaptation. Reporting on adaptation under the ETF can be through either one or more of the national communications, NDCs and NAPs

Jordan will specify its future adaptation communication form based on national consultations and the use of the most appropriate channel.

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