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Opportunities and gaps in the agriculture, water and land use sectors

Krystal Crumpler, Giulia Gagliardi, Theresa Wong, Mohamed Abdel Monem, Sandro Federici, Srijita Dasgupta, Alexandre Meybeck, Olga Buto, Janek Toepper, Mirella Salvatore, Julia Wolf and Martial Bernoux

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CONTENTS

CHAPTER 4

CHAPTER 5

CHAPTER 6

TABLES AND FIGURES

TABLES

FIGURES

FOREWORD

Since the signing of the landmark Paris Agreement in 2015, countries have made progress in solidifying their commitments towards low emissions and climate-resilient pathways. The nationally determined contribution (NDC) represents a country's commitment to act on mitigation and adapt to changes in climate, report on progress made, and identify needs for support. Over time, the NDCs are enhanced to reach the goal of limiting global temperature increases to within 2 degrees Celsius and adapt to climate extremes and variability.

Agriculture is one of the sectors most affected by climate change. It is with this in mind that FAO developed a series of regional-level analyses of the NDCs to assess the current commitments and identify opportunities and gaps in the agriculture sectors for enhancing mitigation ambitions and ensure effective adaptation. With the next round of revisions of the NDCs still being submitted, this report will help to take stock of the priorities, needs and cumulative commitments of the Near East and North Africa (NENA) region in the Agriculture, Water and Land use Sectors towards achieving the Paris goal. It will also help to set the baseline for understanding how new or updated NDCs have enhanced the role of agriculture in their mitigation and adaptation strategies over time. The report highlights the common features and priorities of the region – a region criss-crossed by great diversity in terms of farming systems and climate risks.

The years since the Agreement have been marked by the unprecedented effects of climate change globally. The first of the IPCC Sixth Assessment reports, issued in August 2021, confirms the irreversibility of many of these effects, including temperature increases, the onset of extreme events and sea level rise. These demand urgent action by countries and industries to drastically curb greenhouse gas emissions and scale up adaptation measures. The NENA region continues to suffer the consequences of being one of the most water-scarce areas in the world. Droughts, floods, storms, and locust outbreaks have had significant effects on agricultural productivity, compounding the increasing pressures on water and land resources. Looking ahead, regional projections predict temperature increases of between 1.7 to 2.6 °C, some of them up to 5 °C compared to pre-industrial levels. Rainfall will decrease in many areas, with precipitation becoming more unpredictable and extreme in others. The challenges is amplified in countries facing protracted crises, conflict and food insecurity.

NDCs shows that water scarcity, land degradation and desertification are the dominant slow-onset events of concern in the region. Crops, fisheries and livestock systems emerge as the most vulnerable to productivity decreases, pests and disease, soil erosion and water shortages. All countries prioritize adaptation, with priority strategies ranging from the deployment of drought- and heat-resistant crop and livestock varieties, land and soil conservation, to measures addressing food security and livelihoods with special emphasis on vulnerable populations such as on- and off-farm diversification.

Total emissions in the region are set to double by 2030 as compared to 2015 levels, and Agriculture, Forestry, and Other Land Uses (AFOLU) sectors contribute 15 percent of total emissions with the most prominent source being livestock. These results show tremendous potential to promote livestock-specific mitigation, such as improved feeding and breeding practices, and better integrated crop-livestock strategies to maximize adaptation co-benefits.

Countries are calling for the enhancement of capacities to track adaptation and mitigation progress, implementation of climate-smart agricultural practices, as well as bridging the climate finance gap for adaptation. As the report shows, agriculture is and remains a key part of the solution for addressing shocks and crises such as climate change. This was amplified by the recent Coronavirus disease (COVID-19) pandemic and its effects on food security and food value chains. Building back better through agriculture is one of the main objectives of FAO's NENA regional programme. The Greening Agriculture initiative articulates FAO's support to member countries on water, land, soil, biodiversity, and sustainable agricultural practices in an integrated manner. It aims to direct climate-resilient responses to address the unique

needs of dryland farming systems, especially the dominant rain-fed and irrigated systems. The report also informs the work of the Resilience initiative, which supports countries to reduce multiple forms of risks to agricultural livelihoods.

This analysis provides information on common priorities and pathways for improved coordination and understanding of the needs of the AFOLU sectors, including the achievement of related targets under the Sustainable Development Goals (SDGs). National experts, climate change focal points and negotiators already working closely with the United Nations Framework Convention on Climate Change (UNFCCC) and the Koronivia Joint Work on Agriculture (KJWA) will find data and resources on agriculture, water and land issues to support their work. FAO stands ready to support countries in enhancing information sharing, update and implementation of their NDCs towards increasing ambition and enhancing adaptation and sustainable practices in their agriculture, water and land use sectors.

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ACRONYMS AND ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
BAU	business-as-usual
BUR	biennial update report
COP	Conference of the Parties
COVID-19	coronavirus disease
DRR/M	disaster risk reduction and management
ESCWA	Economic and Social Commission for Western Asia
EWS	early warning systems
FAO	Food and Agriculture Organization of the United Nations
GCC	Cooperation Council for the Arab States of the Gulf
GDP	gross domestic product
GHG	greenhouse gas
INDC	intended nationally determined contributions
IPCC	Intergovernmental Panel on Climate Change
KJWA	Koronivia Joint Work on Agriculture
LAS	League of Arab States
LDC	least developed countries
LULUCF	land use, land use change and forestry
NAP	National Adaptation Plan
NAPA	National Adaptation Plan of Action
NC	national communication
NCC	National Climate Committee of Algeria
NDC	nationally determined contributions
NENA	Near East and North Africa
NGHGI	national greenhouse gas inventory

OECD	Organisation for Economic Co-operation and Development
R&D	research and development
RCP	Representative Concentration Pathway
SFDRR	Sendai Framework for Disaster Risk Reduction
SFM	sustainable forest management
SDG	Sustainable Development Goal
TNA	technology needs assessment
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
2030 Agenda	2030 Agenda for Sustainable Development

CHEMICAL FORMULAE

CO_2	Carbon Dioxide
Mt CO_2 eq	Million tonne of carbon dioxide equivalent

TABLE 1.

AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs: SUMMARY TABLE FOR THE NEAR EAST AND NORTH AFRICA REGION

FAOSTAT COUNTRY NAME	MITIGATION IN AGRICULTURE SECTOR	MITIGATION IN LAND USE SECTOR	ADAPTATION IN AGRICULTURE, WATER AND LAND USE SECTORS	DISASTER RISK REDUCTION	GENDER REFERENCED	CO-BENEFITS REFERENCED IN AGRICULTURE SECTORS	SUSTAINABLE DEVELOPMENT GOALS (SDGS) REFERENCED	NATIONAL ADAPTATION PLAN (NAP) REFERENCED	LOSS AND DAMAGE REFERENCED
NORTH AFRICA									
ALGERIA	✓	✓	✓			✓			
EGYPT	✓		✓	✓	✓	✓	✓		
MAURITANIA	✓	✓	✓	✓		✓		✓	
MOROCCO	✓	✓	✓	✓	✓	✓	✓	✓	
SUDAN		✓	✓	✓	✓	✓	✓	✓	
TUNISIA	✓	✓	✓	✓		✓			
NEAR EAST[1]									
BAHRAIN			✓	✓		✓		✓	
IRAQ	✓		✓	✓					
JORDAN	✓	✓	✓	✓	✓	✓	✓		
KUWAIT			✓	✓					
LEBANON	✓	✓	✓	✓					
OMAN			✓	✓		✓			
PALESTINE	✓	✓	✓	✓	✓	✓	✓	✓	
QATAR				✓		✓			
SAUDI ARABIA			✓	✓					
SYRIAN ARAB REPUBLIC	✓	✓	✓						
UNITED ARAB EMIRATE			✓	✓		✓			
YEMEN	✓		✓	✓				✓	

*Source: NDCs in Near East and North Africa region. *Agriculture, water and land use sectors include crops, livestock, forestry, fisheries and/or aquaculture.*

[1] According to the United Nations Statistics Division (UNSD), the following countries (Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, and Yemen) refer to "Western Asia." FAO refers to the listed countries as "Near East".

INTRODUCTION

BACKGROUND

The Paris Agreement constitutes a landmark achievement in the international response to climate change, as developed and developing countries alike committed to do their part in the transition to a low-emission and climate-resilient future. The Agreement seeks to limit global warming to below a 2 °C rise above pre-industrial levels and pursue efforts to stay within 1.5 °C, as well as sets a global goal on adaptation within the context of sustainable development. Underpinning the Agreement are the nationally determined contributions (NDC)[2] representing the main national policy framework, under the United Nations Framework Convention on Climate Change (UNFCCC), by which Parties communicate their commitments to mitigate national greenhouse gas (GHG) emissions and adapt to the impacts of climate change, and support needed or provided. The new rounds of NDCs will have the chance to build on the processes began in the first NDCs, including generating better knowledge, science, and stakeholder engagement to better represent sectoral priorities.[3]

The success of the Paris Agreement rests upon the enhanced ambition of Parties to progressively revise and strengthen their respective mitigation and adaptation plans over time (UNFCCC, 2015a).[4] The Paris Agreement requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. Being an iterative process, Parties are requested to "communicate by 2020 a new nationally determined contribution and to do so every five years thereafter" (Decision 1/CP.21). In 2023, the first global stocktake agreed upon under the Paris Agreement will assess whether the collective set of commitments and climate action is consistent with the goal of limiting the increase in the global average temperature to 2 degree Celsius (UNFCCC, 2015a).[5] The outcome of the global stocktake is intended to inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of the Agreement, as well as enhancing international cooperation for climate action.

The tracking of NDC implementation will take place under the Enhanced Transparency Framework, which provides a foundation for building mutual trust and confidence (UNFCCC, 2015a).[6] The so-called "Paris Rulebook" requires Parties to report reliable, transparent and comprehensive information on GHG emissions, climate actions and support, with built-in flexibility for developing countries under the principle of common but differentiated responsibilities and respective capabilities (UNFCCC, 2018).[7]

Linked to the Paris Agreement and NDCs are the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development (2030 Agenda), which sets out a vision for a hunger-free, more equitable, sustainable, peaceful and resilient world in 2030. Closing the emissions gap while safeguarding

[2] Intended nationally determined contributions (INDCs) are converted into NDCs when a Party submits an instrument of ratification, accession, or approval to join the Paris Agreement. For the purpose of this document, the INDCs and NDCs are collectively referred to as NDCs.

[3] To date (30 September 2021), five countries (United Arab Emirates, Morocco, Oman, Sudan and Lebanon) have communicated a new and updated NDC to the UNFCCC, respectively, while another three (Mauritania, Tunisia and Yemen, Jordan) have communicated their intention to submit a new or updated NDC this year (Climate Watch, 2021).

[4] Article 4.2 of the Paris Agreement.

[5] Article 14 of the Paris Agreement.

[6] Article 13 of the Paris Agreement.

[7] Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (FCCC/CP/2018/L.23).

food security and pulling millions out of extreme poverty can only be achieved in a context of sustainable development, and sustainable development can only be achieved if coupled with a low-emission and climate-resilient future.

The agriculture, water and land use sectors[8] feature prominently in first-round NDCs, with up to 89 percent of countries including the sectors in their mitigation contributions and up to 98 percent in their adaptation component (FAO, 2016a). As such, the Food and Agriculture Organization of the United Nations (FAO) has a critical role to play in supporting its Member Countries to leverage the mitigation and adaptation potential in the agriculture, water and land use sectors and harness synergies with sustainable development.

OBJECTIVE

FAO recognizes that its goals to eliminate hunger, food insecurity and malnutrition, reduce rural poverty and make agriculture, forestry and fisheries more productive and sustainable cannot be fulfilled without decisive action on climate change (FAO, 2013). Building on its longstanding leadership as a provider of technical knowledge and expertise on sustainable food and agriculture, FAO is committed to supporting member countries prepare for and respond to the adverse impacts of climate change. FAO's Climate Change Strategy outlines its commitment to enhancing countries' institutional and technical capacity to plan and implement NDCs; to improving the integration of food security and nutrition, agriculture, forestry and fisheries within the international climate agenda; and to strengthening the coordination and delivery of FAO's work (FAO, 2017a).

It is with this in mind that FAO developed a series of NDC analyses to better understand current priorities, barriers and support needs specific to the agriculture, water and land use sectors. At the 22nd Conference of the Parties (COP22), FAO launched its first global analysis of the NDCs, evidencing the significant role of the sectors (FAO, 2016a). In 2016, FAO assessed the main challenges countries face when moving from NDC planning to implementation and identified five priority areas for international support (FAO, 2016b). To date, several sector-specific NDC analyses have been developed at the regional level, namely for Eastern Africa (FAO, 2017b), Central Asia and Eastern Europe (FAO, 2019a), Asia (FAO, 2020b), the Pacific (FAO, 2020c) and the Caribbean (FAO, 2020d).

This report provides a unique, sector-specific synthesis of the NDCs submitted by countries in the Near East and North Africa (NENA) region. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture, water and land use sectors in the NENA are to raise mitigation and adaptation ambitions. The findings of this report will help countries to reflect on their progress in advancing toward NDC implementation of their agriculture, water and land use priorities, as well as illustrate potential areas for enhancing mitigation and adaptation ambition in future NDCs. The analysis also helps to clarify the links between the NDCs from the region and the 2030 Agenda and the Sendai Framework for Disaster Risk Reduction (SFDRR). Finally, the report serves as a guide to FAO, and other organizations in the region, to design targeted, evidenced-based programmes that support Member Countries to fill current implementation gaps and scale up climate action in the agriculture, water and land use sectors.

[8] For the purpose of this document, the "agriculture, water and land use sectors" refer to all assets (natural, economic, social and human) and activities (production, aggregation, processing, distribution and consumption) related to crops, livestock, forestry and fisheries and aquaculture systems, and the outputs of those systems, including environmental (eg. status of ecosystem services) and socio-economic outcomes (e.g. food security and nutrition) at the individual, community, national and global levels.

The report is divided into six chapters:

Chapter 1 describes the methodological approach, scope and data underpinning the analysis.

Chapter 2 provides an overview of the regional and subregional trends driving emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

Chapter 3 provides a synthesis of how agriculture, water and land use sectors are figured within the NDCs in the region. It also summarizes the types of barriers to implementation and support needs reported in the sector, as well as the types of policy processes that countries have set up to facilitate NDC formulation, implementation and tracking.

Chapter 4 presents an analysis of the mitigation and adaptation contributions presented in the agriculture, water and land use sectors, pointing to potential policy opportunities and gaps for future enhancement under future NDC revision cycles.

Chapter 5 assesses the alignment between climate actions in the agriculture, water and land use sectors and the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction.

Chapter 6 presents key messages and recommendations.

CHAPTER 1

CHAPTER

1

METHODOLOGY

1.1 GEOGRAPHIC SCOPE

Within the context of this report, the Near East and North Africa region comprises 19 countries: Mauritania, Morocco, Algeria, Tunisia, Libya in the Maghreb sub-region, the Nile valley (Sudan and Egypt), the Mashreq sub-region (Lebanon, Jordan, Palestine, the Syrian Arab Republic and Iraq), and the Gulf Cooperation Council (GCC) countries (Kuwait, Saudi Arabia, United Arab Emirates, Bahrain, Qatar, Oman and Yemen) (UNSD, 2020). The categorization of Maghreb, Mashreq and Gulf countries is often used to reflect subregional distinctions that map to general physical attributes and socioeconomic and demographic patterns. Three countries (Mauritania, Sudan and Yemen) are characterized as least developed countries (LDCs). Six countries – Algeria, Iraq, Kuwait, Libya, Saudi Arabia, United Arab Emirates - are members of the Organization of Petroleum Exporting States. For this analysis, all countries except for United Arab Emirates are considered developing economies. All 19 countries are members of the League of Arab States (LAS). The assignment of countries or areas to specific groupings is for statistical convenience and does not imply any assumption regarding political or other affiliation of countries or territories by the UN.

1.2 DATA

The report synthesises the data contained in 16 first NDCs and 2 INDCs (Iraq and Yemen), representing 18 non-Annex I countries, submitted to the UNFCCC as of 31 December 2020. At the time of publication, Libya has not yet submitted an INDC or NDC. Supplementary data sources include the most recently submitted national communications (NCs), biennial update reports (BURs) and technology needs assessments (TNAs). **Annex 1** contains a list of all national documents analysed.

At the time of publication (31 July 2021), five countries (United Arab Emirates, Oman, Morocco, Sudan and Lebanon) had communicated a new and updated NDC to the UNFCCC, respectively, while another three (Mauritania, Tunisia and Yemen) had communicated their intention to submit a new or updated NDC in 2021 (Climate Watch, 2021). FAO will develop a 2021 Global NDC Update Report to provide an overview of how the agriculture, water and land use sectors are represented in new/updated NDCs.

1.3 METHODS

In order to accommodate for the diversity of NDCs in terms of scope, format and level of detail, FAO developed a common framework for synthesizing information on the agriculture, water and land use sector components in the NDCs (FAO, 2020e). The framework breaks down the NDCs into five main pillars and sub-components specific to the agriculture, water and land use sectors. The framework was developed based on a global stocktaking of NDC content and alignment with internationally standardized terminology, such as those of the Intergovernmental Panel for Climate Change (IPCC) and UNFCCC. It provides a baseline structure for measuring and comparing NDC content, including mitigation and adaptation priorities and targets, barriers, support needs and planning processes, at the country level and across countries over time.

The methodology adopted to construct the various GHG emissions scenarios based on NDC data and the methodology behind the mitigation and adaptation analyses in this report is fully detailed in (FAO, 2021b).

CHAPTER 2

CHAPTER

2

REGIONAL CIRCUMSTANCES

The NENA region is highly diverse in terms of climate and farming systems, though with the commonalities of land and water resource challenges. These variables interact with social, economic and political characteristics to produce varying levels of vulnerability across the region. Given that climate change is a threat multiplier for water-scarce region, countries have emphasized innovation, adaptiveness and resilience in the agriculture, water and land use sectors to adapt to climate change impacts. This section provides an overview of the trends driving climate vulnerabilities, adaptive capacities, food security and nutrition outcomes in the region.

2.1 CLIMATE AND NATURAL RESOURCES

The region spanning North Africa and the Near East is dominated by a predominantly arid to semi-arid climate with high temperatures and low precipitation. The Sahara Desert imposes a heavy influence in the climate of North Africa, particularly Mauritania, southern Morocco, Libya, Egypt and parts of Sudan. Average temperatures range from 40 to 50 °C in summer and 5 to 15 °C in winter, with high daily fluctuations. With the exception of coastal zones, the Arabian Peninsula has a predominantly hot desert climate characterized by less than 100mm of rainfall a year and high diurnal and seasonal fluctuations in temperature. Average temperatures range from 40 to 50 °C in summer and 5 to 15 °C in winter. Southern Algeria, south Mauritania and central and southern Sudan have a transitional Sahelian tropical steppe climate, characterized by low variation in temperature and irregular rainfall ranging between 100 to 600 mm annually. Precipitation is not the main source of water for agriculture and other uses in the region, where groundwater and rivers such as the Nile, Tigris and Euphrates (that flow from outside the region) provide a significant amount of needed water.

Regional diversity in terms of climate, topography and natural resources produces numerous local climatic variations. A Mediterranean climate can be found in the northern and higher elevations of Maghreb and the Mashreq (western Jordan, Lebanon, Palestine and Syrian Arab Republic). In some of these highland areas (Lebanon, Syrian Arab Republic and the north-east of Iraq) and in parts of Morocco, Algeria and Tunisia, cold winters of below 10 °C can be found with average rainfall of more than 1 000 mm a year, and snowfall covering mountainous areas above 1 500 m. A semi-arid steppe climate dominates in a narrow transition zone in Morocco, Algeria and Tunisia, as well as in parts of the Mashreq – Jordan, Syrian Arab Republic, and Iraq. This transforms into an arid desert climate further inland.

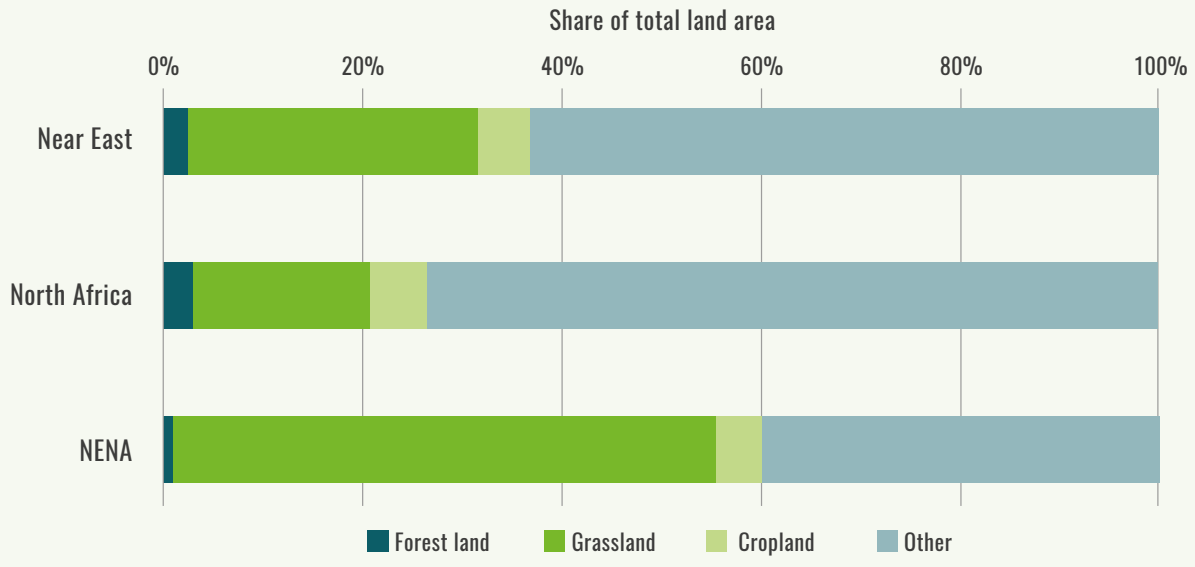
There is evidence of consistent warming trends across the region since the middle of the 20th century, with a significant increase in the frequency of warm days and higher temperature values. These include a consistent and significant increase in the frequency of warm days especially from the 1990s, higher extreme temperature values, and a more gradual but significant reduction in the number of cold days and increased frequency of heat extremes since the 1970s (RICCAR, 2017). Most of available station data in the region have limitations in coverage, consistency, accessibility and adequate functionality to record a full set of weather indicators. However, temperature trends tend to be more consistent and significant than precipitation patterns across the region.

Precipitation analyses show greater variability and less significant trends than for temperature, but subregional and country studies point to downward trends overall. This is the case in the Mashreq, notably in Iraq (1980-2011) and parts of Syrian Arab Republic (1955-2006), except for observed increases in the autumn for the northern part of central Syrian Arab Republic. Other studies for North Africa – Morocco, Algeria and Tunisia (1970-2002) – point to decreasing precipitation totals and reduced length of precipitation episodes, with particularly pronounced estimates for Morocco and western Algeria. Decreasing rainfall trends were also observed for the Arabian Peninsula, although these were less significant than for temperature, but more markedly, the rainfall decreases and increases in heatwaves were seen to be more significant after the mid-1980s (RICCAR, 2017).

Total land area comprising the NENA region amounts to approximately 1 242 million ha, or 9 percent of global land area. Almost 80 percent of the land area in NENA is classified as bare land, with grasslands, spare vegetation cover and cropland suitable for rainfed agriculture accounts for up to 5 percent of the land area. Irrigated areas constitute less than 0.7 percent of total area (Darwish, T, Atallah, T and Fadel, A, 2018). Around 5 percent of total land area is considered suitable for agriculture, while land for pasture accounts for 29 percent and 2.5 percent occupied by forest (FAO, 2020a).[9] The amount of arable land varies greatly, from 30 percent of land in Syrian Arab Republic and Lebanon being arable to only 0.5 percent in Oman and Saudi Arabia (FAO, 2019b). Almost 90 percent of the land area is subject to land degradation. **Figure 1** shows the land cover region/sub-regions, respectively.[10]

FIGURE 1.

LAND COVER IN THE NENA REGION (2018), BY TYPE AND SUBREGION



Source: FAOSTAT, n.d.

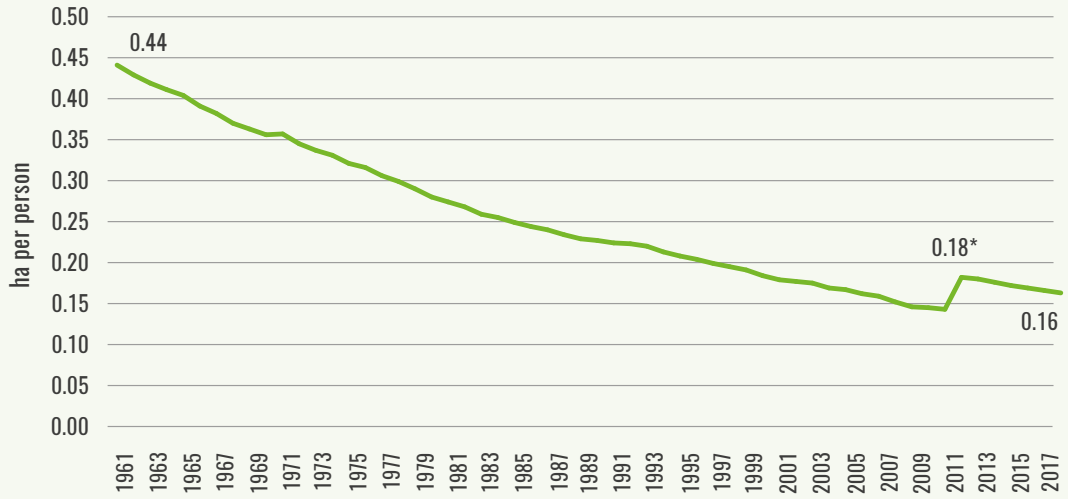
[9] Data from 2018.

[10] Data do not include Palestine.

The main threats to soils in the region are over-grazing and erosion loss of soil cover, and overuse of pesticides, herbicides and chemical fertilizers, which have resulted in salinization, depletion of fertility and soil organic matter and soil contamination. **Other issues, which are less extensive, include sand encroachment, excessive irrigation and poor drainage, wind and water erosion, water logging and in addition to urbanization (FAO, 2019b).** Land losses due to degradation in North Africa are amongst the highest in the world, with 73 percent of rainfed cropland in the Near East being classified as degraded (FAO and ITPS, 2015). The available cropland per capita has consistently decreased from 0.44 ha in 1961 to 0.16 ha in 2018 (**Figure 2**), owing largely to population increases. Similarly, the arable land per capita in the region has decreased from 0.4 ha in 1961 to 0.14 ha in 2018 (**Figure 3**). Economic losses from salinization of soil are estimated at United States Dollar (USD) 1.6 billion annually, up to USD 2 750 per hectare of affected land. In Syrian Arab Republic, 45 percent of irrigated area suffers from soil salinization. The threat is especially serious for the Nile Delta and for Oman's groundwater resources.

FIGURE 2.

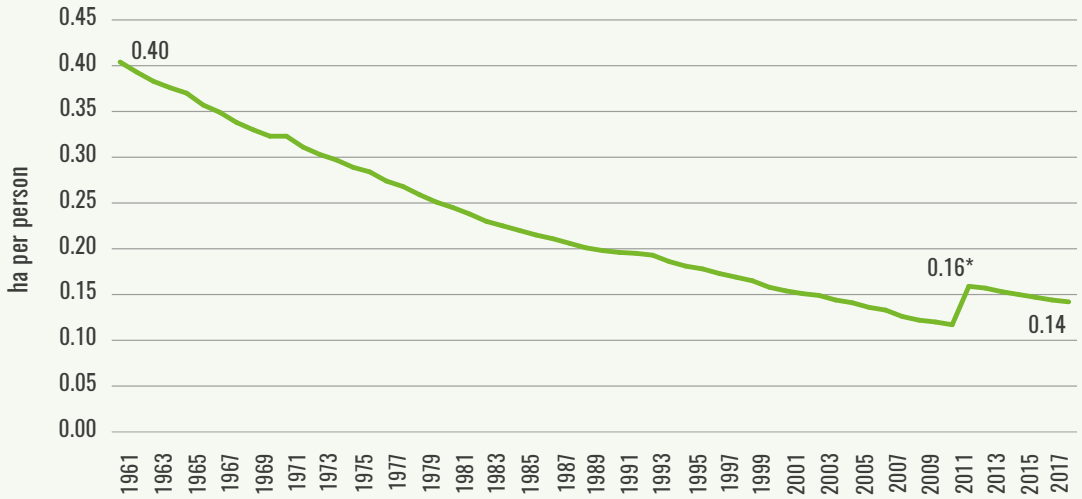
CROPLAND PER CAPITA IN THE NENA REGION (1961-2018)



*Source: FAOSTAT, n.d. * The level shift in 2012 is due to the inclusion of Sudan starting from 2012.*

FIGURE 3.

ARABLE LAND PER CAPITA IN THE NENA REGION (1961-2018)

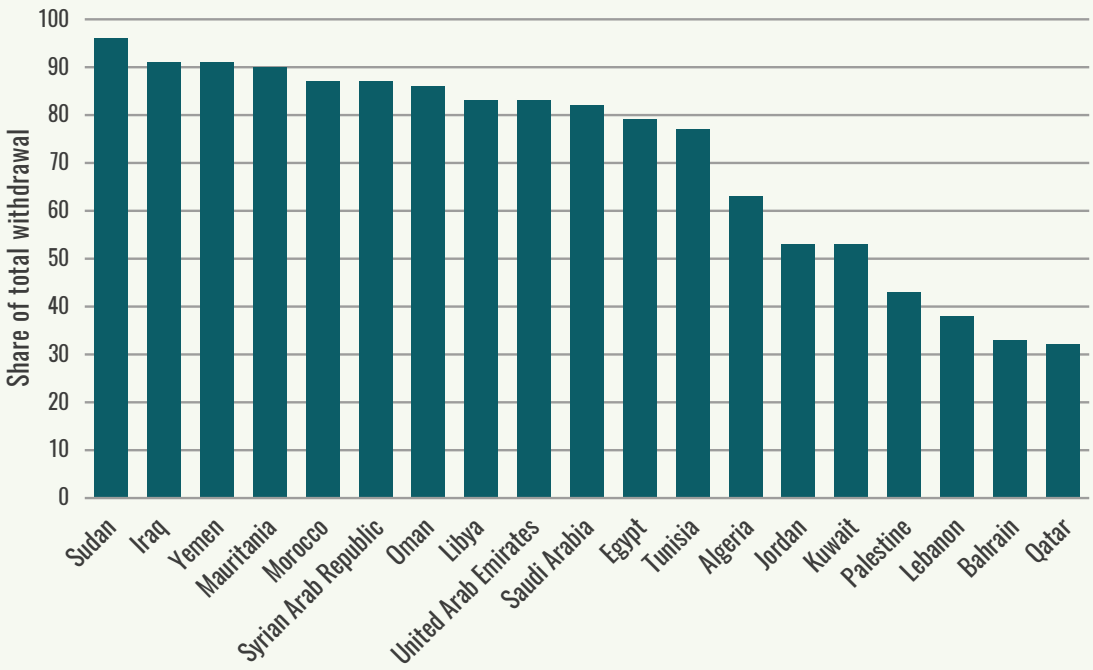


*Source: FAOSTAT, n.d. *The level shift in 2012 is due to the inclusion of Sudan starting from 2012.*

The NENA region is among the most water-stressed regions in the world, with 6 percent of the global population but only 0.6 percent of the world's accessible renewable water. Per capita freshwater availability has decreased by two-thirds over the last forty years due to population growth. Water availability is at 700 m^3 per capita per annum today, one-tenth of the global average, with seven countries classified as extremely water scarce (less than 100 m^3 of total renewable water per capita per year). Agriculture is the dominant water user, consuming over 85 percent of available resources on average (**Figure 4**). The pressures of population growth, rapid expansion of urban areas, past policies of water allocation, and over-extraction of groundwater have contributed to losses in quality and quantity of water resources. Degraded groundwater, surface water and soil resources are some of the main drivers for the lowering of agricultural productivity in the region (RICCAR, 2017).

FIGURE 4.

AGRICULTURAL WATER WITHDRAWAL AS SHARE OF TOTAL WATER WITHDRAWAL IN THE NENA REGION (2013-2017), BY COUNTRY



Source: FAOSTAT, n.d.

Groundwater resources are in heavy use in the region but remain largely unregulated, leading to rapid depletion of aquifers and deterioration of water quality. Many countries rely heavily on groundwater resources to supplement scarce surface water resources, especially for domestic and agricultural needs. Aquifer exhaustion can be seen in Yemen and Morocco, and Syrian Arab Republic, where water tables have plummeted. Over-extraction of groundwater is drying up springs and oases, such as the Azraq Oasis in Jordan. Where coastal aquifers are over-pumped, such as in the Gaza strip and Tehama in Yemen, there is seawater intrusion and increasing salinization of the aquifer (FAO, 2020f). Regulatory schemes based on institutional and technical measures (e.g. water saving technologies, water accounting and supply side measures such as recharge, incentives and trade policies) have been implemented with some degree of success, but these need to be more widely adopted and in conjunction with local participatory governance supported by monitoring and awareness-raising.

Rain-fed agriculture is the most common farming system in the region, dominating the Maghreb, Mashreq (except for Egypt) and the LDCs (Sudan, Mauritania and Yemen), followed by irrigated agriculture. Rainfed systems cover over 55 million hectares – more than two-thirds of the region's cultivated land) and are a source of livelihoods for two-thirds of the region's rural population (RICCAR, 2017).

In Algeria, Iraq, Jordan, Lebanon, Libya, Mauritania, Morocco, the Sudan, Syrian Arab Republic, Tunisia and Yemen, rain-fed agriculture is practised on more than half of all arable land, largely driven by population pressure. Irrigated systems occupy less than one third of the cultivated area (24 million hectares) while contributing almost half of total agricultural value, owing to the focus on high value-added commercial crops and generally efficient irrigation systems that result in higher yields (RICCAR, 2017). However, irrigation water withdrawals are affecting water availability in downstream areas and decreasing discharge to water bodies. The dependence on surface water for irrigation is also threatened by high evapotranspiration rates, leading to the shrinking of marshlands (such as in Iraq), dwindling river flows in the Tigris and Euphrates, and has resulted in the truncation of the flow of the Jordan River to the Dead Sea (RICCAR, 2017).

The water-energy-food nexus is highly pronounced in the NENA region, and the availability, use and management of any one of these three resources have direct and indirect impacts on the other two. The interdependencies, risks and trade-offs associated with this nexus needs to be better integrated in the institutional settings of most NENA countries, as these are administered by separate government entities at the national, provincial and local levels. Small-scale farmers in the region depend heavily on water and energy subsidies and are particular sensitive in shifts in these resources due to climate shocks or related policy shifts (FAO, 2018a).

2.2 POPULATION AND RURAL ECONOMY

The NENA region covers around one million hectares and the total population in the 19 countries in the Near East and Northern Africa is approximately 403 million, accounting for 5.3 percent of world population (FAO, 2020a).[11] Population growth is persistently high, averaging 2.2 percent across the region, with two-thirds of the population under 35 years old (WB, 2020).[12] Sixty-three percent of the region's population lives in urban areas, and this is projected to grow to 73 percent by 2050. The proportion of population living in or around smaller urban centres averages 51 percent, compared with 37 percent in or around large metropolitan areas. Smaller intermediate cities and rural towns, now home to over 40 percent of the urban population in the Near East and North Africa region, are becoming the main nodes for rural populations to access inputs, markets and public services; evidence indicates that these areas receive disproportionately lower investments for infrastructure and social services.

Agriculture as a percentage of gross domestic product (GDP) in 2016 was highest in Sudan, Mauritania and Syrian Arab Republic (around 20 percent), followed by Iraq (18 percent) and Morocco, Algeria, Egypt and Tunisia (10 to 12 percent) (WB, 2020).[13] Total GDP (**Figure 5**) was 3.2 trillion USD, with the largest shares owing to the economies of Saudi Arabia, the United Arab Emirates, Egypt and Iraq. Countries with the highest GDP per capita are Qatar, the United Arab Emirates, and Kuwait respectively, with the lowest GDP per capita rates in the region found in Sudan, Yemen, and Mauritania. The countries with the highest proportions of employment of women in agriculture are Sudan, Morocco, Mauritania and Yemen (from 47 to 55 percent of workforce), whereas representation of women is lowest (near zero) in GCC countries.

Forty-three percent of the population live in rural areas, and NENA's rural population absorbs 70 percent of the region's poor who are largely dependent on agriculture (FAO, 2017c) . The regional average of 16 percent of the labour force in agriculture produces only 5 percent of the GDP of the region (**Figure 6**). There is a declining share of agriculture and an increasing share of industry and services in GDP and employment (FAO, 2019c). Small-scale farmers with limited access to irrigation sources are amongst the poorest in the region. The level of agricultural productivity particularly for cereals and livestock remains below that of other regions and below potential. Most of the region's food is produced by

[11] Data from 2018.

[12] Data includes Iran from 2018.

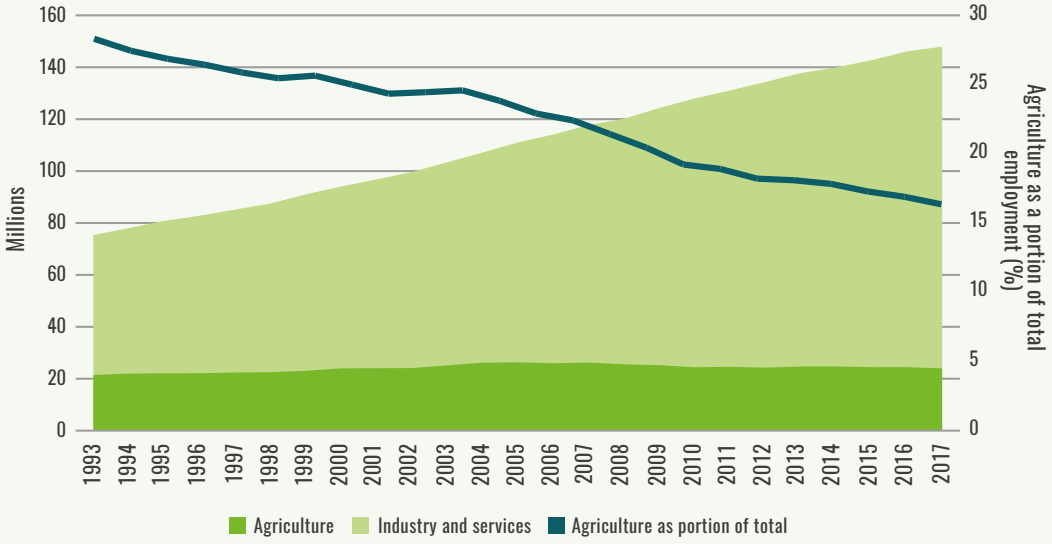
[13] Data from 2018.

smallholders, which means increasing their productivity is key to improving food security and decrease rural poverty (FAO, 2015). Smallholders face high youth employment, lack of financial resources as well as the challenges of water scarcity and climate risks.

Forty percent of the region's overall food supply come from imports, which makes the region particularly vulnerable to global shocks (FAO, 2020g). The major challenges for food availability for the region include the need to enhance agricultural productivity, reducing food loss and waste, managing food imports, sustainably managing water resources, and addressing demographic pressures (FAO, 2020g). Policies could be better oriented towards enhancing research and development (R&D) in efficient and scalable technologies throughout the value chain and strengthening farmers' associations and extension services.

FIGURE 5.

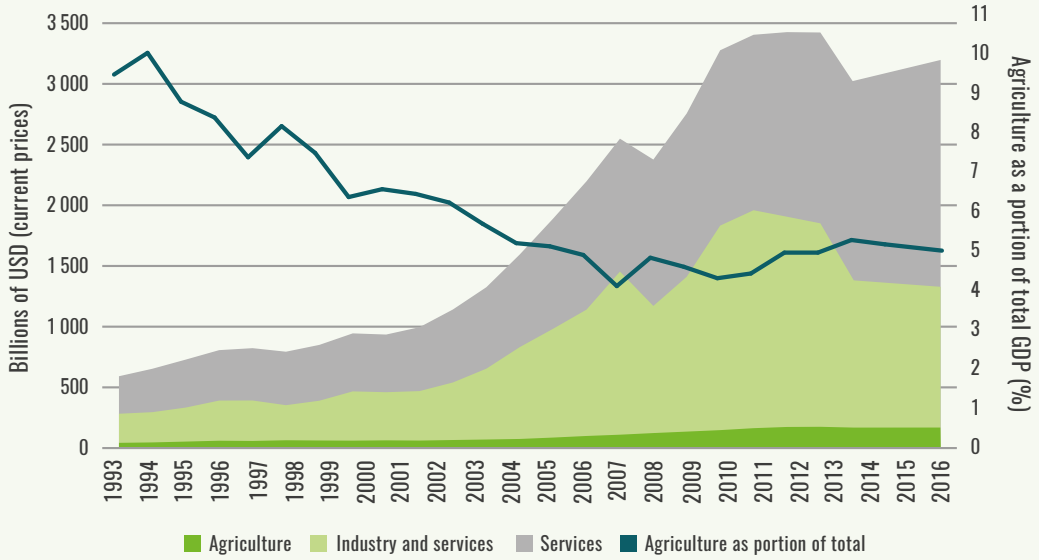
LABOUR FORCE BY SECTOR IN NENA ECONOMIES, 1993-2017



Source: World Bank Data, n.d.

FIGURE 6.

VALUE ADDED BY SECTOR IN NENA ECONOMIES, 1993-2016



Source: World Bank Data, n.d.

2.3 FARMING SYSTEMS

Five major farming system types are identified as predominant in the NENA region: irrigated, highland mixed, rain-fed mixed, dryland mixed and pastoral farming (FAO and WB, 2001). Sparse and arid land, primarily used for nomadic pastoralism, covers 62 percent of the region; however, the majority of the agricultural population lives outside of this arid zone, falling within the highland mixed (30 percent), rainfed mixed (18 percent), irrigated (17 percent), and dryland mixed (14 percent) farming systems (FAO and WB, 2001). The main rainfed crops are wheat, barley, legumes, olives, grapes, fruit and vegetables.

In the Maghreb, the rainfed mixed farming system is the most dominant, covering southern Mauritania, northern Morocco, north-east Algeria and northern Tunisia, but dryland and highland mixed systems exist, as do farming and fishing on coastal stretches. Rainfed and highland mixed farming are found in the northern face of the Atlas Mountains, with dryland mixed found on southern and north-eastern plains. In Tunisia, dryland mixed farming dominates the north-eastern coast, while pastoralism is found south of an arid, sparse band. In other parts of Mauritania, livestock provides employment to 60 percent of the country, and fishing is a major source of income (FAO, 2018a). Compared with other Maghreb countries, Algeria has little arable land, though rainfed and dryland systems are dominant in the northern narrow coastal strip. Libya's main crops are wheat, barley as well as olives, dates, potatoes and onions. These are produced entirely in small, coastal dryland mixed farming systems outside of the sparse arid desert that dominates 90 percent of the country (FAO, 2018a).

In the Mashreq, rainfed mixed farming systems dominate Lebanon, northwest Syrian Arab Republic and the northern headlands of the Tigris River, while dryland mixed farming systems are found in western Syrian Arab Republic and the headlands of the Euphrates (northern Syrian Arab Republic) and Tigris rivers (northern Iraq). Dryland mixed farming systems are dominated by livestock grazing and cereal and pulse cropping. The land along the Euphrates and Tigris rivers is irrigated and focused on rice, maize and sunflower cropping, but livestock is also kept by most farmers. Pastoralism is found across Syrian Arab Republic and extending into north-western Iraq.

Farming along the banks of the Nile in Egypt and Sudan is almost entirely irrigated, with pastoral systems lying directly outside of this irrigated land on both banks (FAO, 2018a). Eighty million people live in agricultural zones supported by large-scale irrigation, which produces high value crops, fruit and vegetables and export crops. Small-scale irrigation is widespread across the region including in arid and high altitudes and found within larger rainfed systems. These support the production of cereals, vegetables and fodder. Where field crops are not grown, horticulture (oranges, tomatoes and potatoes) is widely practiced. Outside of these bands, and particularly in Sudan, cereal and root crop production systems dominate, together with agro-pastoral, pastoral and sparse (arid) farming systems. Pastoral livelihoods in the north extending along the Nile and tributaries include nomadic, semi-nomadic (transhumance) or agro-pastoral systems.

The analysis of climate-impacted farming systems (CIFs) found that rain-fed, irrigated and pastoral farming systems are likely to be the most severely impacted by the effects of climate change. A FAO study conducted in 2018 brought together the FAO farming systems approach with NENA climate change data to identify the farming systems that are most vulnerable to climate change.[14] The study found that cereal, horticultural and perennial crops will see reduced yields. High value crops such as olives are projected to decrease by 65 to 90 percent under the IPCC Representative Concentration Pathway (RCP) 4.5 and by more than 90 percent under RCP 8.5 by the end of the century (FAO, 2018a). Wheat – the main staple crop for the region – and barley are projected to suffer yield losses in most farming systems. Given that wheat is used for direct consumption by farmers as well as for sale, this has serious implications on food security and

[14] Lewis *et al.* (2018) assessed data from the multi-partner project Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR, 2017). Climate change data was generated through downscaled projections from three global circulation models (EC-EARTH, CNRM-CM5, and GFDL-ESM) applied using the regional climate model RCA4 to provide higher-resolution information (at 50 km scale). The data was reported for two climate scenarios at mid-century (RCP 4.5 and RCP 8.5), one moderate and the other more severe.

incomes. While many small-scale farmers already employ integrated crop-livestock systems that increase their adaptation capacity to climate change, there is a need to support options for diversification.

Fifty-three percent of households in Yemen – the final major climate-impacted farming system - practice agriculture as the main source of livelihood, while 48 percent of households practice mixed farming with crops, dairy cattle, and small ruminants (FAO, 2018a). Cereals, coffee, fruit, livestock fodder, and qat account for 80 percent of crop production. Since the outbreak of conflict, there has been a 40 percent reduction in agricultural production due to reduction of land under cultivation and increased cost of agricultural inputs, with severe impacts especially on small-scale farmers (FAO, 2018a).

Sea level rise, heat stress, plant pests and diseases, and sand and dust storms are other climate risks that threaten farming systems across the region. For example, Oman's agriculture is largely centered on coastal regions dominated by horticulture, fruits and cereals, which face threats from an increase in evapotranspiration rates, increasing frequency of cyclones and salinization of coastal aquifers and soils due to sea level rise. Sand and dust storms are expected to intensify due to land degradation and desertification, threatening soil fertility and potentially limiting agricultural productivity for affected areas in Iraq, Jordan and Syrian Arab Republic (FAO, 2018a). Changes in temperature and precipitation are expected to alter the behaviour of plant and animal pests and pathogens, including their physiology and spread. For example, wheat leaf rust is now developing earlier in the season due to temperature increases (FAO, 2020h) while the large-scale desert locust swarms in East Africa and parts of the NENA region in 2019 have origins in unusually large cyclones that occurred over the Arabian peninsula.

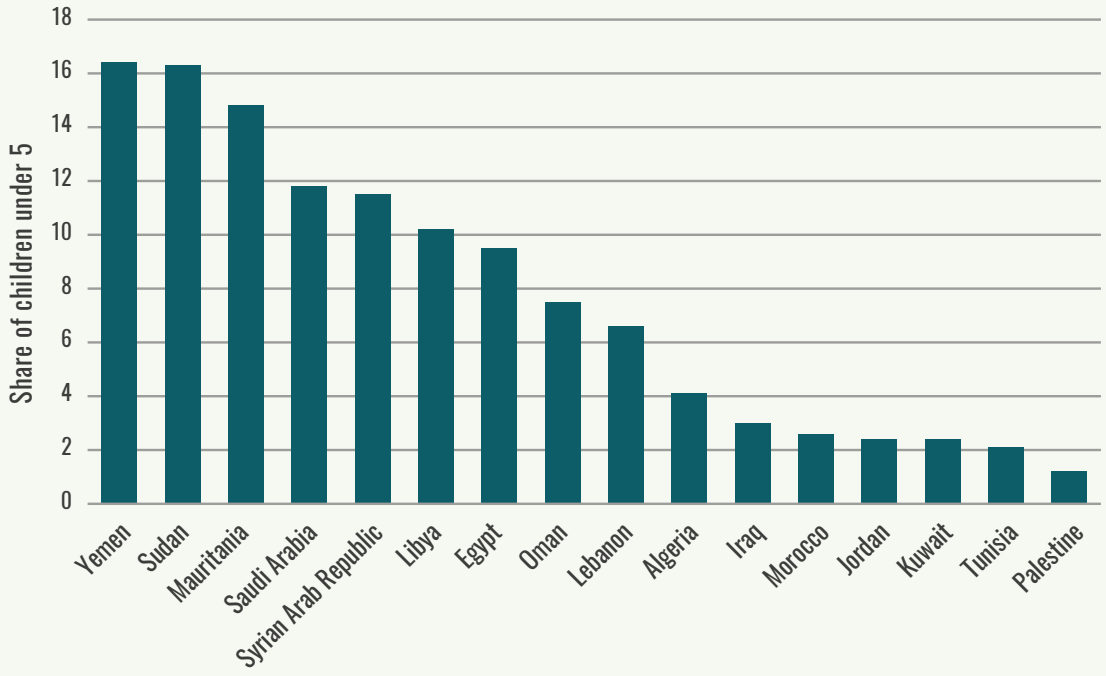
2.4 FOOD SECURITY AND NUTRITION

The region is affected by multiple burdens of malnutrition coupled with increases in obesity, particularly related to women and children.

Conflict and protracted crisis are the main drivers of hunger, though pockets of persistent hunger exist across the region in non-crisis settings, particularly in rural areas. The prevalence of undernourishment has risen from 23 to 26 percent in the five conflict countries since 2011-2013, remaining stable at about 5 percent in non-conflict countries. Yemen reported the highest increase in the prevalence of undernutrition (PoU) (8.8 percent increase), followed by 7.6 percent in Lebanon. In non-crisis settings, significant improvements have been made in combating undernutrition, with absolute numbers of undernourished people falling in Algeria, Morocco and Tunisia between 2016-18. However, during the same period, it rose in, Egypt, Iraq, Jordan, Lebanon, Mauritania, Saudi Arabia and Yemen. Overall, the prevalence of undernutrition in the Arab region is 13.2 percent and increasing (FAO ***et al.***, 2020). Stunting and wasting amongst children under five years old are lower than they were thirty years ago, but several countries record higher than the global average for low-income countries. Some of these (e.g. Sudan, Syrian Arab Republic, Yemen) are linked to conflicts and protected crisis, but others (Egypt and Mauritania) call for integrated policy responses linking nutrition, education and improved food and agriculture policies (FAO ***et al.***, 2020). Figures 7 and 8 illustrate the share of children under five years affected by wasting and who are stunted in the NENA region, by country.

FIGURE 7.

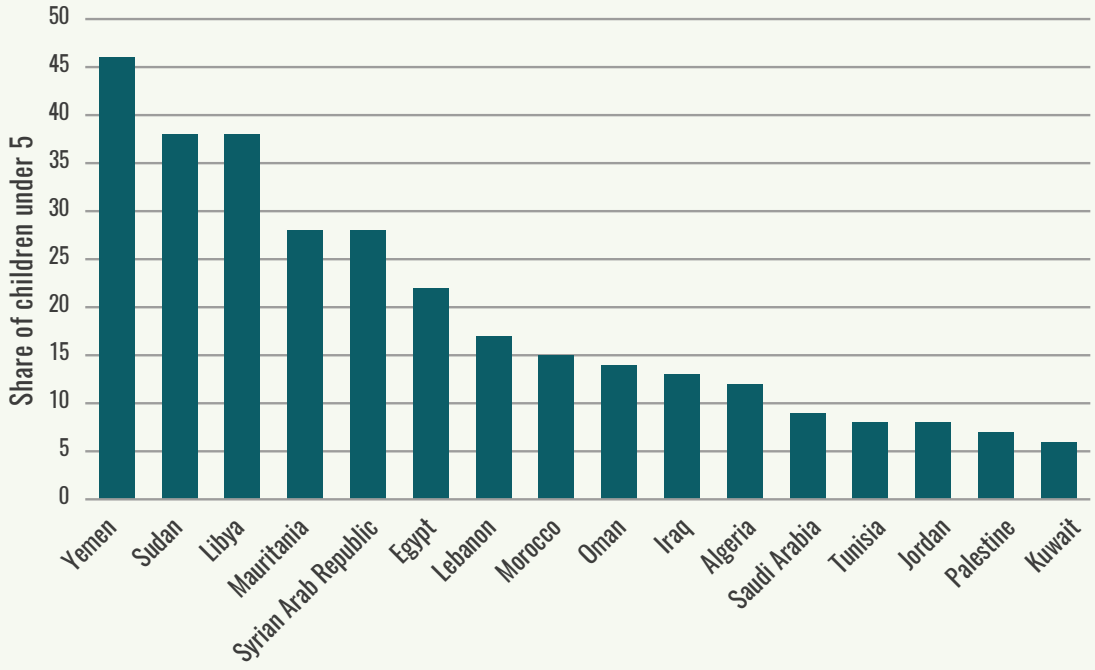
CHILDREN UNDER 5 YEARS AFFECTED BY WASTING IN THE NENA REGION (2015-2017), BY COUNTRY[15]



Source: FAOSTAT, n.d.

FIGURE 8.

CHILDREN UNDER 5 YEARS OF AGE WHO ARE STUNTED IN THE NENA REGION (2015-2018), BY COUNTRY[16]



Source: FAOSTAT, n.d.

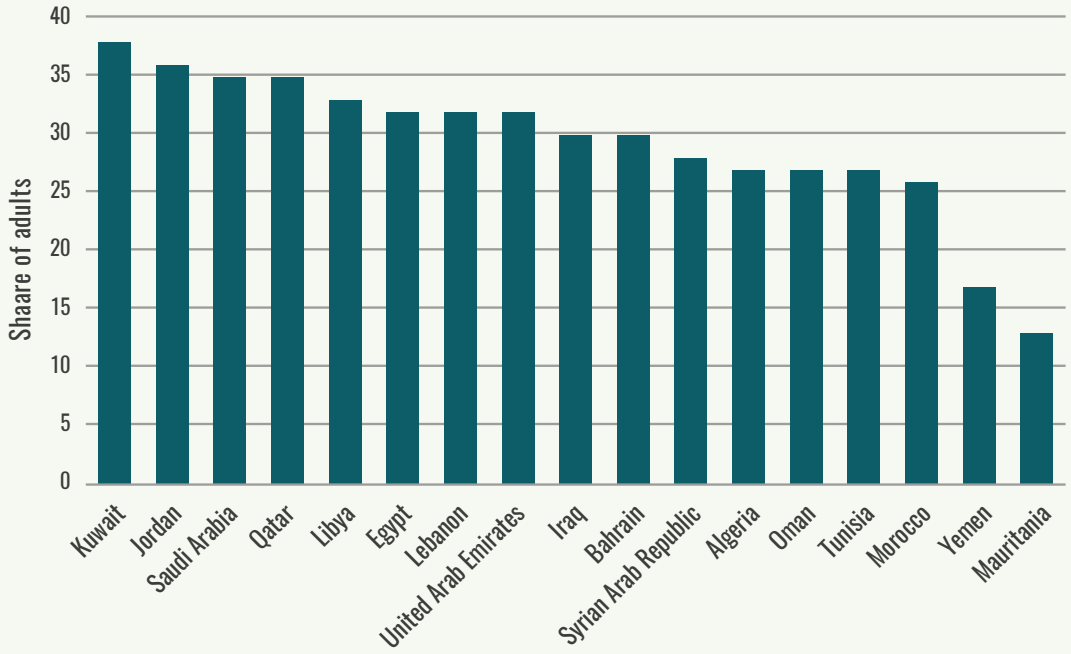
[15] Data not available for Bahrain, Qatar and United Arab Emirates.

[16] Data not available for Bahrain, Qatar and United Arab Emirates.

The Arab region is the second most obese in the world, with the overall trend following the progress of countries from low and low-middle income to middle-income status. Five NENA countries are among the top ten in prevalence of obesity in the world. The regional average stands at 23.6 percent, while the world average is 11.7 percent (FAO, 2018b). Maghreb countries register 19.2 percent; the GCC countries 34.4 percent, and the Mashreq countries have an obesity rate of 28.4 percent. The prevalence of obesity amongst females is 63 percent higher than for males, with increasing recognition of the key role played by women as agents of the shift to the consumption of healthier, more nutritious diets (FAO *et al.*, 2020). Efforts to combat the growth of overweight and obesity, such as the promotion of healthy diets and lifestyles, are not yet on track. **Figure 9** illustrates the prevalence of obesity in the adult population in the NENA Region, by country.

FIGURE 9.

PREVALENCE OF OBESITY IN THE ADULT POPULATION 18 YEARS AND OLDER IN THE NENA REGION (2016), BY COUNTRY



Source: FAOSTAT, n.d.

Improvements in food security and nutrition are positively associated with policies and programmes to support sustainable agricultural production, implement rural transformation strategies, and closing rural-urban disparities. There is a growing need to coordinate public health nutrition and production aspects of the food system, given that domestic agriculture cannot satisfy total domestic demand, and 40 percent of food in the region is imported. Preventing food waste and ensuring food and nutrition security are priorities for resilient food systems that can guard against shocks, whether driven by climate and environmental change, changes in food prices, the spread of plant and animal pests and diseases, or global pandemics.

Food loss and waste is a major concern for the region, with Saudi Arabia and Qatar having the highest rates of food waste in the world. In countries of West Asia, 44 percent of the food in the pre-consumption supply chain is estimated to be lost or wasted, while 34 percent of food served is wasted during the consumption stage (Abiad,M.G and Meho, L.I, 2018). In 2020, while faced with the COVID-19 pandemic, several countries in the NENA region (Sudan, Egypt, Oman, Saudi Arabia and Yemen) and the Horn of Africa faced the worst desert locust crisis in the last 25 years, with the upsurge causing large-scale crop damage and threatening food security in countries also facing recurrent drought, conflict and high food prices.

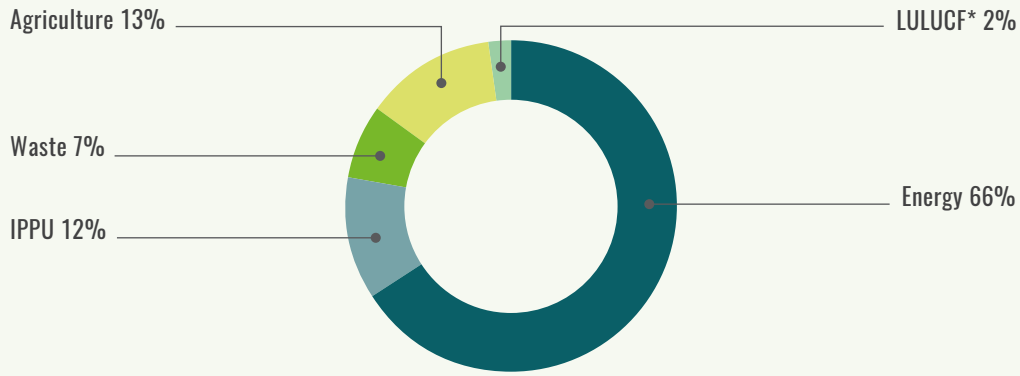
2.5 GREENHOUSE GAS EMISSIONS PROFILE

Based on the national GHG inventories submitted[17] by all countries in the region to the UNFCCC (**Figure 10**), total GHG emissions in the region are estimated at 1.48 billion tonnes (Gt) carbon dioxide (CO_2) eq per year (excluding removals) and 1.43 Gt CO_2 eq (including removals). The energy sector, 972.7 million tonne (Mt) CO_2 eq, represents two-thirds of the region's emissions, while the remaining sectors amount to the other one-third of total emissions: agriculture sector (13 percent), Industrial Processes and Product Use (IPPU) sector (12 percent), Waste sector (7 percent) and Land Use, Land Use Change and Forestry (LULUCF) sector (2 percent).

In the agriculture sector (195.1 Mt CO_2 eq), the greatest sources of emissions are enteric fermentation (44 percent) and managed soils (36 percent), followed by manure management (17 percent), rice cultivation (2 percent) and biomass burning on cropland (1 percent) (**Figure 11**).

FIGURE 10.

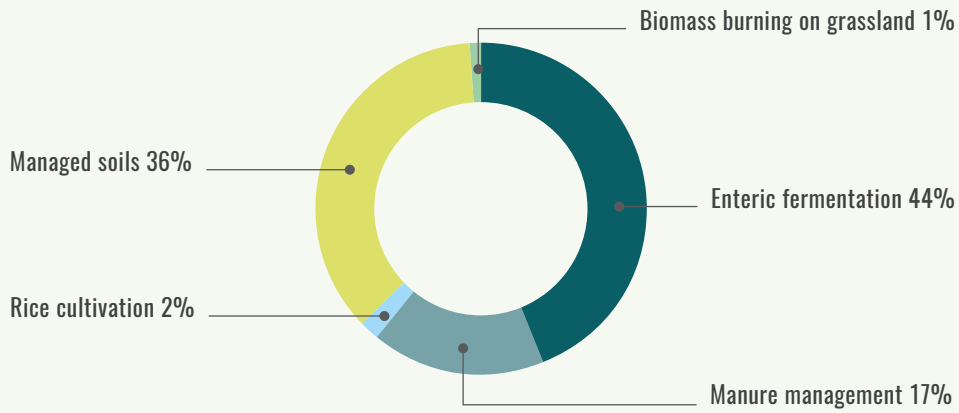
GHG INVENTORY FOR THE NENA REGION, BY IPCC SECTOR



*Source: National GHG inventories for NENA countries; *excluding removals.*

FIGURE 11.

GHG INVENTORY FOR THE AGRICULTURE SECTOR IN THE NENA REGION, BY GHG EMISSION SOURCE CATEGORY



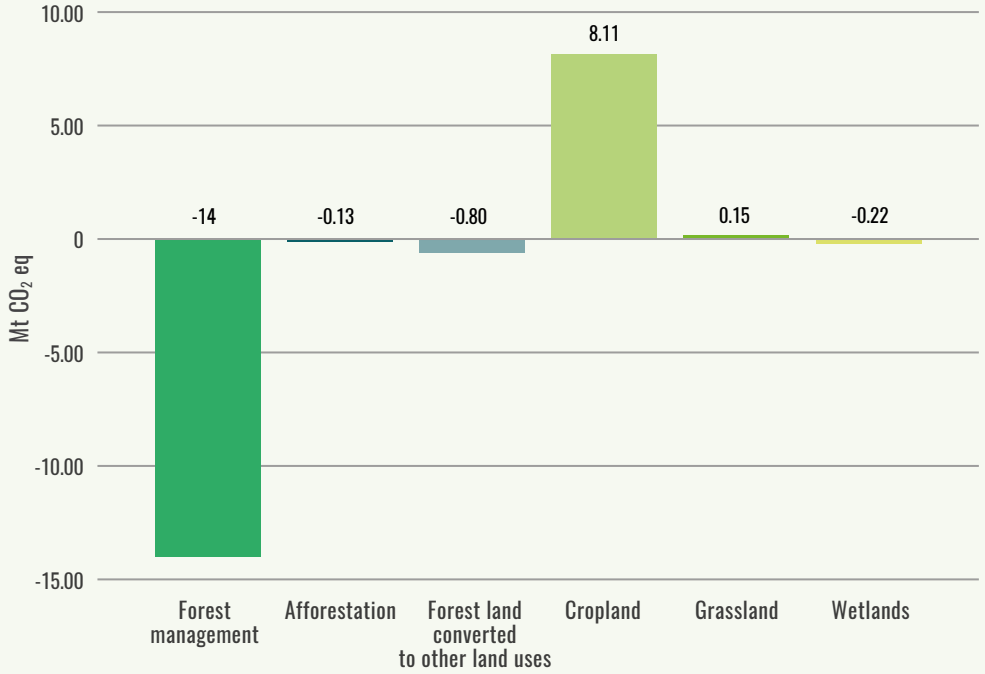
Source: National GHG inventories for all NENA countries.

[17] Refer to **Annex 1** for a list of national GHG inventories and submission dates.

The LULUCF sector is an overall net sink in the region (-8.6 Mt CO_2 eq), with forest management as the greatest sink for removals (92 percent of removals) and cropland as the greatest source of emissions (90 percent of emissions) (**Figure 12**).

FIGURE 12.

GHG INVENTORY FOR THE LULUCF SECTOR IN THE NENA REGION, BY GHG EMISSION SOURCE AND SINK CATEGORY



Source: National GHG inventories for NENA countries.

CHAPTER 3

CHAPTER

3

SYNTHESIS OF THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NATIONALLY DETERMINED CONTRIBUTIONS

3.1 MITIGATION CONTRIBUTION

This section provides a synthesis of the mitigation contributions in the Agriculture, Forestry and Other Land Use (AFOLU) sector contained in the first-round NDCs submitted by 18 countries[18] in the NENA region. Mitigation refers to a human intervention that aims to reduce emission sources or conserve and enhance sinks (IPCC, 2014a). In this report, mitigation in the AFOLU sector refers to the GHG source and sink categories defined by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (NGHGI) for the AFOLU sector (IPCC, 2006). The NDCs often refer to AFOLU, disaggregated by agriculture and LULUCF sector contributions.

3.1.1 General mitigation contribution

Out of the 18 countries with an NDC in the region, the majority (11 countries/58 percent) communicated a GHG target, whereas around one-third[19] (7/37 percent) committed to "Action-only." All GHG targets are set in relation to a business-as-usual (BAU) scenario, as opposed to a base year or trajectory for instance. **Figure 13** illustrates the types of general mitigation contributions in the NDCs in the NENA region (number of countries).

[18] At the time of publication, Libya had not yet submitted an NDC.

[19] Bahrain, Egypt, Kuwait, Qatar, Syrian Arab Republic, Sudan and the United Arab Emirates.

FIGURE 13.

TYPE OF MITIGATION CONTRIBUTIONS IN THE NDCs IN THE NENA REGION

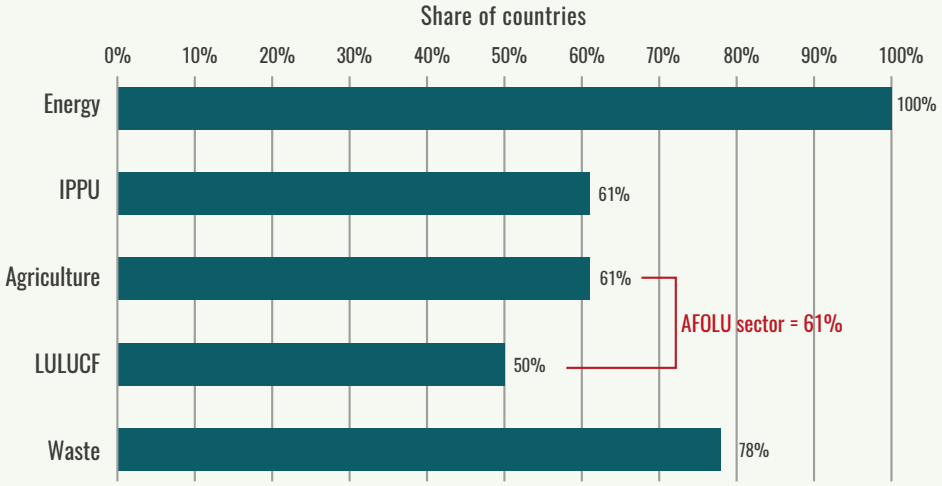
Source: NDCs in NENA region.

The sectoral coverage of general mitigation contributions in the region varies by country. The majority of countries (8 countries/42 percent) present an economy-wide mitigation contribution, which covers all four 2006 IPCC Sectors – Energy, IPPU, AFOLU and Waste. Around one-third (6/32 percent) present mitigation contributions covering multiple sectors, whereas around a quarter (4/21 percent) cover only one sector, i.e. Energy.

All countries with an NDC include mitigation in the energy sector (18 countries/100 percent), followed by waste (14/78 percent), IPPU and agriculture (11/61 percent each) and lastly the LULUCF sector (9/50 percent). Taken together, just under half of all countries (8/44 percent) include mitigation in both the agriculture and LULUCF sector. Taken separately, 61 percent include mitigation in the agriculture or LULUCF sector. **Figure 14** illustrates the scope of general mitigation contributions in the NDCs in the NENA region, by sector (share of countries with an NDC).

FIGURE 14.

SCOPE OF MITIGATION CONTRIBUTIONS IN THE NDCs IN THE NENA REGION, BY SECTOR



*Source: NDCs in NENA region. *In this figure, AFOLU refers to when a country includes either the agriculture and/or LULUCF sector in their general mitigation contribution.*

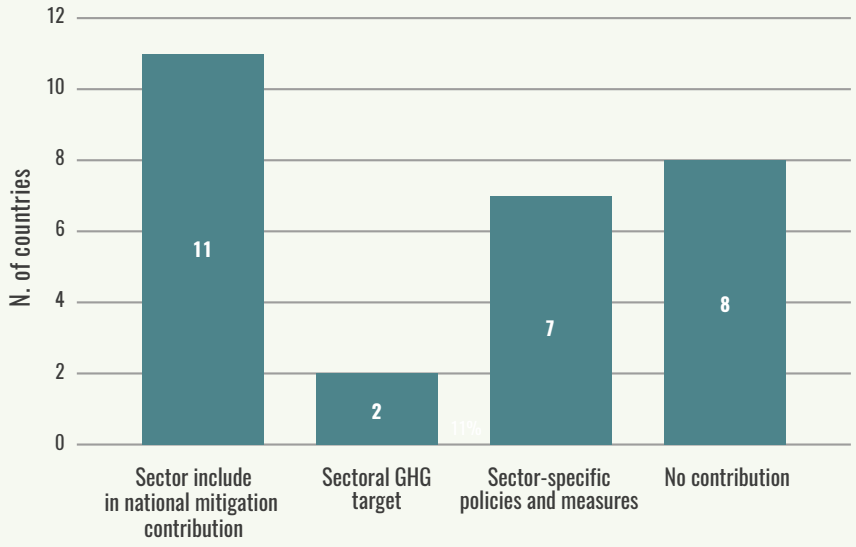
The period of NDC implementation generally refers to 2016 and 2030, while three countries indicate an end-year of 2035 (Iraq) and 2040 (Saudi Arabia and Palestine). **Annex 2** contains detailed information on each country's general mitigation contribution.

3.1.2 Mitigation contribution in the agriculture, forestry and other land use sectors

Over half (11 countries/61 percent) of all countries with an NDC include the agriculture sector in their general mitigation contribution, two countries (Morocco and Mauritania) present a GHG target specific to the agriculture sector,[20] over one-third (7 countries/39 percent) include measures in the agriculture sector and around half (8/44 percent) do not include mitigation in the agriculture sector. **Figure 15** presents the variety of ways in which mitigation contributions in the agriculture sector are expressed in the NDCs (number of countries).

FIGURE 15.

TYPE OF MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR IN THE NDCs IN THE NENA REGION



Source: NDCs in NENA region.

Half (9 countries/50 percent) of all countries with an NDC include the LULUCF sector in their general mitigation contribution, only two countries (Morocco and Mauritania) present a GHG target specific to the LULUCF sector,[21] just under half (8 countries/44 percent) include measures in the LULUCF sector and over half (10/56 percent) do not include mitigation in the LULUCF sector. None of the countries in the region present a non-GHG target at the sectoral level. **Figure 16** presents the variety of ways in which mitigation contributions in the LULUCF sector are expressed in the NDCs (number of countries).

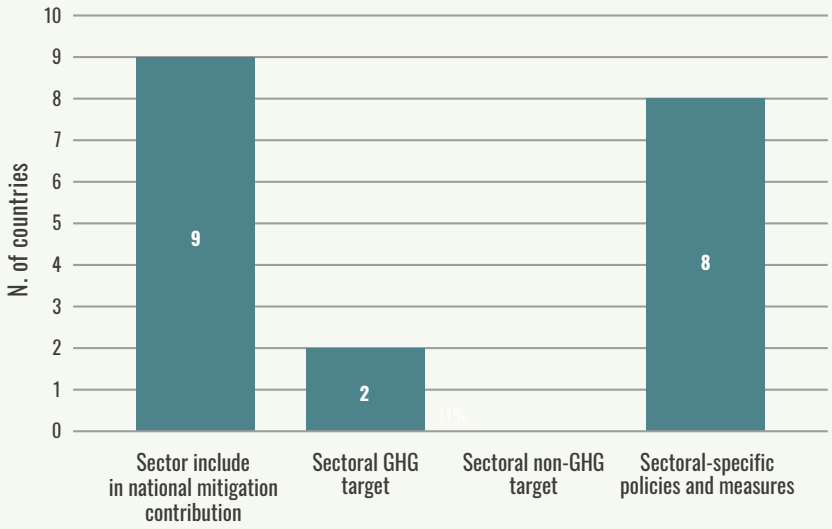
Annexes 3-4 contain detailed information on each country's mitigation contribution in the agriculture and LULUCF sectors.

[20] Morocco and Mauritania present a GHG target for the AFOLU sector. For the sake of this analysis, the GHG target is counted for the agriculture and LULUCF sectors.

[21] Morocco and Mauritania present a GHG target for the AFOLU sector. For the sake of this analysis, the GHG target is counted for the agriculture and LULUCF sectors.

FIGURE 16.

TYPE OF MITIGATION CONTRIBUTIONS IN THE LULUCF SECTOR IN THE NDCs IN THE NENA REGION



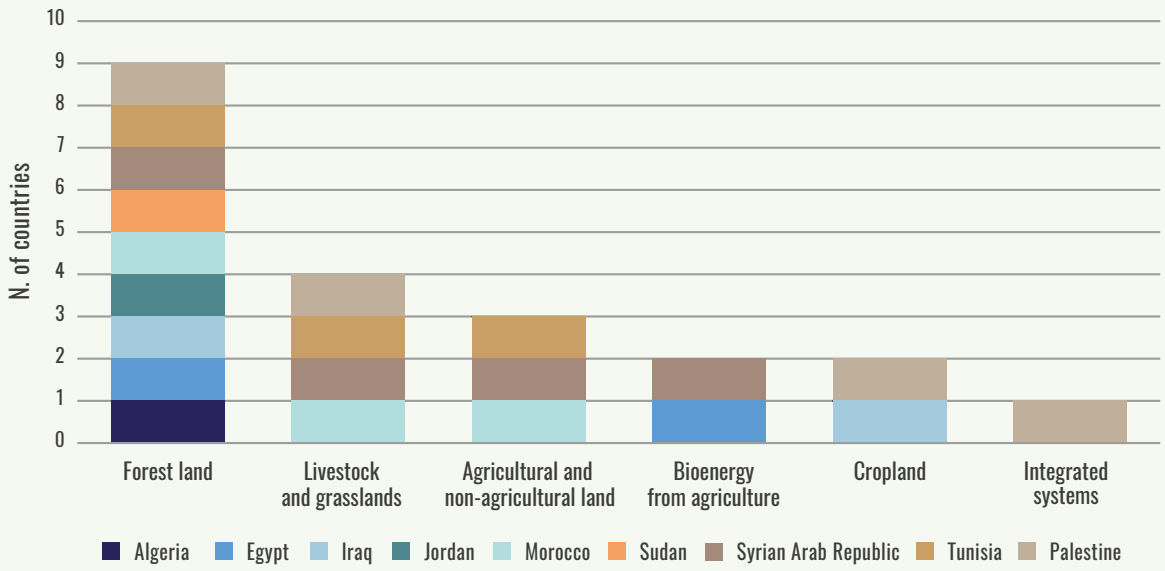
Source: NDCs in NENA region.

3.1.2.1 Mitigation measures

Out of countries with a mitigation contribution in the AFOLU sector, three-fourths (9 countries /75 percent) include mitigation on forest land, whereas one-third (4/33 percent) include mitigation in the livestock and grasslands sector and one-quarter (3/25 percent) include mitigation on agricultural and non-agricultural land uses. Two countries (Egypt and Syrian Arab Republic) promote mitigation via bioenergy from agricultural biomass. Two countries (Iraq and Palestine) include mitigation on cropland and only one country (Palestine) includes mitigation via integrated systems. **Figure 17** illustrates the types of agricultural sub-sectors and land uses category in the mitigation measures in the NDCs (number of countries).

FIGURE 17.

MITIGATION MEASURES IN THE AFOLU SECTOR IN THE NDCs IN THE NENA REGION, BY SUB-SECTOR/LAND USE CATEGORY



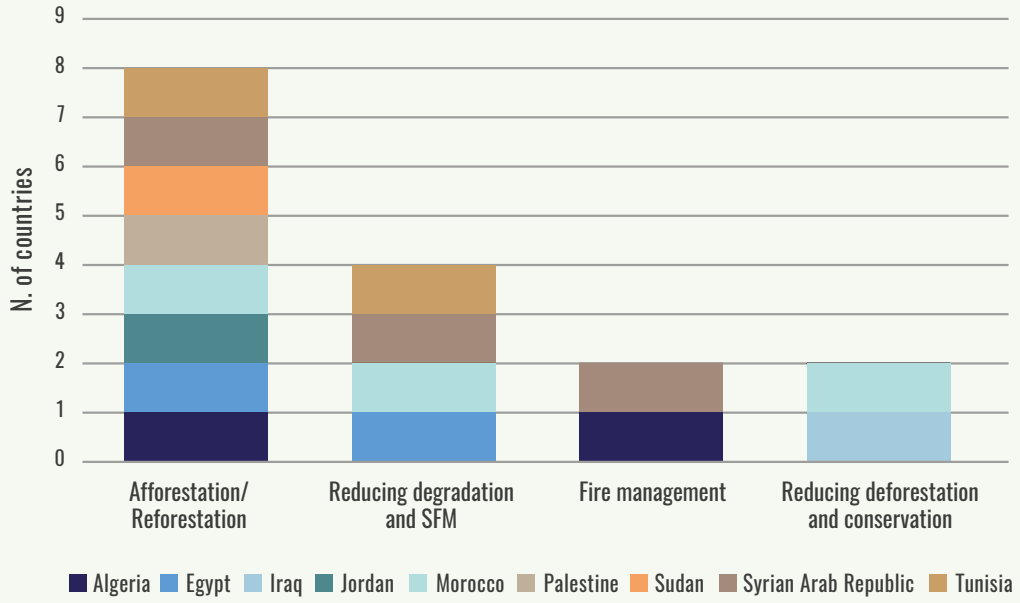
Source: NDCs in NENA region.

FOREST LAND

Out of countries with a mitigation contribution in the AFOLU sector, around three-fourths (9 countries/ 75 percent) include mitigation on forest land. Amongst those countries, the majority (8/89 percent) promote afforestation and reforestation, almost half promote reducing degradation and sustainable forest management (SFM) (4/44 percent), and two countries each promote fire management (Algeria and Syrian Arab Republic) and reducing deforestation and forest conservation (Morocco and Iraq). **Figure 18** illustrates the types of mitigation measures on forest land in the NDCs (number of countries).

FIGURE 18.

MITIGATION MEASURES ON FOREST LAND IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA region.

LIVESTOCK AND GRASSLANDS

Out of countries with a mitigation contribution in the AFOLU sector, around one-quarter (4 countries/ 33 percent) include mitigation in the livestock and grasslands sector. Amongst those countries, three (Morocco, Palestine and Syrian Arab Republic) include grassland restoration and rehabilitation. Tunisia promotes improved animal feeding and manure management, and Palestine prioritizes climate smart practices and more efficient livestock value chains.

AGRICULTURAL AND NON-AGRICULTURAL LAND

Out of countries with a mitigation contribution in the AFOLU sector, and a quarter (3 countries/25 percent) include general mitigation measures related to sustainable agriculture (Tunisia and Syrian Arab Republic) and sustainable land management (Morocco and Iraq).

BIOENERGY

Two countries in the region promote bioenergy-related mitigation measures, including liquid biofuel production and use (Tunisia) and bioenergy from non-specified biomass (Egypt and Tunisia).

CROPLAND

Two countries in the region include cropland-related mitigation measures, namely nutrient management and rice management (Iraq) and climate smart practices for fruit trees, vegetables and field crops (Palestine).

INTEGRATED SYSTEMS

Only one country (Palestine) includes a mitigation measure in integrated systems, namely agroforestry.

Table 2 illustrates some country examples of mitigation measures in the agriculture and LULUCF sectors included in the NDCs.

TABLE 2.

EXAMPLES OF MITIGATION MEASURES IN THE AFOLU SECTOR INCLUDED IN NDCs IN THE NENA REGION

COUNTRY NAME	TYPE OF MITIGATION MEASURE	DESCRIPTION	QUANTIFIED TARGET (IF AVAILABLE)
MOROCCO	LAND RESTORATION AND REHABILITATION	DEVELOP RANGELANDS IN A WAY THAT WILL COMBAT DESERTIFICATION, ENHANCE LIVESTOCK FARMERS' INCOME AND PROTECT BIODIVERSITY	-582 KT CO_2 EQ BY 2030
MOROCCO	AFFORESTATION	PLANTING 3 MILLION DATE PALM TREES TO ENHANCE OASES' PRODUCTIVITY RATE, COMBAT DESERTIFICATION AND HELP PREVENT THE EXODUS OF YOUTH PEOPLE FROM RURAL AREAS	-420 KT CO_2 EQ BY 2030
SYRIAN ARAB REPUBLIC	FIRE MANAGEMENT	IMPLEMENT INTEGRATED MANAGEMENT OF NATURAL AND ARTIFICIAL FOREST FIRES	
JORDAN	AFFORESTATION	AFFORESTING BARREN FOREST AREAS IN THE RAIN BELT AREAS ON WHICH THE RATE OF PRECIPITATION EXCEEDS 300 MM	25% OF BARREN FOREST AREA BY 2030
TUNISIA	IMPROVED FEEDING	OPTIMIZING THE DIETS OF DOMESTIC ANIMALS	
SYRIAN ARAB REPUBLIC	SUSTAINABLE AGRICULTURE	APPLICATION OF CONSERVATION AGRICULTURE	
EGYPT	BIOENERGY FROM AGRICULTURE	CO UTILIZATION OF FOSSIL FUEL AND BIOMASS IN SAME PLANTS	
IRAQ	NUTRIENT MANAGEMENT	SWITCH TO NATURAL FERTILIZER APPLICATION ON CROPLAND	
PALESTINE	CLIMATE SMART AGRICULTURE	ADOPTION OF CLIMATE-SMART PRODUCTION PRACTICES AND MORE RESOURCE EFFICIENT POST-HARVEST PROCESSING PRACTICES IN AGRICULTURAL VALUE CHAINS (INCLUDING FRUIT TREES, VEGETABLES, FIELD CROPS AND LIVESTOCK) THAT REDUCE GREENHOUSE GAS EMISSIONS AND INCREASE CARBON SEQUESTRATION IN PLANT BIOMASS AND SOIL ORGANIC MATTER	THE OBJECTIVE IS FOR AT LEAST 50% OF FARMS IN PALESTINE TO APPLY CLIMATE-SMART AGRICULTURE BY 2040
TUNISIA	MANURE MANAGEMENT	RECOVERING ENERGY FROM ANIMAL WASTE	

Source: NDCs in NENA region.

3.1.2.2 Long-term mitigation goals

None of the countries in the region communicate a long-term mitigation goal or vision in their NDC.

3.2 ADAPTATION COMPONENT

This section provides a synthesis of the adaptation components in the agriculture, water and land use sectors contained in the first-round NDCs submitted by 18 countries[22] in the NENA region. Adaptation to climate change refers to the process of adjustment to actual or expected climate and its effects in order to moderate harm or to benefit from opportunities associated with such changes (IPCC, 2019). In this report, adaptation in the agriculture, water and and use sectors signifies modifying agricultural production and socio-economic institutional systems in response to and in preparation for actual or expected climate variability and change and their impacts, to moderate harmful effects and exploit beneficial opportunities (FAO, 2017e).

[22] Libya did not submit an NDC as of 1 September 2020.

3.2.1. Climate-related impacts, risks and vulnerabilities

To inform adaptation planning and to contextualize the level of ambition and priorities set forth in the NDCs, adaptation components are often supplemented by a description of the climate-related impacts, risks and vulnerabilities either observed and/or projected in "ecosystems" and the wider livelihood or "social systems".[23] This section synthesizes the types of climate-related impacts, risks and vulnerabilities reported in either the NDCs or latest available NCs of 18 countries in the NENA region.

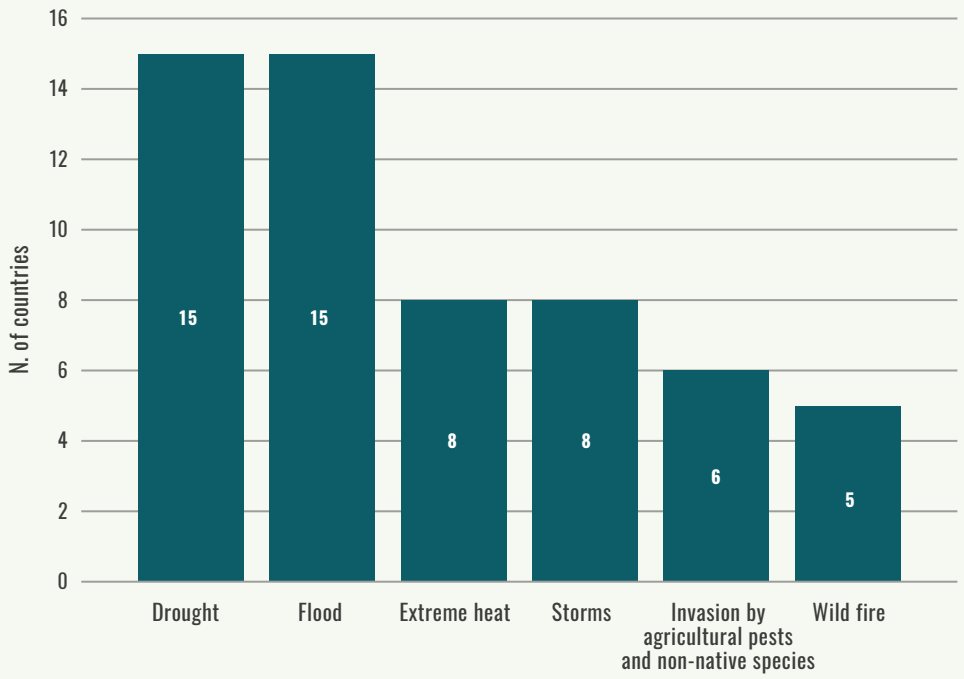
3.2.1.1 Climate-related hazards

All countries in the region (except Libya) make reference to observed and/or projected climate-related "hazards" in their NDCs and/or NCs, referring to hydro-meteorological, climatological and biological processes or phenomenon that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.[24]

Amongst the types of climate-related hazards reported, the majority of countries reference droughts and floods (15 countries/83 percent each), followed by extreme heat and storms (8/44 percent each), invasion by agricultural pests and non-native species (6/33 percent) and wild-fire (5/29 percent). **Figure 19** illustrates the types of observed and/or projected climate-related hazards reported in NDCs and/or NCs (number of countries).

FIGURE 19.

CLIMATE-RELATED HAZARDS REPORTED IN THE NENA REGION, BY TYPE



Source: NDCs and NCs in NENA.

[23] Refer to FAO (2020d) for a definition of ecosystems and social systems in the context of adaptation in the agriculture, water and land use sectors in the NDCs.

[24] Definition of climate-related hazard adapted from IPCC (2014b) and EM-DAT (undated).

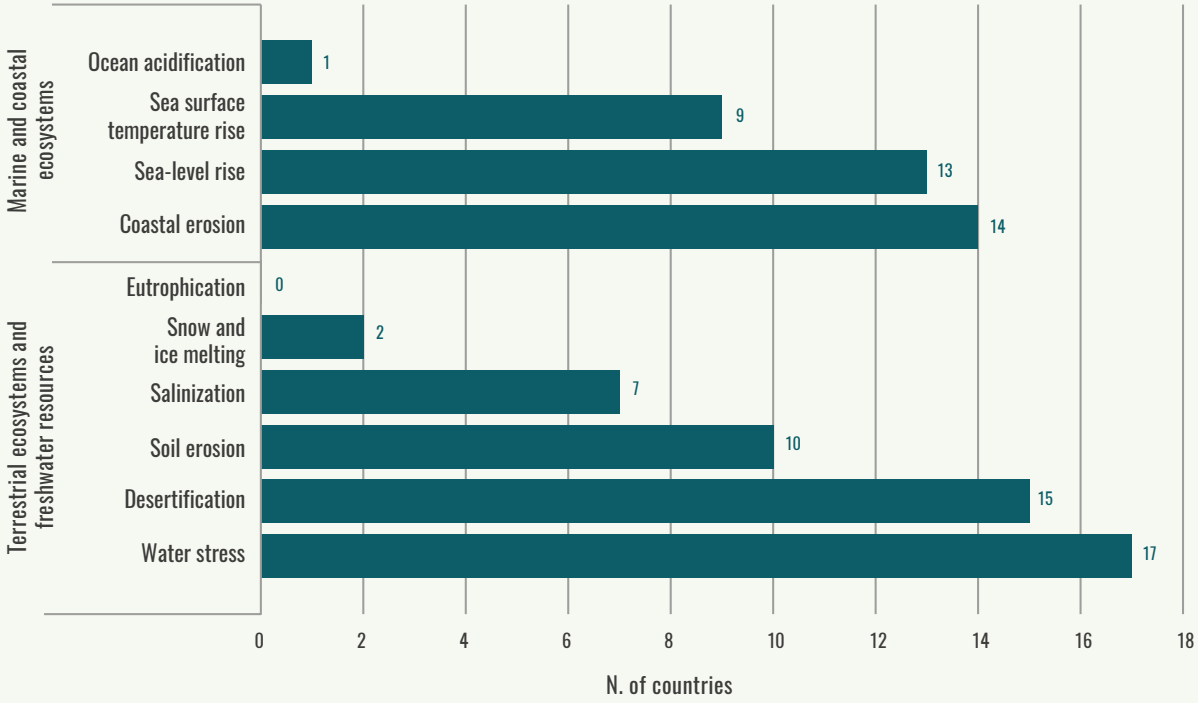
3.2.1.2 Climate-related slow onset events

All countries in the region (except Libya) report observed and/or projected climate-related chemical, biological, and physical changes, leading to "slow onset events."[25] Amongst the types of climate-related slow onset events reported in terrestrial and freshwater ecosystems, almost all countries reference water stress (17 countries/94 percent), followed by desertification (15/83 percent), soil erosion (10/56 percent), salinization (7/39 percent), and snow and ice melting (Lebanon and Morocco).

Amongst climate-related slow onset events reported in marine and coastal ecosystems, the majority of countries reference coastal erosion (14 countries/78 percent), sea level rise (13 countries/72 percent), sea surface temperature rise (9/50 percent) and ocean acidificatio (United Arab Emirates) n. **Figure 20** illustrates the types of climate-related slow onset events reported in the NDCs and/or NCs (number of countries).

FIGURE 20.

CLIMATE-RELATED SLOW-ONSET EVENTS REPORTED IN THE NENA REGION, BY TYPE



Source: NDCs and NCs in NENA.

3.2.1.3 Climate-related impacts in ecosystems

All countries in the region (except Libya and Iraq) report observed and/or projected climate-driven "impacts" on ecosystems.[26] The impacts of climate change refer generally to the effects of extreme weather events and of climate change on ecosystems, biodiversity and ecosystem services due to the interaction between the vulnerability and exposure of a given system to climate hazards (IPCC, 2014b).

Amongst countries reporting climate related impacts, the majority (16 countries/94 percent) reference impacts on agroecosystems, followed by ecosystems in general (12/71 percent) and coastal zones (12/71 percent). Two countries reference climate-related impacts on desert ecosystems (Morocco and Jordan),

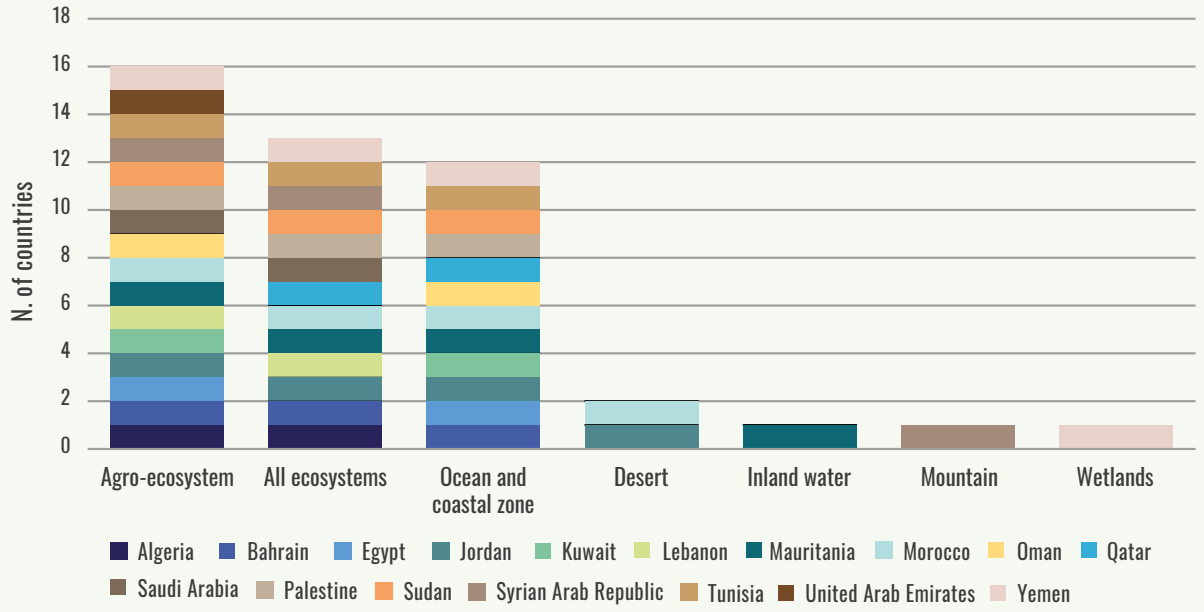
[25] Definition of climate-related slow onset events adopted from IPCC (2014b).

[26] Definition of ecosystems elaborated from (WRI, 2005).

while one country each references inland water ecosystems (Mauritania), mountain ecosystems (Syrian Arab Republic) and wetlands (Yemen). **Figure 21** illustrates the distribution of climate-related impacts reported across ecosystems in the NDCs and/or NCs (number of countries).

FIGURE 21.

CLIMATE-RELATED IMPACTS REPORTED IN ECOSYSTEMS IN THE NENA REGION, BY ECOSYSTEM TYPE



Source: NDCs and NCs in NENA.

Table 3 illustrates some country examples of observed and/or projected climate-related impacts on ecosystems reported in the NDCs or NCs.

TABLE 3.

EXAMPLES OF CLIMATE-RELATED IMPACTS ON ECOSYSTEMS REPORTED IN THE NENA REGION

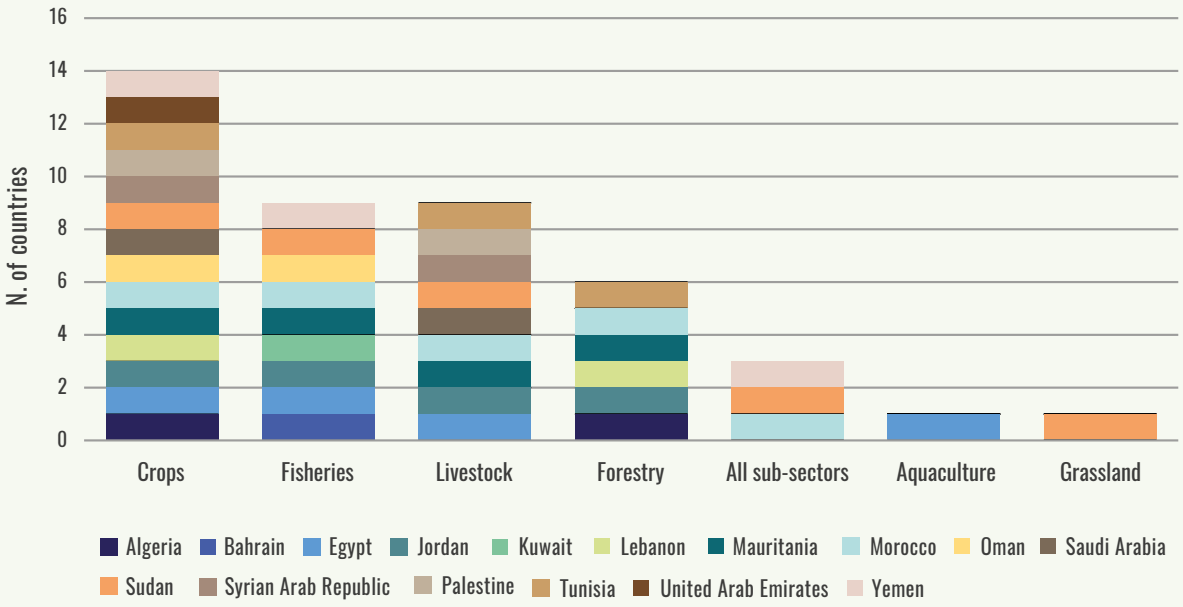
COUNTRY NAME	ECOSYSTEM	DESCRIPTION OF CLIMATE-RELATED IMPACT
SUDAN	COASTAL ZONE	THE POTENTIAL DECLINE OF MANGROVES DUE TO RISING SEA LEVELS WILL IN TURN IMPACT THE LIFE-CYCLE OF MANY VALUABLE BIRD SPECIES THAT DEPEND ON THESE AREAS FOR SAFE NESTING, FEEDING AND ROOSTING SITES
BAHRAIN	COASTAL ZONE	CORAL REEFS OF WHICH OVER 80% ARE ENDANGERED DUE TO BLEACHING EVENTS AND MARINE POLLUTION
JORDAN	COASTAL ZONE	CORAL BLEACHING IN THE GULF OF AQABA
YEMEN	WETLANDS	DETERIORATION OF WETLANDS
MOROCCO	DESERT	INCREASED DEGRADATION IN OASIS ECOSYSTEMS
JORDAN	DESERT	STEPPE VEGETATION LOST GROUND FOR TROPICAL ELEMENTS AND DESERT SPECIES
SYRIAN ARAB REPUBLIC	MOUNTAIN	A DECREASE IN PRECIPITATIONS AND AN INCREASE IN TEMPERATURES MIGHT CAUSE SPATIAL "UPWARD SHIFT" FOR SOME PLANT SPECIES OF THE FOREST VEGETATION ZONES OF MOUNTAINOUS AREAS
TUNISIA	ALL ECOSYSTEMS	LOSS BY SALINIZATION OF APPROXIMATELY 50 PER CENT OF THE RESOURCES CURRENTLY AVAILABLE IN COASTAL AQUIFERS
SYRIAN ARAB REPUBLIC	ALL ECOSYSTEMS	THE CLIMATE CHANGE PROJECTION FOR THE UPPER EUPHRATES AND TIGRIS WATERSHED AREAS SHOWS THAT MAJOR REDUCTIONS IN WATER FROM MELTED SNOW MIGHT AFFECT THESE TWO RIVERS' STREAM FLOW
MOROCCO	ALL ECOSYSTEMS	FORECASTS CONDUCTED ON CERTAIN WATER BASINS INDICATE THAT WATER AVAILABLE TO RESIDENTS WILL DECREASE TO THE LEVEL OF WATER SHORTAGE BY 2050

Source: NDCs and NCs in NENA.

Amongst the climate-related impacts observed and/or projected in agroecosystems, the majority of countries report impacts on the crops sector (14 countries/82 percent), around half report impacts in the fisheries (9/53 percent) and livestock sectors (9/53 percent). Around one-third report climate-related impacts in the forestry sector (6/35 percent), followed by agriculture in general (3/18 percent), aquaculture (Egypt) and grasslands (Sudan). **Figure 22** illustrates the distribution of climate-related impacts reported across agro-ecosystems, by sub-sector in the NDCs and/or NCs (number of countries).

FIGURE 22.

CLIMATE-RELATED IMPACTS REPORTED ON AGRO-ECOSYSTEMS IN THE NENA REGION, BY SUB-SECTOR



Source: NDCs and NCs in NENA.

Table 4 illustrates some country examples of observed and/or projected climate-related impacts on agro-ecosystems reported in the NDCs or NCs.

TABLE 4.

EXAMPLES OF CLIMATE-RELATED IMPACTS ON AGRO-ECOSYSTEMS REPORTED IN THE NENA REGION

COUNTRY NAME	SECTOR	DESCRIPTION OF CLIMATE-RELATED IMPACT
TUNISIA	CROPS	LOSS BY SUBMERSION OF APPROXIMATELY 16,000 HECTARES OF AGRICULTURAL LAND IN LOW-LYING COASTAL AREAS
SUDAN	CROPS	CROP PRODUCTION IS DECLINING AND PREDICTED TO DECLINE SUBSTANTIALLY FOR MILLET AND SORGHUM AS WELL AS OTHER CASH CROPS
LEBANON	CROPS	CHANGES IN TEMPERATURE AND RAINFALL WILL DECREASE PRODUCTIVITY OF LANDS CURRENTLY USED TO PRODUCE MOST CROPS AND FRUIT TREES, ESPECIALLY WHEAT, CHERRIES, TOMATOES, APPLES, AND OLIVES
MAURITANIA	LIVESTOCK	INCREASED DISEASES IN LIVESTOCK
JORDAN	GRASSLANDS	THE INCREASE IN EVAPOTRANSPIRATION (ET) RATE AND DECREASE IN PRECIPITATION IN DRIER SYSTEMS SUCH AS THE ARID AND SEMIARID RANGELANDS WOULD REDUCE PRODUCTIVITY
EGYPT	INLAND FISHERIES	INCREASED WATER SALINITY IN THE COASTAL LAKES IN EGYPT IS EXPECTED TO NEGATIVELY AFFECT FISH SPECIES
KUWAIT	MARINE FISHERIES	NUMEROUS FISH KILL INCIDENTS HAVE OCCURRED IN KUWAIT BAY. SUCH EXPERIENCES ARE CONSISTENT WITH DOCUMENTATION OF WARMING WATER TEMPERATURES LEADING TO INCREASES IN THE FREQUENCY AND SEVERITY OF FISH KILLS ASSOCIATED WITH PLANKTON BLOOMS
ALGERIA	FORESTRY	DEGRADATION OF MORE OF 8% OF FORESTS
OMAN	CROPS	SEA LEVEL RISE IMPLIES A STEADY DECLINE IN CROPLAND AVAILABLE FOR CULTIVATION AS CULTIVATABLE LAND BECOMES INUNDATED
MOROCCO	FORESTRY	FOREST ECOSYSTEMS AND PRODUCTION CAPACITY LOSS (CEDAR TREES, CORK OAK, CYPRESS TREES, ARGAN TREES)

Source: NDCs and NCs in NENA .

As the variety of climate-related hazards, slow onset events and impacts reported translate into impacts on the provision of ecosystem services and biodiversity, which are critical to sustaining agriculture and food systems, the following table details the types of ecosystem-services impacts observed and/or projected in the region. Amongst the most frequently reported ecosystems service impacts, biodiversity loss (17 countries/100 percent), losses in primary production and productivity (14 countries/82 percent), changes in water availability and quantity (11/65 percent), changes in species range, abundance and extinction (9/53 percent) and desertification and land degradation (9/53 percent) rank highest in the region. **Table 5** describes the types of ecosystem-service impacts reported in the NDCs and/or NCs (number of countries and share of total countries with impacts reported).

TABLE 5.

CLIMATE-RELATED ECOSYSTEM SERVICE IMPACTS REPORTED IN THE NENA REGION, BY TYPE

TYPE OF CLIMATE-RELATED ECOSYSTEM SERVICE IMPACTS'	N. OF COUNTRIES WITH IMPACT REPORTED	% OF COUNTRIES WITH IMPACT REPORTED
BIODIVERSITY LOSS	17	100%
PRIMARY PRODUCTION AND PRODUCTIVITY LOSS	14	82%
CHANGES IN WATER AVAILABILITY AND QUALITY	11	65%
CHANGES IN SPECIES RANGE, ABUNDANCE AND EXTINCTION	9	53%
DESERTIFICATION AND LAND DEGRADATION	9	53%
MANGROVE MORTALITY AND/OR CORAL REEF DEGRADATION	7	41%
SOIL EROSION, SEDIMENTATION AND WATER RETENTION CAPACITY REDUCTION	6	35%
COASTAL EROSION	5	29%
PEST AND DISEASE INCIDENCE	5	29%
TREE MORTALITY AND FOREST LOSS	5	29%
CHANGES IN HYDROLOGICAL FLOW AND WATER CYCLING	2	12%
BIOMASS LOSS	1	6%
CHANGES IN PHENOLOGY	1	6%
CHANGES IN SPECIES DISTRIBUTION AND ECOSYSTEM CONNECTIVITY	1	6%
HABITAT LOSS	1	6%

Source: NDCs and NCs in NENA.

3.2.1.4 Climate-related impacts in social systems

Almost all countries in the region (except Libya, Kuwait and United Arab Emirates) report observed and/or projected climate-related impacts or risks in "social" systems. The impacts of climate change generally refer to the effects of climate related extremes and variability, and longer-term changes, on the lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure, due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. The vulnerability of an exposed system depends on sensitivity and lack of capacity to cope and adapt. The probability of occurrence compounded by the impact, or risk, results from the interaction of vulnerability, exposure, and hazard.[27]

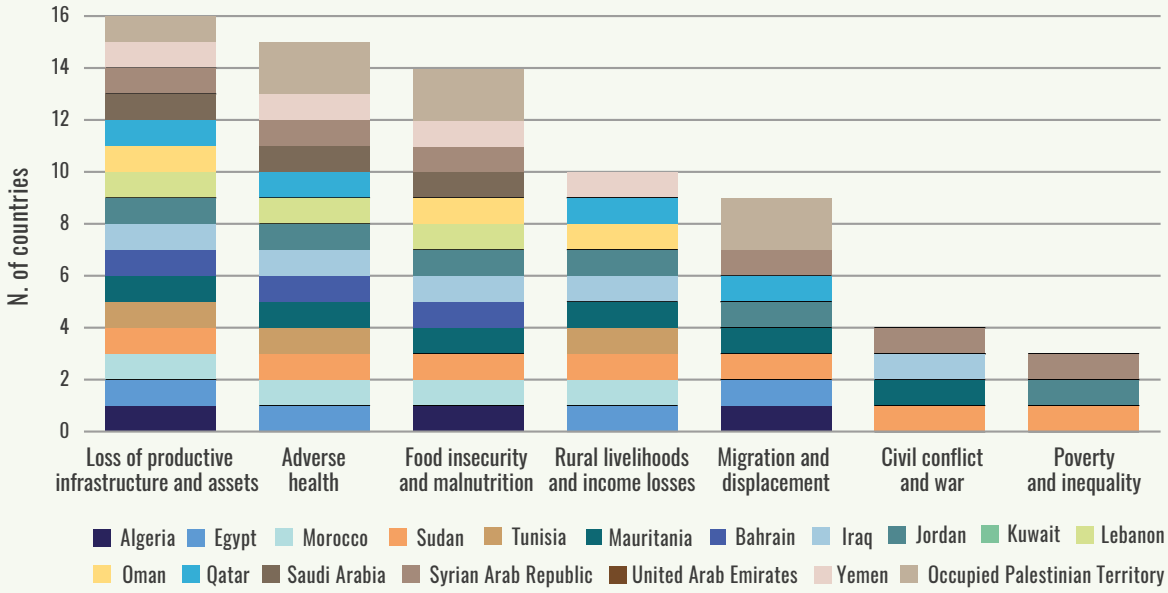
Amongst countries with observed and/or projected climate-related risks reported in social systems, all report the loss of productive infrastructure and assets (16 countries/100 percent), followed by adverse health impacts (14/88 percent), food insecurity and malnutrition (13/81 percent) and rural livelihoods and income losses (10/63 percent). Half report climate-related migration and displacement (8/50 percent), one-fourth reference civil war and conflict (4/25 percent) and one-fifth (3/19 percent) report poverty and

[27] Definition of impact, vulnerability and risk in ecosystems adapted from IPCC (2014b).

inequality. None of the countries in the region report gender and youth inequality as a climate-related risk. **Figure 23** illustrates the distribution of climate-related risks reported in the NDCs and/or NCs by type (number of countries).

FIGURE 23.

CLIMATE-RELATED RISKS REPORTED IN THE NENA REGION, BY TYPE



Source: NDCs and NCs in NENA.

Table 6 illustrates some country examples of observed and/or projected climate-related risks in social systems reported in the NDCs or NCs.

TABLE 6.

EXAMPLES OF CLIMATE-RELATED RISKS IN SOCIAL SYSTEMS REPORTED IN THE NENA REGION

COUNTRY NAME	TYPE OF CLIMATE-RELATED RISK	DESCRIPTION
MAURITANIA	LOSS OF PRODUCTIVE INFRASTRUCTURE AND ASSETS	COASTAL EROSION AND SEA LEVEL RISE THREATEN COASTAL INFRASTRUCTURES DEDICATED TO FISHING
BAHRAIN	ADVERSE HEALTH	INCREASED PREVALENCE OF NUTRITIONAL DISEASES, INFECTIOUS AND PARASITIC, IN PARTICULAR DIARRHEAL AND ACUTE RESPIRATORY INFECTIONS, IN CHILDREN UNDER 5 YEARS OLD
MOROCCO	ADVERSE HEALTH	MALARIA, SCHISTOSOMIASIS, TYPHOID AND CHOLERA, LIKELY TO BE MADE WORSE BY CLIMATE CHANGE
MAURITANIA	FOOD INSECURITY AND MALNUTRITION	NUTRITION LEVELS IMPACTED BY DROUGHT
SUDAN	FOOD INSECURITY AND MALNUTRITION	FOOD INSECURITY AND FAMINES, PARTICULARLY LOSS OF LIVELIHOODS OF MANY PASTORAL AND NOMADIC GROUPS
SUDAN	RURAL LIVELIHOODS AND INCOME LOSSES	FARMER INCOMES EXPECTED TO DROP
MAURITANIA	CONFLICT OVER RESOURCES	CONFLICT AMONGST DIFFERENT NATURAL RESOURCES USERS
JORDAN	MIGRATION AND DISPLACEMENT	THE CONTINUOUS INFLUX OF REFUGEES FROM SYRIAN ARAB REPUBLIC HAS FURTHER INCREASED WATER DEMAND AND CONSEQUENTLY, POSSIBLY INCREASE WATER STRESS
EGYPT	MIGRATION	SEA LEVEL RISE WILL RESULT IN A MORE SIGNIFICANT CHALLENGE, WHICH IS THE MIGRATION OF PEOPLE FROM THE AFFECTED AREAS TO OTHER AREAS, THUS AFFECTING THE EFFICIENCY OF DIFFERENT SERVICES AND INCREASING THE FINANCIAL COST REQUIRED FOR THEIR DEVELOPMENT

PALESTINE	GENDER AND YOUTH INEQUALITY	GENDER INEQUALITY IN WEST BANK
MAURITANIA	FOOD INSECURITY AND MALNUTRITION	NUTRITION LEVELS IMPACTED BY DROUGHT

Source: NDCs and NCs in NENA.

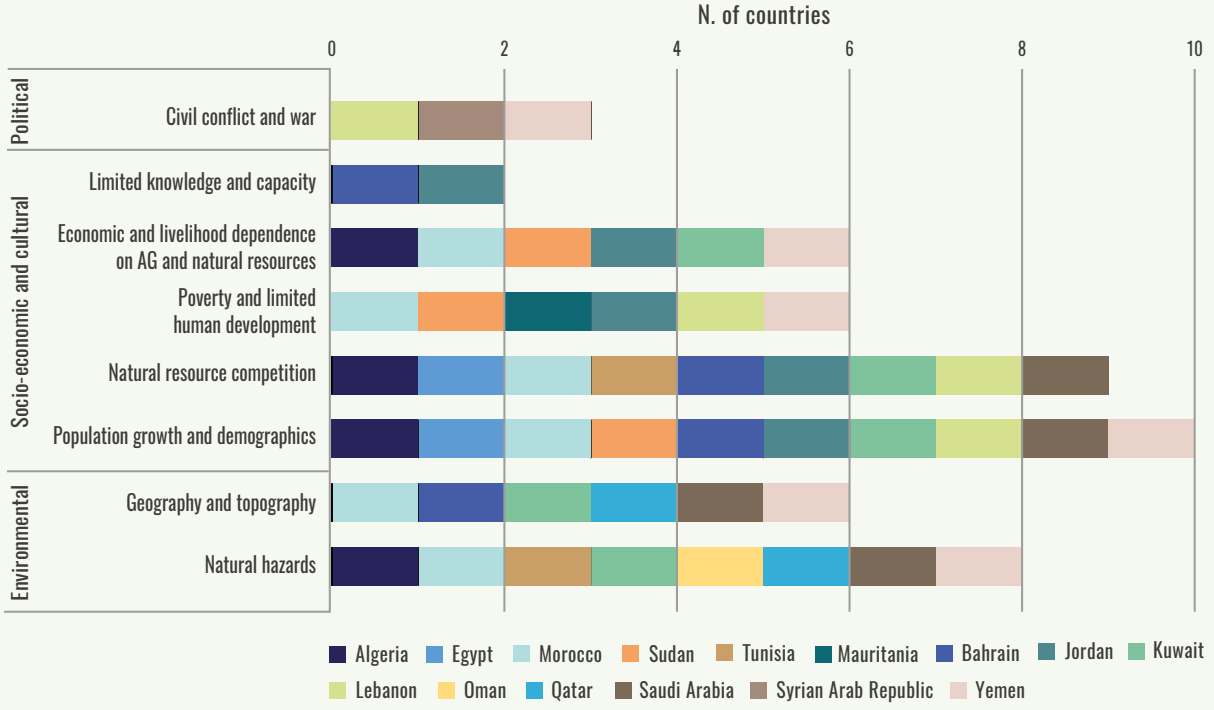
3.2.1.5 Non-climatic drivers of vulnerability

Almost all countries in the region (except Libya, Kuwait and United Arab Emirates) report on the intersecting environmental, social, economic, cultural, political and institutional variables, or stressors, that can affect individual adaptive capacity to respond, as well as the level of exposure to climate change, creating new or exacerbating existing vulnerabilities to climate change.[28]

Amongst non-climatic drivers of vulnerability to climate change reported in the region, the majority of countries report population growth and demographic changes and natural resource competition (10 countries/63 percent each), followed by natural hazards (8/50 percent). Just under half report economic and livelihood dependence on agriculture and natural resources (7 countries/ 44 percent), and over one-third reference geography and topography (6/38 percent) and poverty and low human development levels (6/38 percent). One-fourth (3/19 percent) reference civil conflict and war as a political driver of vulnerability. Two countries (Bahrain and Jordan) reference limited knowledge and capacity as an institutional driver of vulnerability. **Figure 24** illustrates the distribution of non-climatic drivers of vulnerability to climate change reported in the NDCs and/or NCs by type (number of countries).

FIGURE 24.

NON-CLIMATIC DRIVERS OF VULNERABILITY TO CLIMATE CHANGE REPORTED IN THE NENA REGION, BY TYPE



Source: NDCs and NCs in NENA.

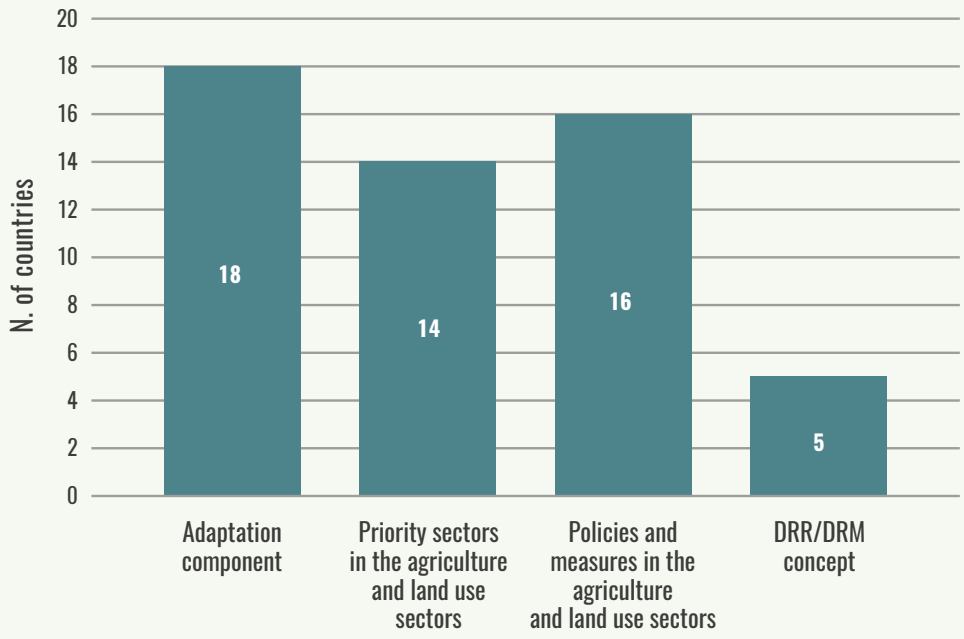
[28] Definition of non-climatic stressors adapted from IPCC (2014b).

3.2.2 Adaptation component in the agriculture, water and land use sectors

All 18 countries in the region with an NDC communicated an adaptation component – 17 of which contain adaptation in the agriculture, water and land use sectors.[29] The majority of countries with an adaptation component present a set of priority sectors or cross-sectoral priorities for adaptation in the agriculture, water and land usesectors (14 countries/78 percent), while even more (16/89 percent) include sector-specific adaptation measures. Only around one-quarter (5/28 percent) reference disaster risk reduction and management (DRR/M) in their adaptation component. **Figure 25** illustrates the types of adaptation components in the agriculture, water and land use sectors in the NDCs (number of countries).

FIGURE 25.

ADAPTATION COMPONENTS IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA.

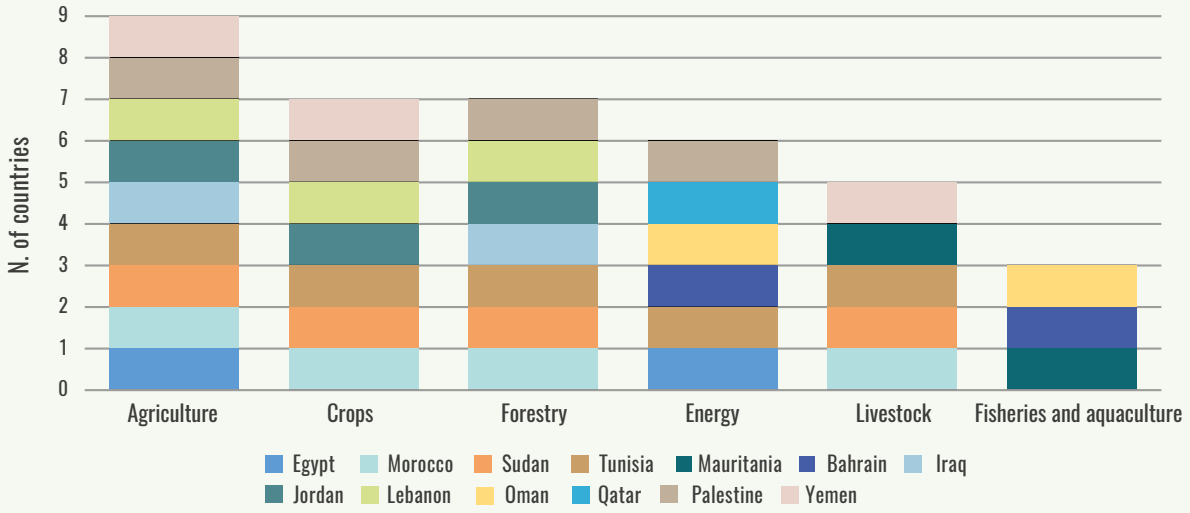
3.2.2.1 Adaptation priority sectors

Out of all countries with an adaptation component in their NDC, the majority (14 countries/78 percent) identify priority sectors in the agriculture, water and land use sectors. Amongst those countries, agriculture, in general, is most frequently mentioned (9 countries/64 percent), followed by the crops and forestry sub-sectors (7/50 percent each), bioenergy (6/36 percent each), and livestock (5/36 percent) while fisheries and aquaculture is mentioned by less than one-third of countries (4/29 percent). **Figure 26** illustrates the distribution of adaptation priority sectors in the agriculture, water and land use sectors in the NDCs (number of countries).

[29] Qatar's adaptation component does not include the agriculture, water and land use sectors.

FIGURE 26.

ADAPTATION PRIORITY SECTORS IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY SUB-SECTOR

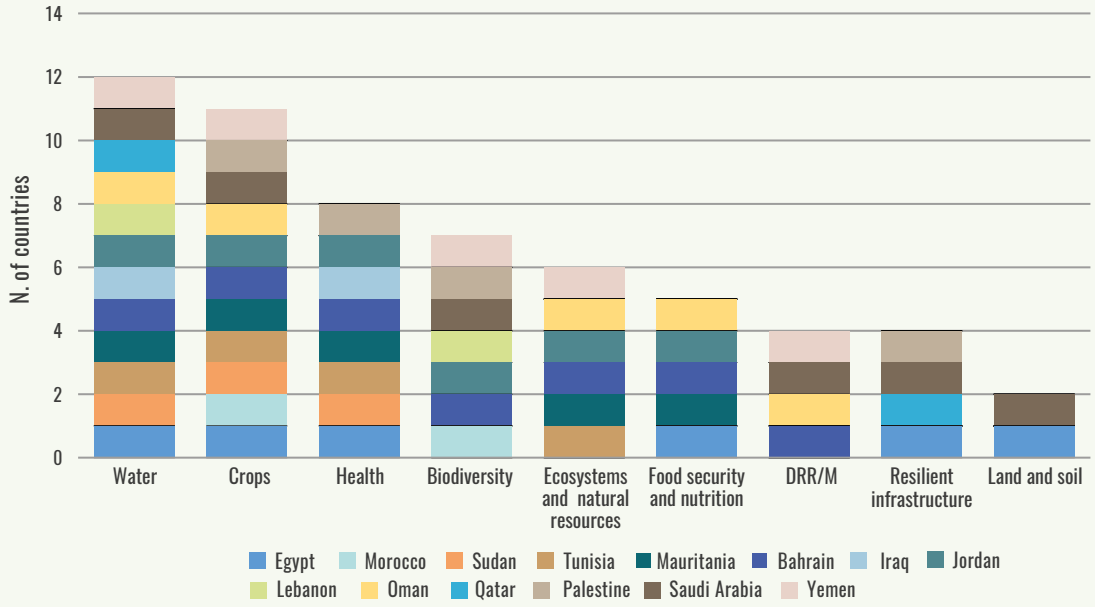


Source: NDCs in NENA.

Amongst cross-sectoral priorities for the agriculture, water and land use sectors, the majority of countries identify water resources (12 countries/86 percent), followed by coastal zones (11/79 percent) and health (8/57 percent), while biodiversity (7/50 percent) and ecosystems and natural resources (6/43 percent) are mentioned by around half of countries. Food security and nutrition (5/36 percent), DRR/M and resilient infrastructure (4/29 percent each) are mentioned by around one-third of countries. Only one country (Palestine) includes indigenous peoples, poverty and inequality reduction and gender equality as priority areas in their adaptation component. **Figure 27** illustrates the distribution of cross-sectoral priorities for adaptation in the agriculture, water and land use sectors sectors in the NDCs (number of countries).

FIGURE 27.

CROSS-SECTORAL PRIORITIES FOR ADAPTATION IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY PRIORITY AREA



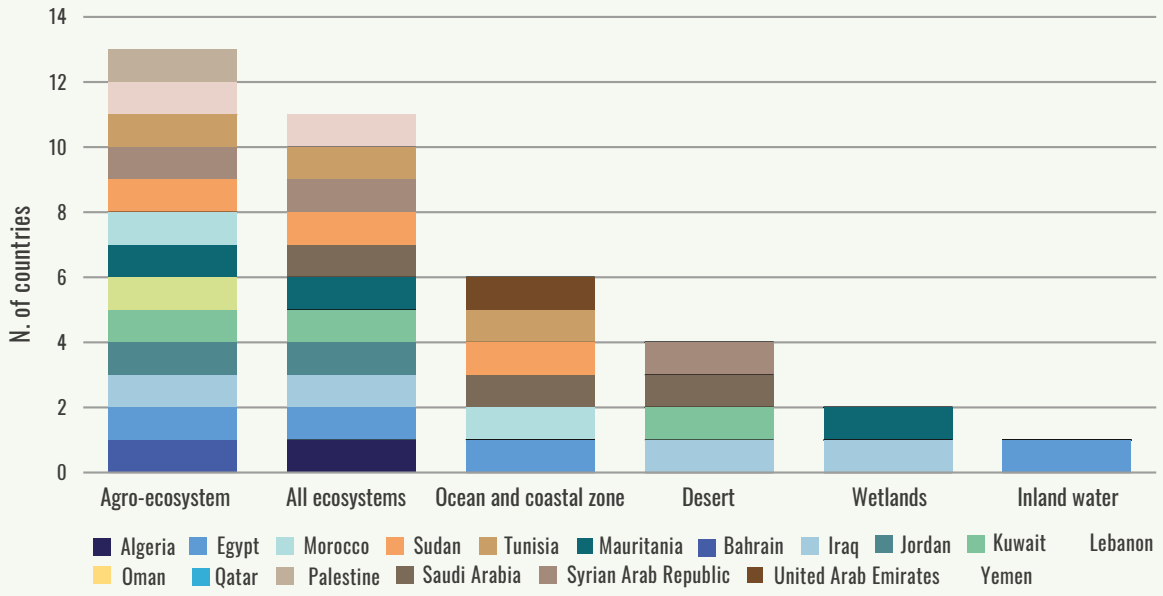
Source: NDCs in NENA.

3.2.2.2. Adaptation measures in ecosystems

Out of all countries with an adaptation component in their NDC, the majority (16 countries/89 percent) include adaptation measures in the agriculture, water and land use sectors. Amongst those countries, the majority promote adaptation measures in agroecosystems (13 countries/81 percent) and ecosystems in general (11/69 percent), over one-third (6/38 percent) include measures in coastal zones and one-fourth (4/25 percent) in desert ecosystems. Two countries (Mauritania and Iraq) include adaptation measures in wetlands and one country (Egypt) in inland water ecosystems. **Figure 28** illustrates the distribution of adaptation measures in the agriculture, water and land use sectors, by sub-sector (number of countries).

FIGURE 28.

ADAPTATION MEASURES IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCS IN THE NENA REGION, BY ECOSYSTEM TYPE

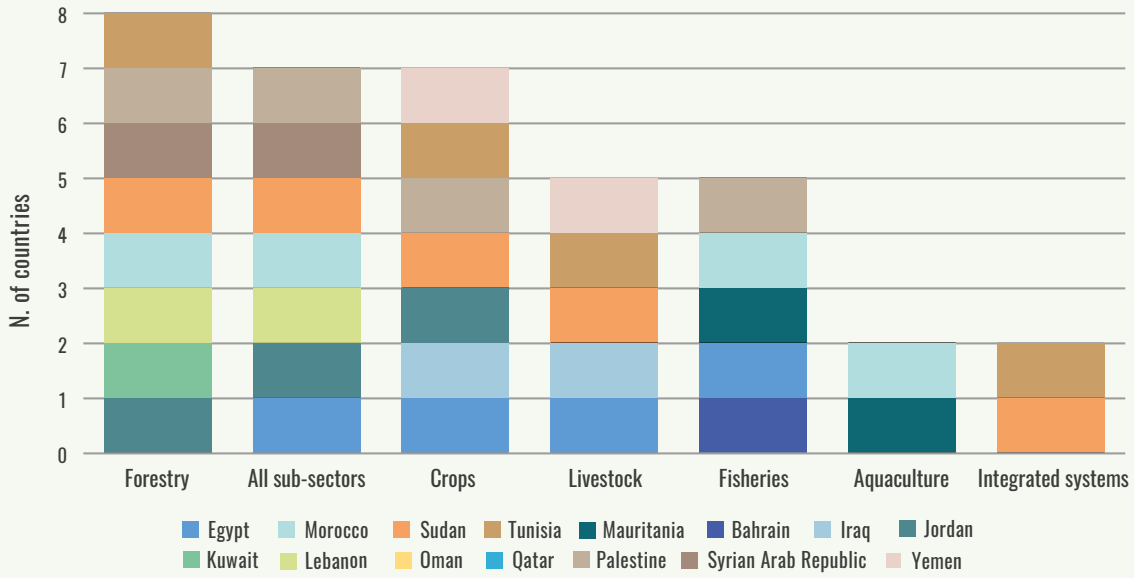


Source: NDCs in NENA.

Amongst countries with an adaptation component in the agriculture, water and land use sectors, almost half promote adaptation measures in the forestry sector (8 countries/47 percent) and over one-third promote adaptation in agriculture in general and in the crops sector (7/41 percent each), one-third (5/29 percent each) in the livestock and fisheries sector. Two countries each include adaptation measures in aquaculture (Morocco and Mauritania) and in integrated systems (Tunisia and Sudan). **Figure 29** illustrates the types of adaptation measures in the agriculture, water and land use sectors in the NDCs, by sub-sector (number of countries).

FIGURE 29.

ADAPTATION MEASURES IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY AGRICULTURAL SUB-SECTOR



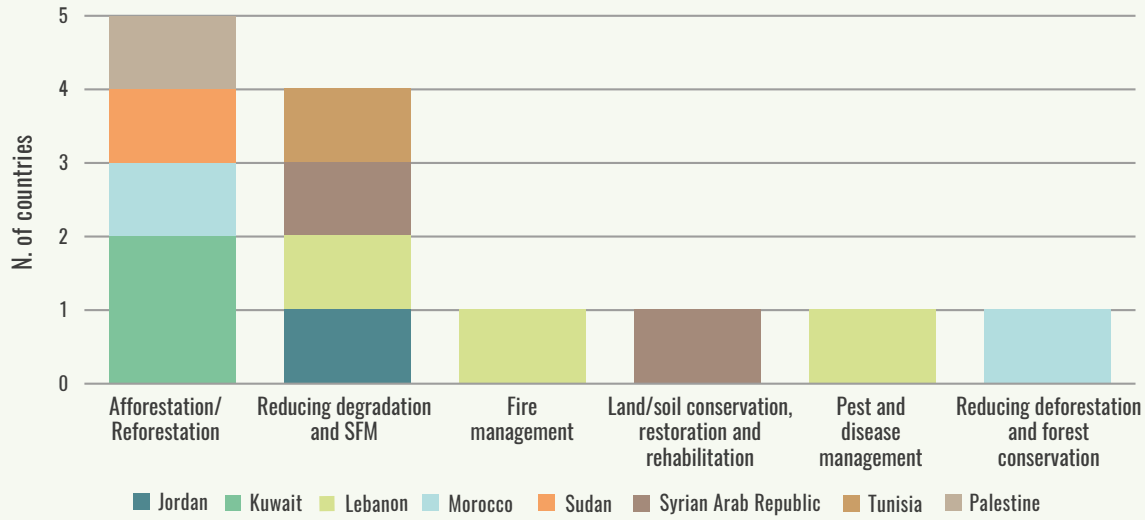
Source: NDCs in NENA.

FORESTRY

Amongst countries with an adaptation component in the agriculture, water and land use sectors, almost half promote adaptation measures in the forestry sector (8 countries/47 percent). Amongst those countries, the majority (5/63 percent each) promote afforestation/reforestation, followed by reducing forest degradation and SFM (4/50 percent). Only one country each promotes fire management (Lebanon), land/soil conservation, restoration and rehabilitation (Syrian Arab Republic), forest pests and diseases management (Lebanon) and reducing deforestation and forest conservation (Morocco) as an adaptation measure. **Figure 30** illustrates the types of forestry adaptation measures in the NDCs (number of countries).

FIGURE 30.

ADAPTATION MEASURES IN THE FORESTRY SECTOR IN THE NDCs IN THE NENA REGION, BY TYPE



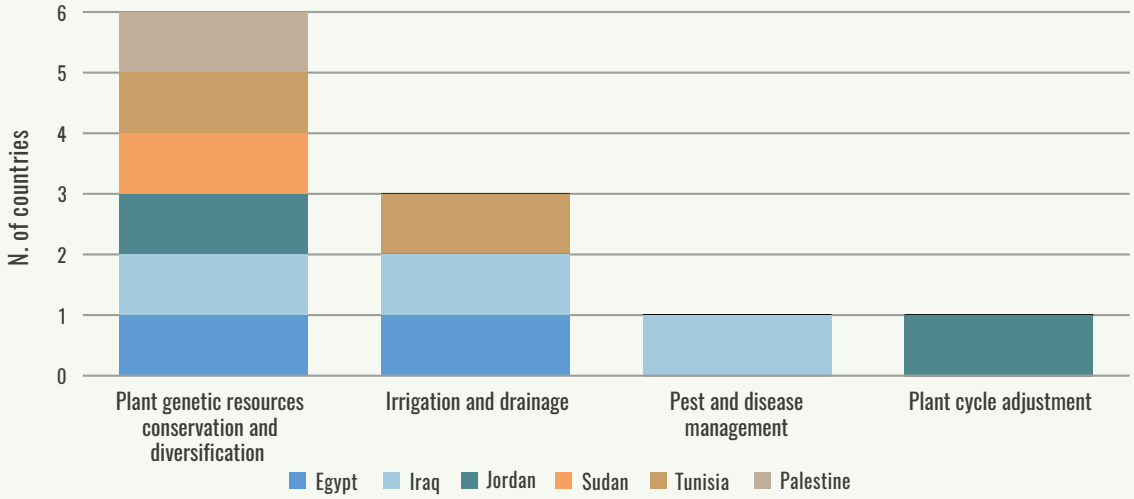
Source: NDCs in NENA.

CROPS

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around one-third promote adaptation measures in the crops sub-sector (7 countries/41 percent). Amongst those countries, the majority (6/86 percent) promote plant genetic resources conservation and diversification, followed by irrigation and drainage (3/43 percent). One country each promotes pest and disease management (Iraq) and plant cycle adjustments (Jordan) as adaptation measures. **Figure 31** illustrates the types of adaptation measures in the crops sub-sector in the NDCs (number of countries).

FIGURE 31.

ADAPTATION MEASURES IN THE CROPS SUB-SECTOR IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA.

LIVESTOCK

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around one-third promote adaptation measures in the livestock sub-sector (5 countries/29 percent). Amongst those countries, two (Sudan and Egypt) promote animal genetic resources conservation and diversification, and another two (Sudan and Iraq) include adaptation measures targeting improved animal and herd management. One country each promotes improved animal feeding (Egypt), animal husbandry (Sudan), land/soil conservation, restoration and rehabilitation of grasslands (Tunisia) and sustainable livestock management in general (Yemen).

FISHERIES

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around one-fourth promote adaptation measures in the fisheries sector (5 countries/29 percent). Four of those countries (Bahrain, Egypt, Mauritania and Morocco) promote the conservation and diversification of aquatic genetic resources and one (Palestine) promotes improved fisheries technologies as an adaptation measure.

AQUACULTURE

Only two countries in the region (Mauritania and Morocco) include adaptation measures related to improved aquaculture management practices.

INTEGRATED SYSTEMS

Only two countries in the region include adaptation measures related to integrated systems, particularly agroforestry (Sudan) and other mixed production systems (Tunisia).

Table 7 illustrates some country examples of adaptation measures in agro-ecosystems included in the NDCs.

TABLE 7.

EXAMPLES OF ADAPTATION MEASURES IN AGRO-ECOSYSTEMS INCLUDED IN NDCs IN THE NENA REGION

COUNTRY NAME	SECTOR	DESCRIPTION OF ADAPTATION MEASURE	QUANTIFIED TARGET
MOROCCO	AQUACULTURE	REDUCTION OF DISCHARGES	90% REDUCTION COMPARED TO CURRENT LEVELS
EGYPT	CROPS	CHANGING CULTIVARS TO THOSE THAT ARE MORE TOLERANT TO HEAT, SALINITY AND PESTS	
TUNISIA	CROPS	CONSERVING AND EXPLOITING GENETIC HERITAGE TO ADAPT CEREAL CROPS TO CLIMATE CHANGE, DEVELOPING INNOVATIVE SYSTEMS FOR ARABLE CROPS	
JORDAN	CROPS	MODIFICATION OF CROPPING PATTERNS AND CROP CALENDAR INCLUDING PLANTING AND HARVESTING DATES	
MOROCCO	FISHERIES	REACH A 95% RATE OF TRADED SPECIES MANAGED SUSTAINABLY	95% OF TOTAL SPECIES
PALESTINE	FISHERIES	ENLARGEMENT OF THE FISHING AREA AND IMPROVE FISHING EQUIPMENT	
LEBANON	FORESTRY	RAISING TREE NURSERIES' PRODUCTIVITY AND PLANTING TREES	
MOROCCO	FORESTRY	AFFORESTING 600 000 HECTARES	600 000 HECTARES
SUDAN	INTEGRATED SYSTEMS	INTRODUCTION OF AGROFORESTRY IN AREAS VULNERABLE TO CLIMATE CHANGE	
SUDAN	LIVESTOCK	IMPROVING ANIMAL PRODUCTIVITY AND ANIMAL BREEDS	
SUDAN	LIVESTOCK	REGULAR SURVEILLANCE OF ANIMAL DISEASES THROUGH IMPROVED MONITORING	
SUDAN	LIVESTOCK	IMPROVING VETERINARY SERVICES (INCLUDING MOBILE CLINICS, PROVISION OF VACCINES ETC.) TO ENHANCE THE ADAPTIVE CAPACITY IN VULNERABLE AREAS	

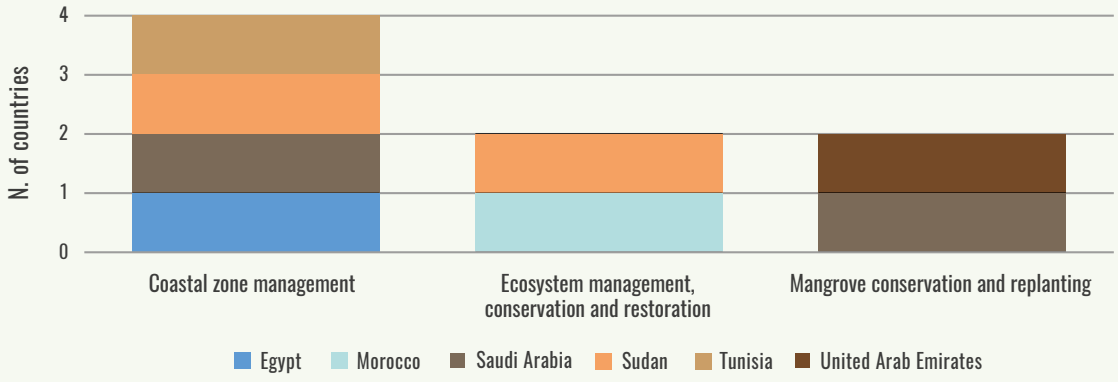
Source: NDCs in NENA region.

COASTAL ZONE ECOSYSTEMS

Amongst countries with an adaptation component in the agriculture, water and land use sectors, over one-third (6/38 percent) include measures in coastal zones. Amongst those countries, the majority (4/67 percent) promote coastal zone management, while two countries (Sudan and Morocco) include ecosystem management, conservation or restoration and another two (United Arab Emirates and Saudi Arabia) include mangrove conservation and replanting as adaptation policies or measures. **Figure 32** illustrates the types of adaptation measures in coastal zones in the NDCs (number of countries).

FIGURE 32.

ADAPTATION MEASURES IN COASTAL ZONES IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA.

DESERT ECOSYSTEMS

Four countries include adaptation measures in desert ecosystems, namely those promoting land/soil conservation, restoration or rehabilitation (Kuwait, Saudi Arabia and Syrian Arab Republic), afforestation/reforestation (Kuwait) and water-use efficiency and reuse (Iraq).

WETLAND ECOSYSTEMS

Only two countries (Iraq and Mauritania) in the region includes adaptation measures in wetland ecosystems, namely wetland ecosystem management, conservation and restoration.

INLAND WATER ECOSYSTEMS

Only one country (Egypt) in the region includes adaptation measures in inland water ecosystems, namely water-related ecosystem protection and restoration.

Table 8 illustrates some country examples of adaptation measures in ecosystems in the NDCs.

TABLE 8.

EXAMPLES OF ADAPTATION MEASURES IN ECOSYSTEMS INCLUDED IN NDCs IN THE NENA REGION

COUNTRY NAME	ECOSYSTEM	DESCRIPTION OF ADAPTATION MEASURE	QUANTIFIED TARGET
UNITED ARAB EMIRATES	COASTAL ZONE	RESTORATION AND PLANTATION EFFORTS OF BOTH MANGROVES AND SEA-GRASS, SUPPORTING ECOSYSTEM-BASED ADAPTATION AS WELL	
MOROCCO	COASTAL ZONE	RESTORING 50 % OF DAMAGED MARINE HABITATS	50% OF DAMAGED HABITATS
TUNISIA	COASTAL ZONE	CONSERVATION OF THE ECOLOGICAL FUNCTIONS OF LOW-LYING COASTAL AREAS	
IRAQ	DESERT	REUSE OF DRAINAGE WATER IN GREEN BELTS AGAINST DESERTIFICATION	3.5 BILLION M^3 PER YEAR BY 2035
KUWAIT	DESERT	REDUCING THE OPEN DESERT LAND RATIO FROM 75% TO 51%	51% OPEN DESERT LAND RATION
EGYPT	INLAND WATER	MAINTAINING WATER LEVEL IN LAKE NASSER. COOPERATE WITH NILE BASIN COUNTRIES TO REDUCE WATER EVAPORATION AND INCREASE RIVER CAPACITY	
IRAQ	WETLANDS	WETLANDS, PROTECTION OF NATURAL VEGETATION COVER, BUFFER ZONES AROUND PROTECTED AREAS	17% AREA PROTECTED BY 2035
YEMEN	ALL ECOSYSTEMS	PROMOTION AND SCALE-UP OF RAINWATER HARVESTING TO REDUCE CLIMATE INDUCED WATER SHORTAGE	
PALESTINE	ALL ECOSYSTEMS	NATIONAL NETWORK OF PROTECTED AREAS, INCLUDING 50 PROTECTED AREAS AND 51 BIODIVERSITY HOTSPOTS	50 PROTECTED AREAS/51 BIODIVERSITY HOTSPOTS
SAUDI ARABIA	ALL ECOSYSTEMS	DEVELOP AND IMPLEMENT PLANS THAT WILL HARNESS NEW SOURCES OF FRESHWATER, CONSTRUCT ADDITIONAL DAMS FOR COLLECTION OF DRINKING WATER AND RECHARGING OF AQUIFERS	

Source: NDCs in NENA region.

LAND AND SOIL RESOURCES

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around two-thirds (11 countries/65 percent) include adaptation measures related to land and soil resources. Out of those, the majority (10 countries/91 percent) promote land/soil conservation, restoration and rehabilitation across a variety of ecosystems and agroecosystems, while around one-third (3/27 percent) promote coastal zone management and one country (Sudan) includes integrated landscape management.

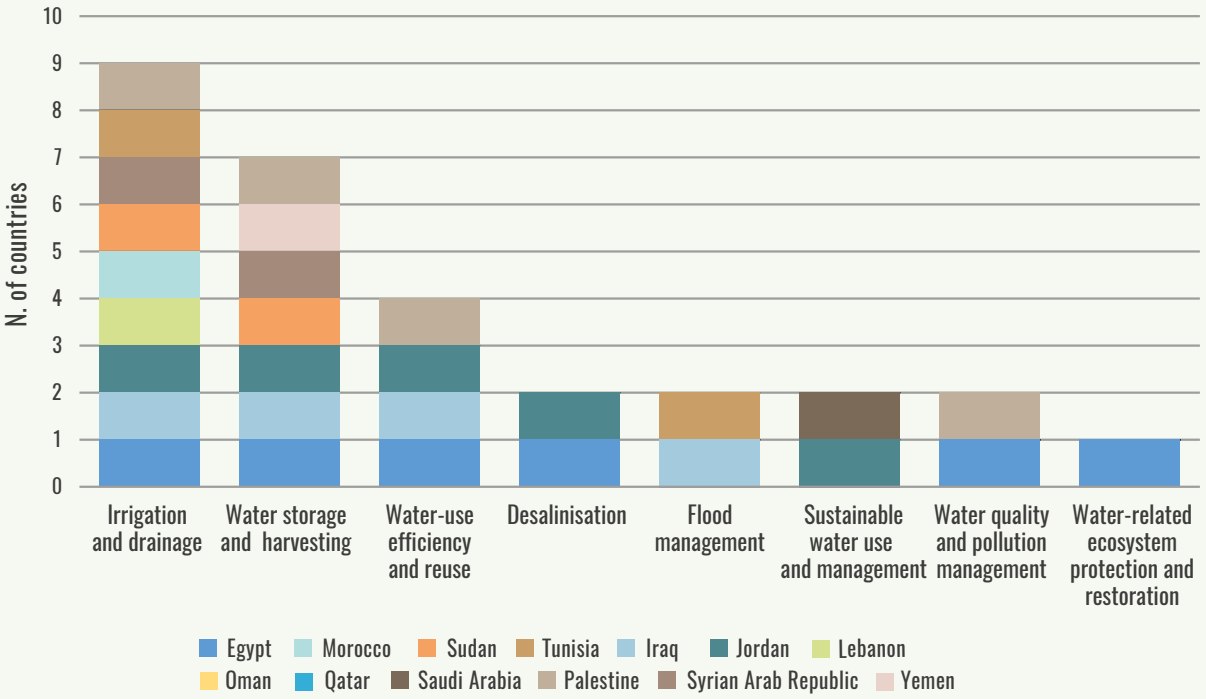
WATER RESOURCES

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around two-thirds (11 countries/65 percent) include adaptation measures related to water resources. Amongst those, the majority promote irrigation and drainage (9 countries/82 percent) and almost two-thirds (7/64 percent) promote water storage and harvesting. Four countries (Jordan, Iraq, Palestine and Egypt) promote water use efficiency and reuse, while two countries each promote desalinisation (Jordan and

Egypt), flood management (Tunisia and Iraq), water quality and pollution management (Egypt and Palestine) sustainable water use and management (Saudi Arabia and Jordan). Only one country promotes (Egypt) water-related ecosystem protection and restoration. **Figure 33** illustrates the types of water-related adaptation measures in the NDCs (number of countries).

FIGURE 33.

WATER-RELATED ADAPTATION MEASURES IN THE NDCs IN THE NENA REGION, BY TYPE



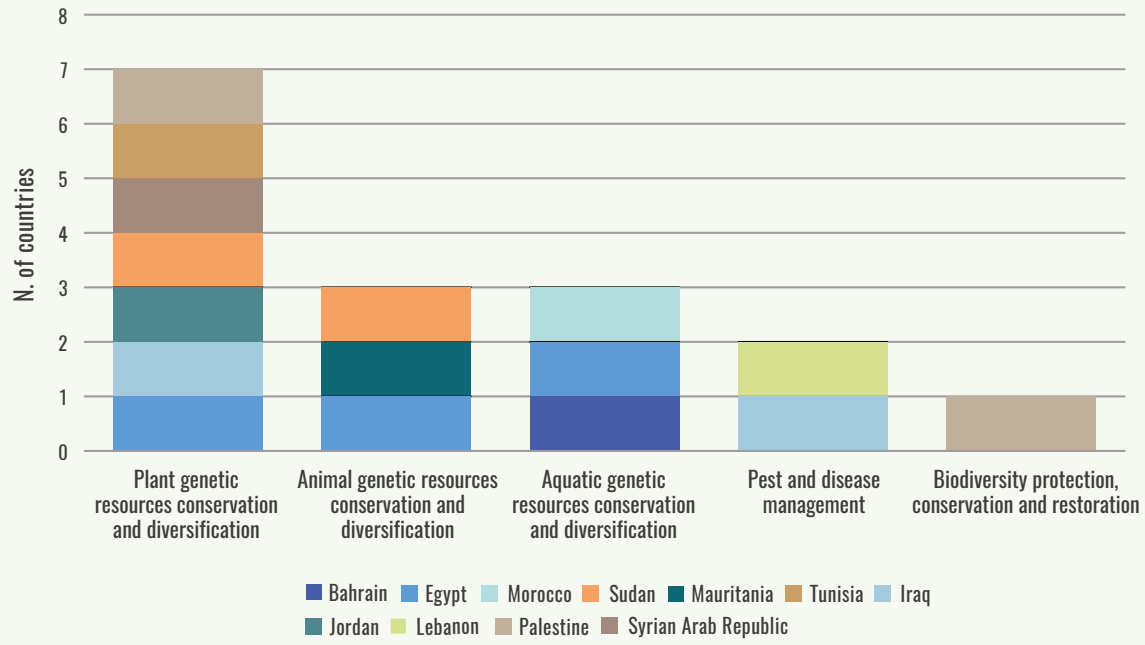
Source: NDCs in NENA region.

GENETIC RESOURCES

Amongst countries with an adaptation component in the agriculture, water and land use sectors, around two-third (11 countries/65 percent) include adaptation measures related to genetic resources. Amongst those, the majority (7/64 percent) promote plant genetic resources conservation and restoration, whereas three countries (Sudan, Egypt and Mauritania) promote the conservation and restoration of animal genetic resources and another three (Morocco, Egypt and Bahrain) promote aquatic genetic resources conservation and restoration. Two countries (Lebanon and Iraq) include pests and diseases management and one country (Palestine) includes biodiversity protection, conservation and restoration as an adaptation measure. **Figure 34** illustrates the types of genetic resource-related adaptation measures in the NDCs (number of countries).

FIGURE 34.

GENETIC RESOURCE-RELATED ADAPTATION MEASURES IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA region.

Table 9 illustrates some country examples of natural resources-related adaptation measures included in the NDCs.

TABLE 9.

EXAMPLES OF NATURAL RESOURCES-RELATED ADAPTATION MEASURES INCLUDED IN NDCs IN THE NENA REGION

COUNTRY NAME	NATURAL RESOURCE TYPE	DESCRIPTION OF ADAPTATION MEASURE
JORDAN	GENETIC RESOURCES	INTRODUCING NEW VARIETIES OF CROPS THAT USE LESS WATER AND ARE SALT-TOLERANT
TUNISIA	GENETIC RESOURCES	REHABILITATION OF FOREST NURSERIES AND THE EXPANSION OF INDIGENOUS AND MULTI-USE SPECIES
MOROCCO	GENETIC RESOURCES	INCREASING BY 50 % THE VOLUME OF SEA PRODUCTS UTILIZED AND MARKETED
SYRIAN ARAB REPUBLIC	LAND AND SOIL	REDUCTION OF SOIL DEGRADATION AND CONDUCTING DRIFT MEASUREMENTS IN DEGRADED AREAS BY SETTING UP TEST STATIONS, PREPARATION OF SOIL DEGRADATION RISK MAPS USING REMOTE SENSING, MONITORING AND GIS TECHNIQUES AND IMPLEMENTATION OF PROJECTS FOR THE REHABILITATION OF AFFECTED AREAS
MOROCCO	LAND AND SOIL	PROTECTING 1,500,000 HECTARES AGAINST EROSION, WHICH WILL INCLUDE THE PRIORITIZATION OF 22 BASINS
KUWAIT	LAND AND SOIL	IMPLEMENTING GREEN BELT PROJECTS IN THE MOST VULNERABLE DESERT AREAS
EGYPT	WATER	RAINWATER HARVESTING AND INCREASING WATER STORAGE CAPACITY
PALESTINE	WATER	SUPPORTING IMPROVEMENTS IN EFFICIENT USE OF WATER IN WOMEN'S PRIVATE SMALL-SCALE AGRICULTURAL PROJECTS
SUDAN	WATER	ESTABLISHMENT AND REHABILITATION OF HAND PUMPS AND CONSTRUCTION OF WATER-NETWORKS IN RURAL AREAS FOR PROVISION OF DRINKING-WATER AND ACHIEVING WATER SECURITY IN ORDER TO DISCOURAGE COMMUNITIES' MIGRATION FROM VULNERABLE AREAS

Source: NDCs in NENA region.

3.2.2.3 Adaptation measures in social systems

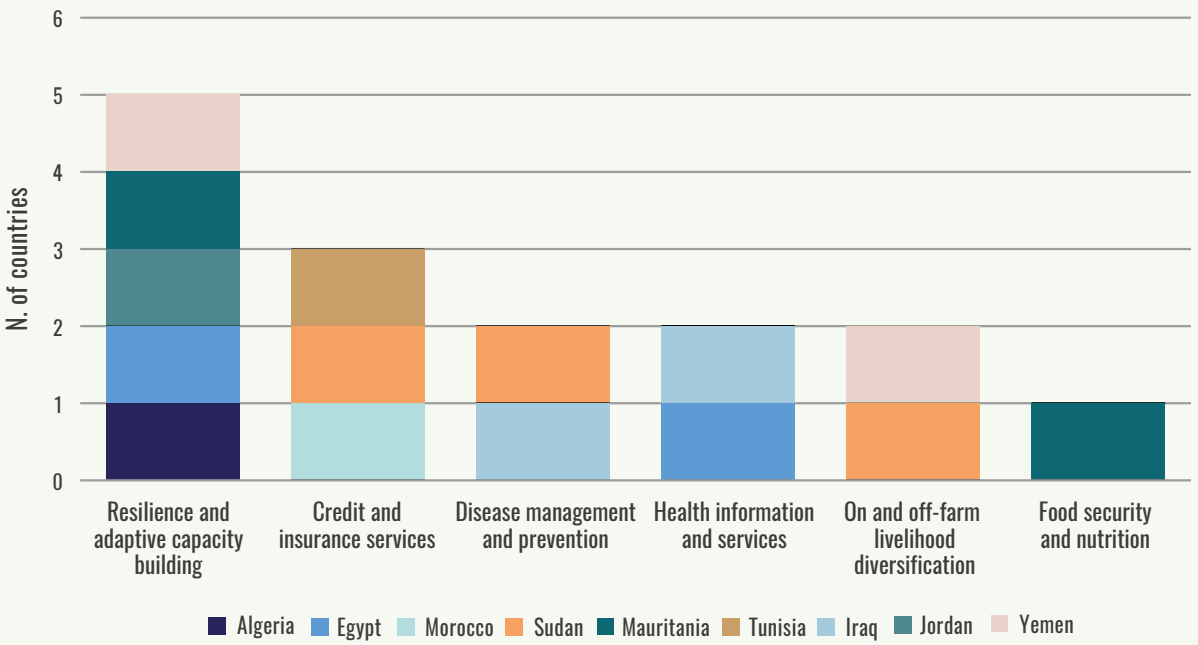
Amongst countries with an adaptation component in the agriculture, water and land use sectors, the majority (15 countries/89 percent) include adaptation measures in social systems, which comprise the following three dimensions: socio-economics and well-being, knowledge and capacity and institutions and governance.

SOCIO-ECONOMICS AND WELL-BEING

Amongst those countries with adaptation policies or measures in social systems, one-third (5 countries/33 percent) promote resilience and adaptive capacity building, while three countries (Tunisia, Morocco and Sudan) promote improved access to and availability of credit and insurance services. Two countries each promote adaptation policies or measures related to disease management and prevention (Sudan and Iraq), health information and services (Iraq and Egypt), on- and off-farm livelihood diversification (Yemen and Sudan). Only one country (Mauritania) promotes a food security and nutrition-related adaptation measure. **Figure 35** illustrates the types of socio-economics and well-being adaptation measures in the NDCs (number of countries).

FIGURE 35.

SOCIO-ECONOMIC AND WELL-BEING RELATED ADAPTATION MEASURES IN THE IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY TYPE



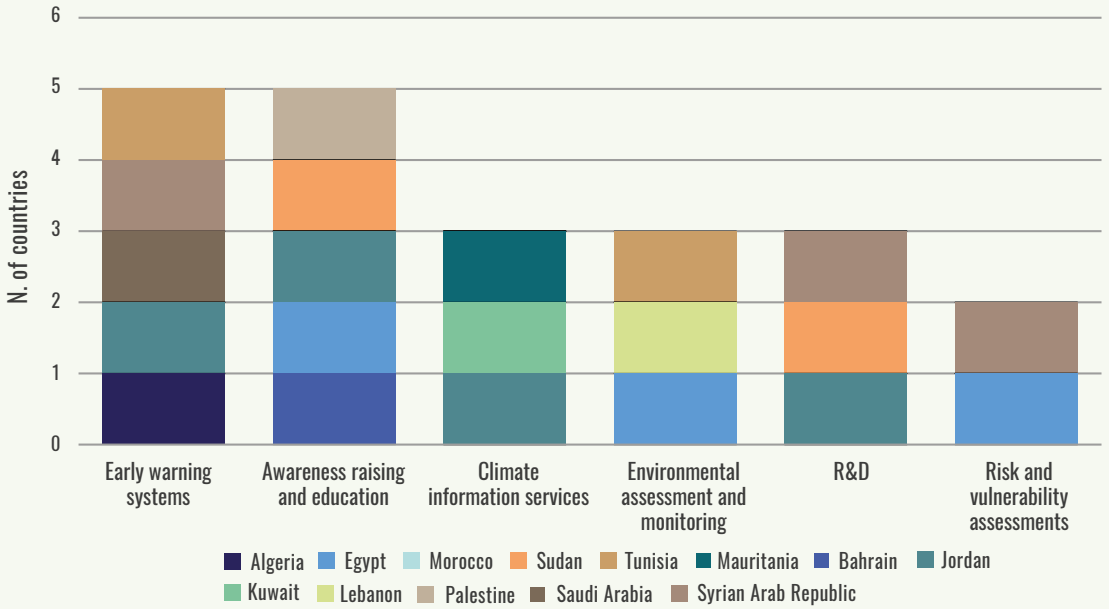
Source: NDCs in NENA region.

KNOWLEDGE AND CAPACITY

Amongst those countries with adaptation policies or measures in social systems, one-third (5 countries/33 percent each) promote early warning systems (EWS) and awareness raising and education (4/29). Three countries promote adaptation policies or measures related to climate information services (Mauritania, Jordan and Kuwait), environmental assessments and monitoring systems (Tunisia, Lebanon and Egypt) and R&D (Syrian Arab Republic, Sudan and Jordan). Two countries (Syrian Arab Republic and Egypt) include policies or measures related to risk and vulnerability assessments and one country (Palestine) promotes extension services in agriculture. **Figure 36** illustrates the types of knowledge and capacity-related adaptation measures in the NDCs (number of countries).

FIGURE 36.

KNOWLEDGE AND CAPACITY-RELATED ADAPTATION MEASURES IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY TYPE



Source: NDCs in NENA region.

INSTITUTIONS AND GOVERNANCE

Amongst those countries with adaptation policies or measures in social systems, around one-third (4 countries/ 29 percent) promote policy mainstreaming and coherence, while only two countries (Jordan and Egypt) include institutional building policies or measures. One country each includes a DRR-related (Egypt) and law and regulation-related (Egypt) adaptation policies or measures.

Table 10 illustrates some country examples of adaptation measures in social systems included in the NDCs.

TABLE 10.

EXAMPLES OF ADAPTATION MEASURES IN SOCIAL SYSTEMS INCLUDED IN NDCs IN THE NENA REGION

COUNTRY NAME	SOCIAL DIMENSION	DESCRIPTION
ALGERIA	LAW AND REGULATION	ADAPTING THE INSTITUTIONAL AND REGULATORY FRAMEWORK TO CLIMATE CHANGE
EGYPT	INSTITUTIONAL CAPACITY BUILDING	BUILD AN EFFECTIVE INSTITUTIONAL SYSTEM TO MANAGE CLIMATE CHANGE ASSOCIATED CRISES AND DISASTERS AT THE NATIONAL LEVEL
JORDAN	EARLY WARNING SYSTEMS	ESTABLISHMENT OF AN INTEGRATED DROUGHT MONITORING AND EARLY WARNING SYSTEMS
EGYPT	ENVIRONMENTAL ASSESSMENT AND MONITORING	BUILDING INSTITUTIONAL CAPACITIES OF COMPREHENSIVE COLLECTION AND ANALYSIS OF MONITORING AND OBSERVATIONS AND GEOGRAPHIC DATA
PALESTINE	AWARENESS RAISING	INCREASING THE AWARENESS OF PEOPLE, PARTICULARLY WOMEN, IN WATER-POOR AREAS OF MEASURES THEY CAN TAKE TO HELP PREVENT MAJOR DISEASES RELATED TO WATER, SANITATION, AND FOOD
MOROCCO	CREDIT AND INSURANCE SERVICES	COVERAGE OF RISK AGAINST CLIMATIC VARIATIONS THROUGH MULTI-RISK INSURANCE FOR CEREALS AND LEGUMES COVERING 1 MILLION HECTARES
SUDAN	GENDER EQUALITY AND WOMEN EMPOWERMENT	ESTABLISHMENT OF WOMEN COOPERATIVE SOCIETIES TO EMPOWER THEM AND INCREASE THEIR RESILIENCE
MAURITANIA	FOOD SECURITY AND NUTRITION	REACH THE FOLLOWING RATES OF COVERAGE OF FOOD NEEDS: 117% FOR RICE, 80% FOR WHEAT, 75% FOR TRADITIONAL CEREALS, 160% FOR MILK, 126% FOR WHITE MEAT
IRAQ	HEALTH INFORMATION AND SERVICES	ENHANCING HEALTH SERVICES AND PROVISION OF POTABLE WATER
SYRIAN ARAB REPUBLIC	RESEARCH AND DEVELOPMENT	DEVELOPING STUDIES AND METHODS FOR IDENTIFYING AND CONTROLLING DUST STORMS IN AFFECTED OR THREATENED AREAS THROUGH THE USE OF GREEN BELTS AND BARRIERS

Source: NDCs in NENA region.

3.2.2.4 Long-term adaptation goals

Amongst all 18 countries with an adaptation component, only two communicate a long-term adaptation goal or vision. Algeria aims to develop a national plan of adaptation to the impacts of climate change in the context of the finalization of its contribution, and in order to promote a more climate change resilient economy. Morocco commits to preserving its territory and its civilization in the most appropriate manner, effectively responding to the vulnerabilities of its territory and implementing an adaptation policy that builds resilience for all of its population and its economic actors to face these vulnerabilities.

3.3 BARRIERS TO IMPLEMENTATION

Under the call for enhanced transparency of action and support in the Paris Agreement (Article 13), Parties are now required to report information necessary to track progress made in implementing and achieving their NDC, including barriers to addressing the social and economic consequences of mitigation, barriers, gaps and challenges to the implementation of adaptation and to attracting international support.

The TNAs provide critical information on the types of constraints impeding the uptake of climate change adaptation and mitigation at scale (UN Environment and UNEP DTU Partnership, 2018). So far, globally, more than 80 developing countries have already conducted their TNAs to identify priority mitigation and adaptation technologies to address climate change issues. The identified technologies have also been mentioned by several countries in their NDCs (UNFCCC, undated).

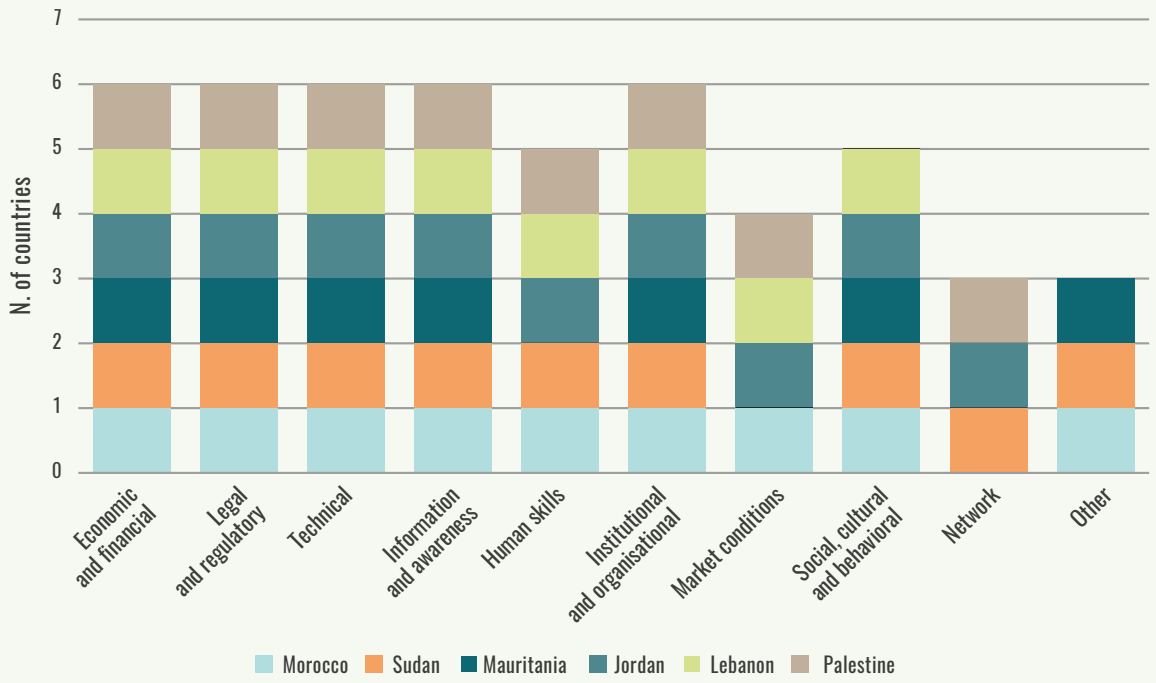
This section synthesizes the types of barriers to the implementation of climate change mitigation and adaptation in the context of the NDCs in the agriculture, water and land use sectors, as expressed in the NDCs and the latest available TNAs submitted by six countries, namely Sudan, Mauritania, Morocco, Tunisia,[30] Jordan, Lebanon and Palestine.

Amongst barriers reported, all countries (6 countries/100 percent of countries with barriers reported) identified economic and financial constraints, lack of legal and regulatory processes, lack of knowledge and information, institutional and organizational obstructions, technical issues and lastly, social, cultural and behavioral issues as the main barriers towards uptake and implementation of technologies. Other barriers reported by the countries include unfavorable market conditions and networks and limited human skills. **Figure 37** illustrates the types of barriers to implementation reported (number of countries).

[30] Tunisia conducted its Technical Needs Assessment (TNA) but barriers to uptake and implementation were not identified as part of the process.

FIGURE 37.

BARRIERS TO NDC IMPLEMENTATION REPORTED IN THE NENA REGION, BY TYPE



Source: NDCs and TNAs of NENA.

3.4 SUPPORT NEEDS

Article 9, 10 and 11 of the PA recognize the importance of the provision of support towards developing country Parties, particularly countries with the least capacity and those that are particularly vulnerable to the adverse effects of climate change. Under the new transparency requirements of the Enhanced Transparency Framework (ETF), Parties are required to report information on financial, technology transfer and capacity building support needed and received or provided, by sector or sub-sector.

This section provides a synthesis of the types of support needs (finance, technology transfer and capacity building) for NDC implementation in general and in the agriculture, water and land use sectors, as expressed in the NDCs and latest available TNAs submitted by six countries.

Overall, only around one-third of countries in the region with an NDC report finance (7 countries/ 39 percent) and technology needs (6 countries, 33 percent), whereas one-fifth of countries (4/22 percent) report only capacity building needs.

3.4.1 Finance needs

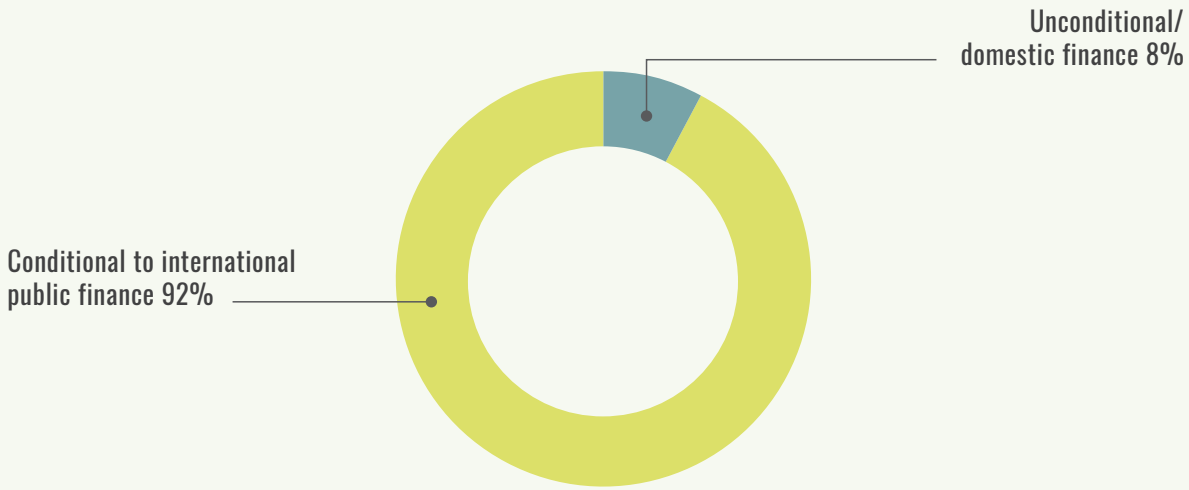
Climate finance needs in the NENA region exceed current rates of investment.[31] Eight countries[32] in the region identified climate finance needs in the NDCs totaling USD 371 billion (ESCWA, undated). Countries identified public international climate finance support needs of around 92 percent of the total, or USD 341 billion (**Figure 38**). Analysis of Organisation for Economic Co-operation and Development (OECD) data finds that the NENA region receives an average of USD 4 billion per year in public international climate finance support, which is far below the needs of the 8 NENA countries who communicated finance needs (ESCWA, undated).

[31] Based on analyses by FAO and the United Nations Economic and Social Commission for Western Asia (ESCWA) of Organisation for Economic Co-operation and Development (OECD) data (ESCWA, 2021).

[32] Egypt, Iraq, Jordan, Mauritania, Morocco, Palestine, the Sudan, and Tunisia.

FIGURE 38.

CLIMATE FINANCE NEEDS EXPRESSED IN THE NDCs OF NENA COUNTRIES, BY CONDITIONAL AND UNCONDITIONAL SHARE OF TOTAL

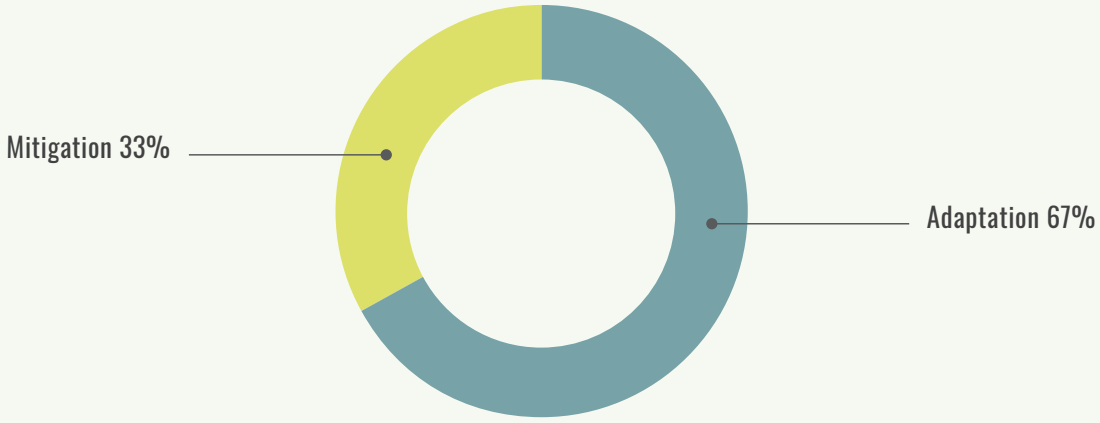


Source: NDCs in NENA region.

Out of the 8 NENA countries with finance needs communicated, the region requests for more than double the amount of climate finance for adaptation than it does for mitigation (**Figure 39**). Forty-three percent of funding in the NENA region targeted adaptation (ESCWA, undated).

FIGURE 39.

ADAPTATION AND MITIGATION FINANCE NEEDS AS EXPRESSED IN THE NDCs OF NENA COUNTRIES, BY SHARE OF TOTAL



Source: NDCs in NENA region.

Climate finance flows to the agriculture, water and land use sectors in the NENA region lag behind that of other regions (FAO, 2021a). The rate of climate finance flows to the NENA region has increased more gradually than that to regions like Africa, Asia and the Americas. International climate finance flows to energy, transport and other sectors in the region outnumber flows to water and sanitation sectors by five times and AFOLU by seven times, respectively (ESCWA, undated).

The flows of finance within the region also varies to a significant degree, with middle-income countries able to attract the most funding whereas the region's LDCs receive very little climate finance support (ESCWA, undated).

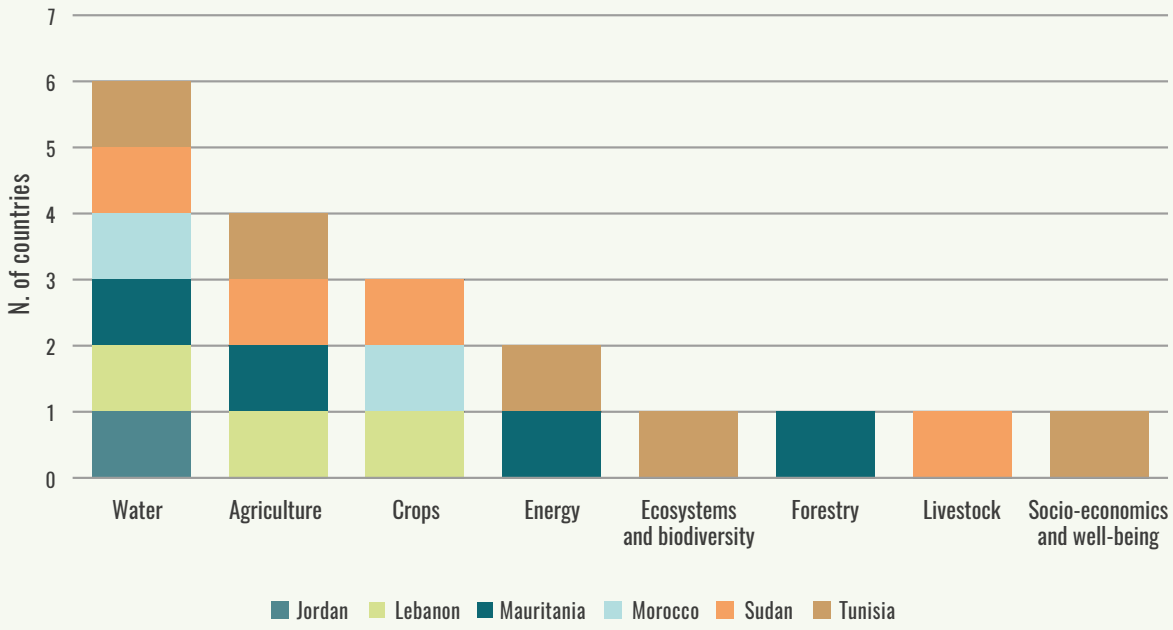
3.4.2 Technology transfer needs

To accelerate the rapid transformational changes needed towards low-emission development and climate resilience, scaling up support in the agriculture, water and land use sectors in the form of enhanced finance, technology development and transfer and capacity building is a prerequisite. Information on the potential, ability and scale of climate technologies and capacities required for the uptake of climate action in a country is a fundamental starting point for designing technology action plans and capacity-building programmes. The TNA process helps to formulate a country's long term development plans by identifying priority technologies for key sectors in order to transit to a low emission, climate resilient and sustainable pathway (CTCN, n.d.).

Generally, only around one-third of countries in the region report technology transfer needs (6 countries/33 percent) in the NDCs and/or TNAs. Out of countries in the region with technology needs reported in the agriculture, water and land use sectors, all of them report water (6 countries/100 percent) as a priority area for technology transfer and dissemination, followed by agriculture in general (4/67 percent), crops (Sudan, Morocco and Lebanon) and bioenergy (Tunisia and Mauritania), amongst others. **Figure 40** illustrates the priority areas for technology transfer in the agriculture, water and land use sectors expressed in the NDCs and TNAs (number of countries).

FIGURE 40.

PRIORITY AREAS FOR TECHNOLOGY TRANSFER AND DISSEMINATION IN THE AGRICULTURE, WATER AND LAND USE SECTORS REPORTED IN THE NENA REGION

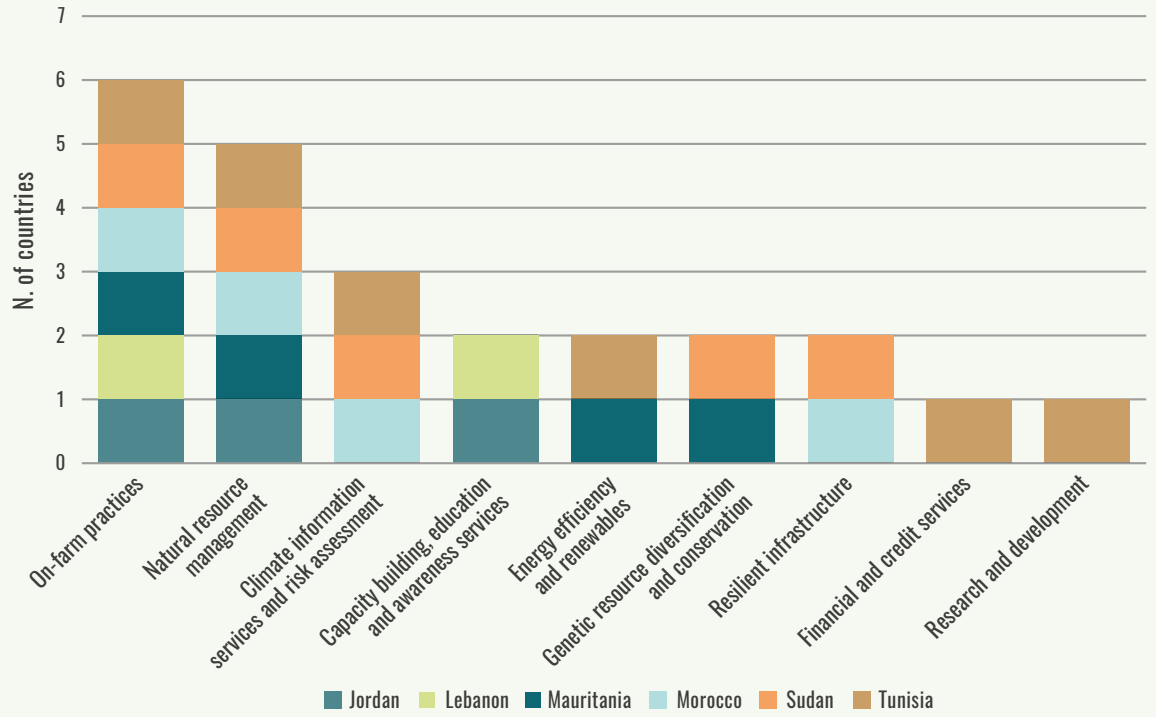


Source: NDCs and TNAs in NENA region.

Across the priority areas for technology transfer and dissemination in identified in the agriculture, water and land use sectors, all countries report on-farm technologies (6 countries/100 percent) and the majority report natural resource management technologies (5/67 percent) as most needed, followed by climate information services (Tunisia, Morocco and Sudan), energy efficiency and renewable technologies (Tunisia, Mauritania) and genetic resource conservation and diversification technologies (Sudan and Mauritania), amongst others. **Figure 41** illustrates the types of priority technologies for transfer and dissemination the agriculture, water and land use sectors expressed in the NDCs and TNAs (number of countries).

FIGURE 41.

PRIORITY TECHNOLOGIES FOR TRANSFER AND DISSEMINATION IN THE AGRICULTURE, WATER AND LAND USE SECTORS REPORTED IN THE NENA REGION



Source: NDCs and TNAs in NENA region.

Table 11 illustrates some country examples of technology needs in the agriculture, water and land use sectors reported in NDCs and TNAs in the region.

TABLE 11.

EXAMPLES OF PRIORITY TECHNOLOGY NEEDS IN THE AGRICULTURE, WATER AND LAND USE SECTORS REPORTED IN THE NENA REGION

COUNTRY NAME	PRIORITY AREA FOR SUPPORT	DESCRIPTION OF TECHNOLOGY NEED
MAURITANIA	ENERGY	SOLAR POWERED PUMPING TECHNOLOGY
	WATER	RUNOFF TECHNOLOGY
MOROCCO	CROPS	FOR ADAPTATION OF MOROCCAN AGRICULTURE TO CLIMATE CHANGE, THERE IS A NEED TO DEVELOP A SYSTEM FOR STOCK TAKING INFORMATION ON IRRIGATED AGRICULTURE, AND DISSEMINATION OF GOOD PRACTICES FOR MANAGING DRY LAND CROPS
	WATER	WATER EFFICIENT IRRIGATION TECHNOLOGIES; FLOOD WARNING SYSTEMS; RAINWATER COLLECTION
TUNISIA	ECOSYSTEMS AND BIODIVERSITY	PAYMENT MECHANISM FOR ECOSYSTEM SERVICES
	WATER	DEVELOPMENT OF WASTEWATER TREATMENT FOR AGRICULTURE; EARLY WARNING SYSTEM FOR FLOODS; RAINWATER COLLECTION
	AGRICULTURE	NATIONAL AGRICULTURE MAP
SUDAN	AGRICULTURE	IMPROVED CROP VARIETIES (BREEDING AND IMPORTED) AND LIVESTOCK BREEDING
	WATER	SEASONAL FORECASTING AND EARLY WARNING SYSTEM (AUTOMATIC WATER LEVEL)
JORDAN	WATER	BRACKISH WATER TREATMENT AND RE-USE
LEBANON	AGRICULTURE	CONSERVATION AGRICULTURE; SELECTION OF ADAPTED VARIETIES AND ROOTSTOCKS (SAVR)
	WATER	RAINWATER HARVESTING

Source: NDCs and TNAs in NENA region.

3.4.3 Capacity-building needs

Only four countries (Mauritania, Morocco, Palestine and Tunisia) report capacity-building needs for NDC implementation in the NDCs and/or TNAs. All three countries identify capacity needs around knowledge sharing and skill development, whereas two (Mauritania and Tunisia) report capacity needs around organizational performance and institutional capabilities. Tunisia, for example, highlighted the need for training of stakeholders to ensure that the NDC goals and targets are achieved. In addition, it also mentioned the need to introduce technology transfer programmes to allow the country to develop technical skills to ensure the sustainability and continuity of its contributions. Mauritania on the other hand, highlighted the need for capacity building in a number of technical areas, including knowledge building activities for experts on GHG inventories and mitigation actions, establishment of an MRV system, conducting financial evaluations of different activities and institutionalize national teams to audit and monitor activities. The Palestine references capacity building needs for building GHG inventories and projections, as well as climate risk and vulnerability assessments. **Table 12** illustrates some country examples of capacity-building needs in the agriculture, water and land use sectors reported in NDCs and TNAs in the region.

TABLE 12.

EXAMPLES OF CAPACITY-BUILDING NEEDS IN THE AGRICULTURE, WATER AND LAND USE SECTORS REPORTED IN THE NENA REGION

COUNTRY NAME	PRIORITY AREA	DESCRIPTIOIN OF CAPACITY-BUILDING NEED
TUNISIA	MITIGATION AND ADAPTATION	• CAPACITY-BUILDING MEASURES AND ACTIVITIES SUCH AS TRAININGS FOR RELEVANT STAKEHOLDERS WILL BE REQUIRED IN ORDER TO ACHIEVE THE NDC GOALS AND TARGETS • ACILITATING TECHNOLOGY TRANSFER PROGRAMMES IN ORDER TO MONITOR THE COUNTRY'S PERFORMANCE AND CONTRIBUTION TOWARDS ACHIEVING THE GOALS AND TARGETS
MAURITANIA	MITIGATION	CAPACITY DEVELOPMENT ACTIVITIES FOR EXPERTS TO IMPROVE KNOWLEDGE OF GHG INVENTORIES AND MITIGATION ACTIONS, AND SUPPORT THE ESTABLISHMENT OF AN MRV SYSTEM
	MITIGATION	CAPACITY BUILDING ON DEVELOPING A FINANCIAL EVALUATION OF MITIGATION ACTIVITIES
PALESTINE	MITIGATION	• CAPACITY BUILDING ACTIVITIES FOR THE DEVELOPMENT OF SKILLS RELATED TO GHG INVENTORIES • CAPACITY BUILDING ACTIVITIES AIMED AT IMPROVING SKILLS FOR DEVELOPING EMISSION PROJECTIONS AND MITIGATION OPTIONS
	ADAPTATION	CAPACITY BUILDING FOR VULNERABILITY AND ADAPTATION ASSESSMENTS

Source: NDCs and TNAs in NENA region.

3.5 NATIONALLY DETERMINED CONTRIBUTIONS PLANNING PROCESSES

Under COP24 decision 4/CMA1 (**Annex 1**) on information to facilitate clarity, transparency and understanding (CTU), Parties are expected to provide a description of the various planning processes underlying the preparation of NDCs, as well as the processes, either planned or already established, to accompany NDC implementation and track its progress. Such institutional arrangements provide the enabling environment for an iterative planning process that ensures that climate action is smart, forward-looking, and inclusive. The INDC (and later the NDC) planning processes differed across countries and regions, depending on the domestic circumstances, national and international environmental commitments, and lastly, country capacities to undertake a consultative process to formulate the NDCs.

This section provides a synthesis of the types of planning processes underlying NDC formulation, implementation and reporting in general and in the agriculture, water and land use sectors, as described in the NDCs of 11 countries.

Out of countries with an NDC, around two-thirds (12 countries/67 percent) include information on domestic institutional arrangements and coordination mechanisms, half (9/50 percent) include

information on domestic implementation mechanisms and monitoring systems, around one-third (6/33 percent) include information on policy mainstreaming and budget integration processes and only three countries (Morocco, Palestine and United Arab Emirates) include information on knowledge and evidence generation. **Table 13** illustrates the types of NDC planning processes described in the NDCs (number of countries and share of total with NDC).

TABLE 13.

TYPES OF PLANNING PROCESSES FOR NDC FORMULATION, IMPLEMENTATION AND REPORTING IN NENA

NDC PLANNING PROCESSES	N. OF COUNTRIES	% OUT OF COUNTRIES WITH NDC
DOMESTIC INSTITUTIONAL ARRANGEMENTS AND COORDINATION MECHANISMS	**12**	**67%**
CROSS-SECTORAL COORDINATION MECHANISMS BETWEEN NDC AND OTHER KEY POLICY PROCESSES	8	44%
STAKEHOLDER ENGAGEMENT	7	39%
NDC AND SECTORAL FOCAL POINTS	6	33%
DOMESTIC IMPLEMENTATION MECHANISMS AND MONITORING SYSTEMS	**9**	**50%**
INSTITUTIONAL ARRANGEMENTS FOR MONITORING AND EVALUATING NDC IMPLEMENTATION	8	44%
INSTITUTIONAL ARRANGEMENTS FOR TRACKING AND REPORTING NDC PROGRESS	2	12%
POLICY COHERENCE AND BUDGETING PROCESSES	**6**	**33%**
POLICY MAINSTREAMING AND BUDGET INTEGRATION	5	28%
POLICY OPTION PRIORITIZATION	1	6%
PROJECT DEVELOPMENT AND CLIMATE FINANCE MOBILIZATION	1	6%
KNOWLEDGE AND EVIDENCE GENERATION	**3**	**17%**
VULNERABILITY AND CAPACITY ANALYSIS	2	11%
MITIGATION BASELINE ANALYSIS	1	6%

Source: NDCs in NENA. Note that a country may communicate more than one type of policy process per category.

Amongst the types of domestic institutional arrangements and coordination mechanisms related to NDC planning, many countries provide information on NDC and sectoral focal points, stakeholder engagement processes and cross-sectoral coordination mechanisms set up between the NDCs and other key policy processes. Several countries in the region had established national committees comprising relevant ministries and government representatives to formulate the NDCs. For example, in Algeria, a National Climate Committee (NCC) was established under the Ministry of Environment that aims to strengthen the institutional framework required for improved coordination, monitoring and assessment of national climate change policies and programmes, in alignment with Algeria's commitments to the UNFCCC. The NCC, which is composed of representatives of relevant government bodies and the National Economic and Social Council, leads the development of the NDC through a consultative process with different national level stakeholders. Similarly, Morocco also developed its NDC through a consultative process, involving various stakeholders, which spanned over two years and included an intensive review of current policies and programmes. The Ministry of Environment in Qatar has a dedicated department on climate change responsible for strengthening the governance of climate change related activities at the national scale. Sudan, on the other hand, has conducted its TNA to identify its adaptation and mitigation priorities, needs and barriers in 2013. The results from this process supported the formulation of its NDC.

Many countries have also reported various initiatives under domestic implementation mechanisms and monitoring systems such as institutional arrangements for monitoring and evaluating NDC implementation, policy coherence and budgeting processes and institutional arrangements for tracking and reporting NDC progress. For example, in Lebanon, to streamline reporting and monitoring processes as per national and international requirements, the government aims to integrate an MRV system into its current activities. At present, the MRV related activities and requirements for the UNFCCC processes are generally covered in the NCs and BURs. A similar approach to strengthen MRV of NDC and other climate change policies and programmes is also envisioned by the government of Saudi Arabia. In

Algeria, multiple national entities and frameworks such as the National Climate Committee, National Climate Change Agency, National Climate Plan, National Actions Plan for Environment and Sustainable Development, National system of Measurement, Reporting and Verification (among others) will provide the institutional framework required for monitoring and evaluating the NDC implementation status. In some countries, the NDC is being considered integral to national strategies, which greatly supports policy coherence and mainstreaming at the national scale. For example, in Jordan, the NDC is a key component of its National Green Growth Plan.

The need for policy mainstreaming and budget integration through policy option prioritization and project development and climate finance mobilization has also been identified by a few countries in the region, such as the Palestine and Kuwait. The United Arab Emirates has already launched an initiative to develop a full national inventory of greenhouse gas emissions as part of its mitigation baseline analysis.

CHAPTER 4

CHAPTER

4

GAP AND OPPORTUNITY ANALYSIS FOR THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NATIONALLY DETERMINED CONTRIBUTIONS

This section reflects on the current "ambition" levels of the mitigation and adaptation contributions in the agriculture, water and land use sectors contained in the NDCs of NENA countries. It presents the GHG emissions scenarios "with" and "without" NDC implementation to understand current baselines and expected emissions reductions. A comparative analysis of key GHG emissions and adaptation hotpots in the agriculture, water and land use sectors against the NDCs is also presented, pointing to opportunities for enhancing the coverage of mitigation and adaptation measures in future NDC revisions.

4.1 GREENHOUSE GAS EMISSION SCENARIOS

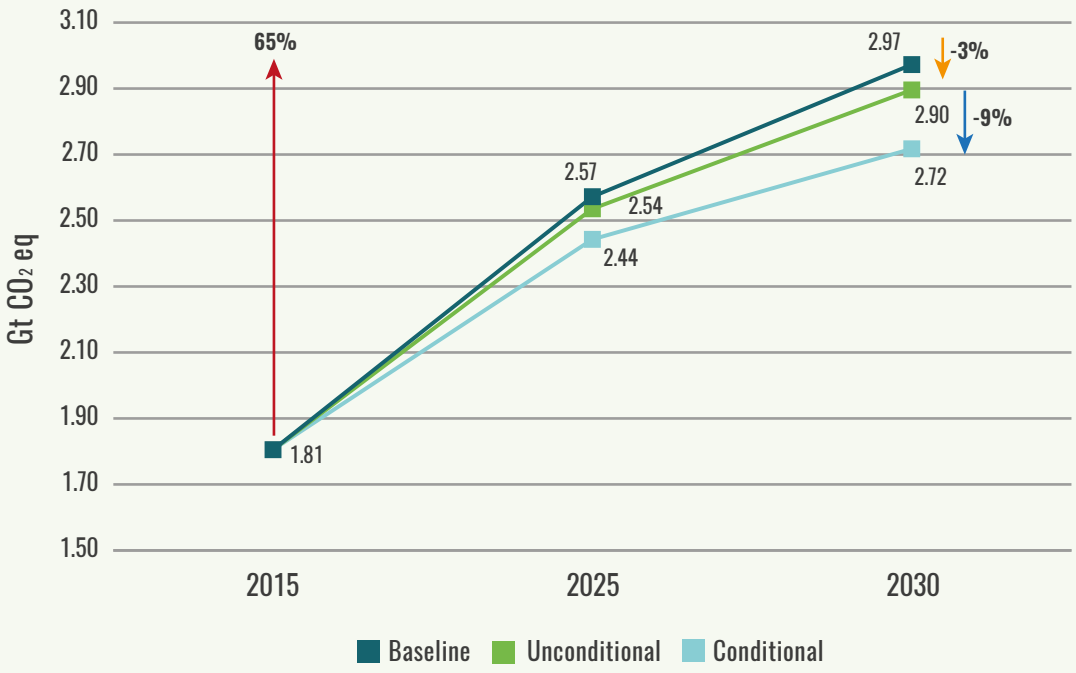
Based on national GHG inventory data and emissions reduction scenarios reported in the NDCs in the NENA region, this section depicts three emissions scenarios: 2015 historical emissions levels (2015), baseline emissions levels "without" NDC implementation (2030) and target emissions levels "with" NDC implementation. For those countries with a GHG target and baseline emissions levels reported in the NDC, the target emissions levels were estimated at the country level. For those countries with a GHG target but no baseline emissions level reported in the NDC, the baseline was extrapolated based on the country's historical emissions level and the regional baseline trend (i. e. average change in baseline net emissions between 2015 and 2030). For those countries without a GHG target and baseline emissions levels reported in the NDC, the baseline was extrapolated based on the country's historical emissions level and the regional

baseline trend. For those countries without a GHG target, their 2030 emissions levels "with" and "without" NDC implementation are identical. Refer to FAO (2021) for further details on the methodology behind the GHG emissions scenarios under NDC implementation.

In NENA, net emissions are expected to increase by approximately 65 percent by 2030 as compared to 2015 levels, rising from 1.8 to 2.9 Gt of CO_2 eq. The expected reduction[33] in net emissions if unconditional [34]mitigation targets are implemented is around 3 percent, while if conditional targets are reached the expected reduction would be an additional 9 percent by 2030, compared to the baseline scenario. These reductions would lead to a level of emissions equivalent to 2.7 Gt of CO_2 eq in 2030. Total net emissions are expected, thus, to rise overall, despite NDC implementation, by around 50 percent compared to the 2015 starting levels. **Figure 42** illustrates the 2015 historical, 2025 and 2030 baseline and 2025 and 2030 NDC target GHG emissions scenarios as either communicated in the NDCs or extrapolated by FAO using the methodology described above (Gt CO_2 eq).

FIGURE 42.

ECONOMY-WIDE GHG EMISSIONS SCENARIOS "WITH" AND "WITHOUT" NDC IMPLEMENTATION IN THE NENA REGION



Source: FAO elaboration of national GHG inventories and NDC targets in the NENA region.

In the Near East, net emissions are expected to increase by approximately 70 percent by 2030 as compared to 2015 levels, rising from 1.0 to 1.7 Gt CO_2 eq. The expected reduction[35] in net emissions if unconditional mitigation targets are implemented is only 1 percent, while if conditional targets are reached the expected reduction would be an additional 5 percent by 2030, compared to the baseline scenario.

[33] Net emission reduction estimated based on GHG targets communicated by Algeria, Morocco, Tunisia, Mauritania, Lebanon, Palestine.

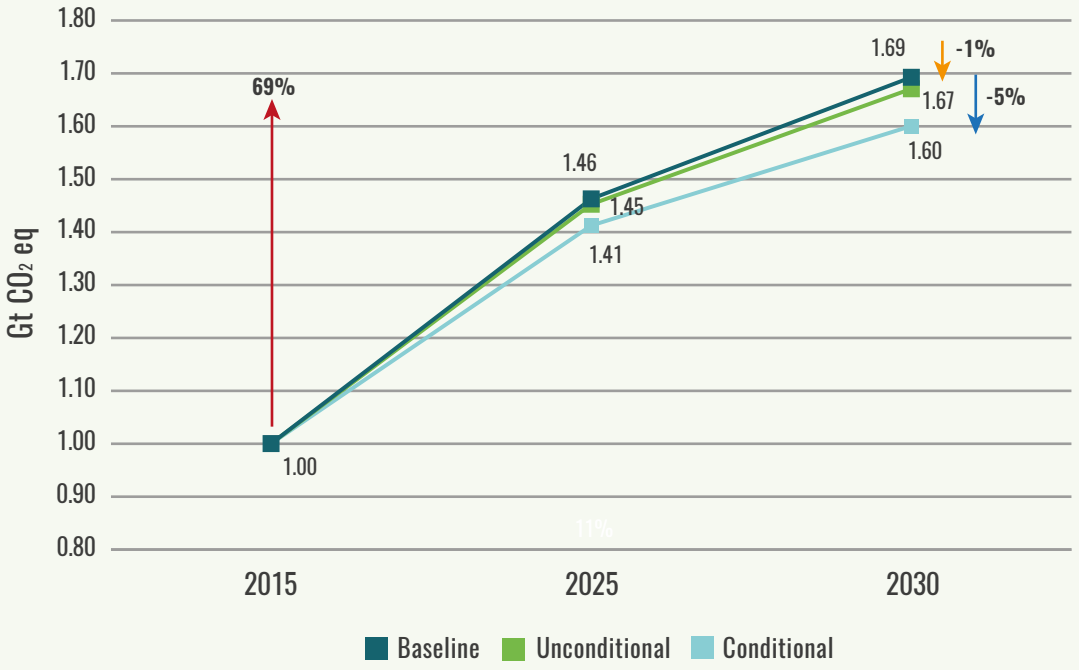
[34] Unconditional targets refer to emission reduction targets based on domestic means and not conditional to the provision of external support (eg. international climate finance).

[35] Net emission reduction estimated based on GHG targets communicated by Jordan, Lebanon and Palestine with economy-wide GHG target.

These would lead to a level of emissions equivalent to 1.6 Gt CO_2 eq in 2030. Despite NDC implementation, total net emissions are expected, thus, to rise by around 60 percent compared to the 2015 starting levels. **Figure 43** illustrates the 2015 historical, 2025 and 2030 baseline and 2025 and 2030 NDC target GHG emission scenarios as either communicated in the NDCs or extrapolated by FAO (Mt CO_2 eq).

FIGURE 43.

ECONOMY-WIDE GHG EMISSION SCENARIOS "WITH" AND "WITHOUT" NDC IMPLEMENTATION IN THE NEAR EAST



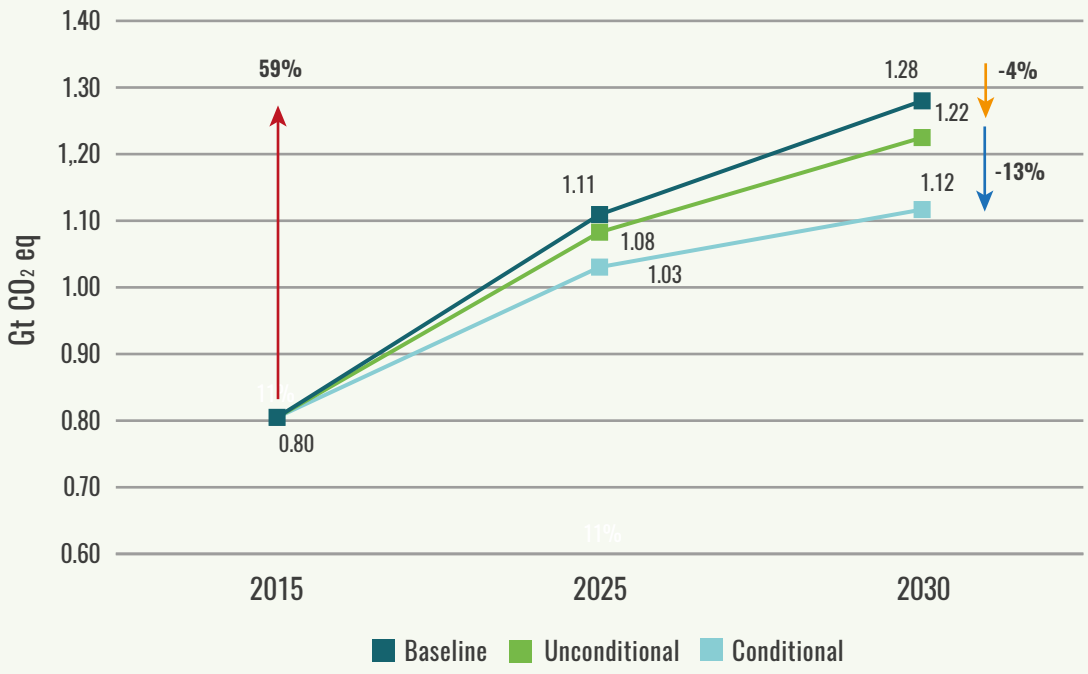
Source: FAO elaboration of national GHG inventories and NDC targets in Near East.

In North Africa, net emissions are expected to increase by approximately 60 percent by 2030 as compared to 2015 levels, rising from 0.8 to 1.3 Gt CO_2 eq. The expected reduction[36] in net emissions if unconditional mitigation targets are implemented is around 4 percent, while if conditional targets are reached the expected reduction would be an additional 13 percent by 2030, compared to the baseline scenario. These reductions would lead to a level of emissions equivalent to 1.1 Gt CO_2 eq in 2030. Despite NDC implementation, total net emissions are expected, thus, to rise by around 40 percent compared to the 2015 starting levels. **Figure 44** illustrates the 2015 historical, 2025 and 2030 baseline and 2025 and 2030 NDC target GHG emission scenarios as either communicated in the NDCs or extrapolated by FAO.

[36] Net emission reduction estimated based on GHG targets communicated by Algeria, Morocco, Tunisia, Mauritania with economy-wide GHG target.

FIGURE 44.

ECONOMY-WIDE GHG EMISSION SCENARIOS "WITH" AND "WITHOUT" NDC IMPLEMENTATION IN NORTH AFRICA



Source: FAO elaboration of national GHG inventories and NDC targets in North Africa.

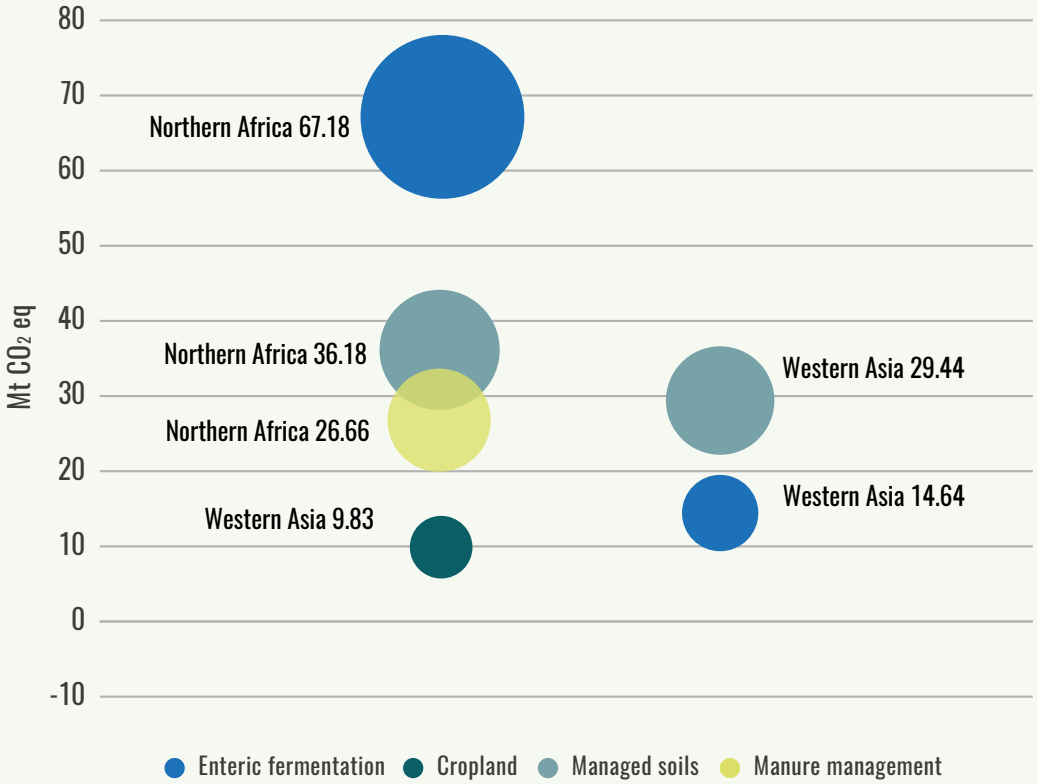
4.2 MITIGATION POLICY OPPORTUNITIES AND GAPS

Based on the national GHG inventories of those 16 countries[37] with sectoral emissions and removals disaggregated by categories and sub-categories in the agriculture and LULUCF sectors, the greatest sources of emissions, or "GHG hotspots," were identified at the subregional level. **Overall, the largest GHG hotspots are associated with emissions from enteric fermentation in Northern Africa (67 Mt CO_2eq), followed by emissions from managed soils in Northern Africa (36 Mt CO_2eq) and Western Asia (29 Mt CO_2eq).** Other GHG hotspots include emissions from manure management in North Africa, cropland and enteric fermentation emissions in Western Asia. **Figure 45** illustrates the overall distribution of GHG hotspots in the agriculture, water and land use sectors in the region by sub-region (Mt CO_2eq).

[37] Libya and Bahrain do not include disaggregated sectoral emissions and removals.

FIGURE 45.

GHG HOTSPOTS IN THE AFOLU SECTOR IN THE NENA REGION, BY SUB-REGION



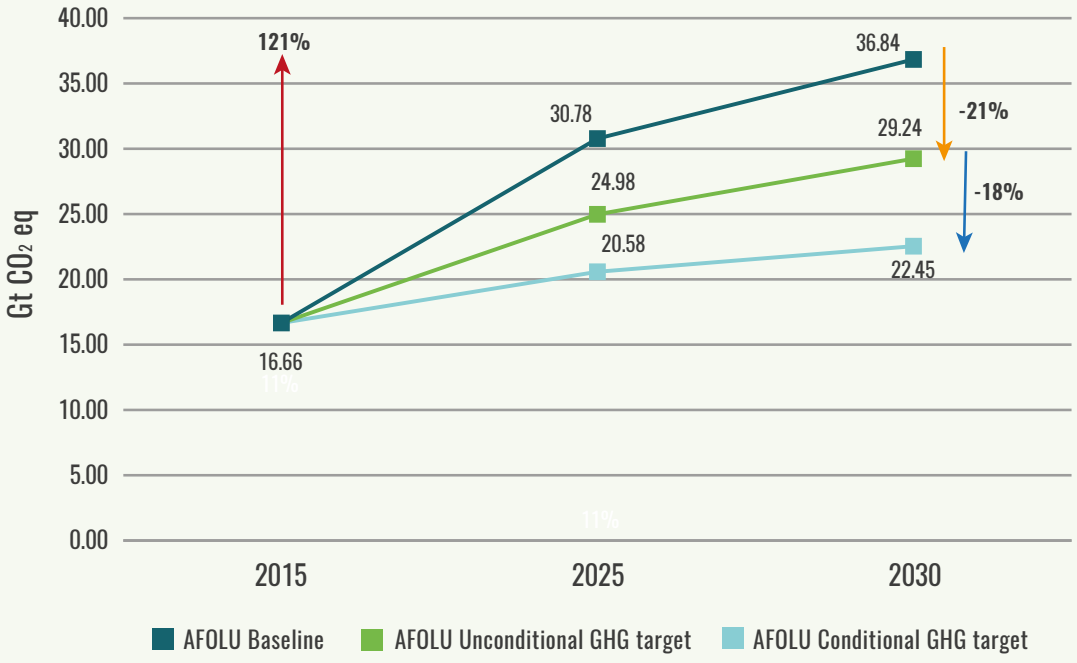
Source: National GHG Inventories.

Only one country (Morocco) projects a BAU counterfactual emissions scenario specific to the AFOLU sector, against which it sets a sectoral GHG emission reduction target. Morocco projects a doubling of net AFOLU emissions by 2030 (121 percent increase). Implementation of unconditional mitigation contribution would result in a net reduction of around 21 percent and implementation of the conditional contribution would result in another 19 percent – for a total of 39 percent reduction compared to the 2030 BAU scenario. **Figure 46** illustrates the baseline and conditional and unconditional mitigation scenarios for the AFOLU sector found in Morocco's NDC.

A comparative analysis was undertaken to assess the coverage of AFOLU mitigation measures presented in the NDCs against the GHG hotspots identified in national GHG inventories. **Overall, significant mitigation policy coverage gaps in the NDCs emerge around emissions from enteric fermentation and managed soils.** Only one country (Syrian Arab Republic) includes mitigation measures addressing its respective GHG hotspots identified. **Figure 47** illustrates the results of the policy gap analysis comparing the share of countries with a given GHG hotspot against the share of countries with mitigation policy coverage in relation to their respective hotspots.

FIGURE 46.

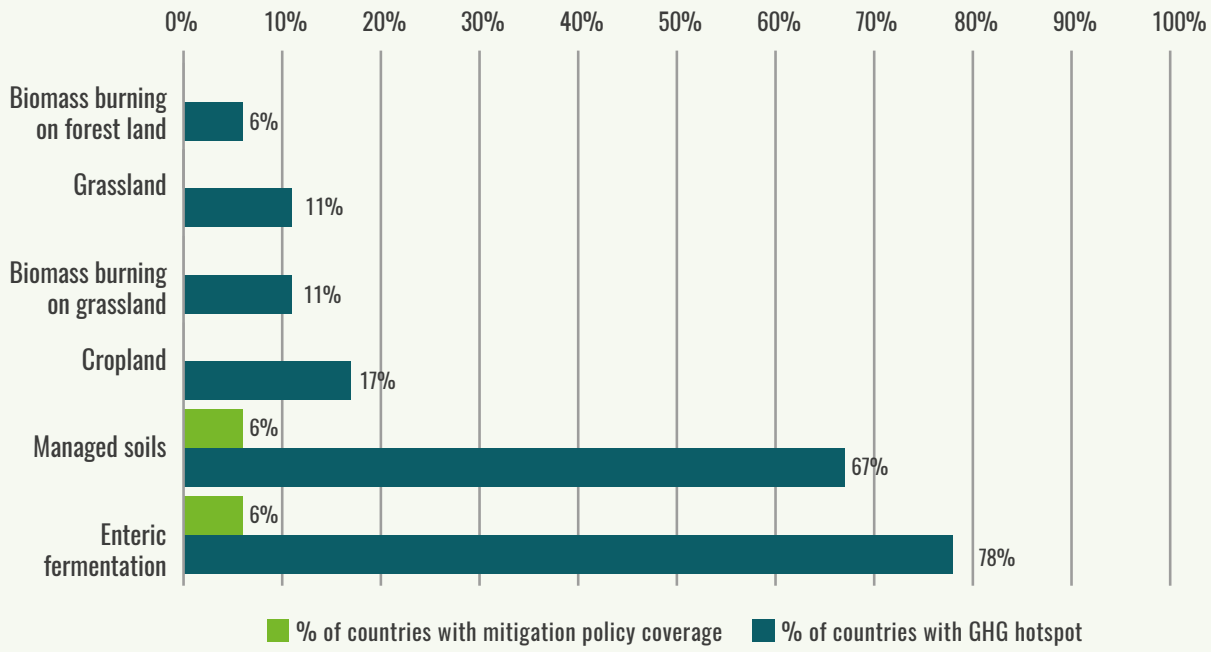
MOROCCO'S GHG TARGET IN THE AFOLU SECTOR



Source: FAO elaboration of Morocco's NDC target for the AFOLU sector.

FIGURE 47.

NDC MITIGATION POLICY COVERAGE GAP ANALYSIS FOR THE AFOLU SECTOR IN NENA

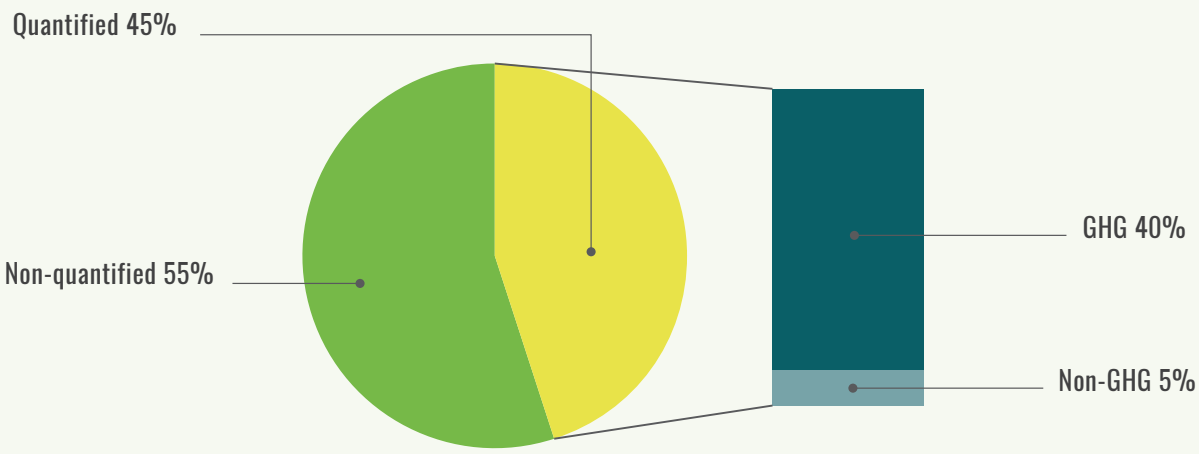


Source: FAO analysis of national GHG inventories and NDCs in the NENA region.

Less than half of all mitigation measures in the AFOLU sector are quantified. Some countries (Morocco, Sudan, Palestine and Jordan) include non-GHG metrics to measure mitigation policies or measures in the AFOLU sector, such as hectares of land or number of farms under improved management. However, quantified and measurable targets are key to planning for NDC implementation and the tracking of progress. **Figure 48** illustrates the distribution of metrics associated with mitigation measures in the AFOLU sector in the NDCs, by type (share of total).

FIGURE 48.

METRICS ASSOCIATED WITH MITIGATION MEASURES IN THE AFOLU SECTOR IN THE NDCs IN THE NENA REGION



Source: NDCs in NENA.

None of the countries in the region make reference to the development of long-term emission development strategies (LEDS), whereby NDC targets could serve as milestones in the longer-term approach to ensuring low-emission, climate-resilient development.

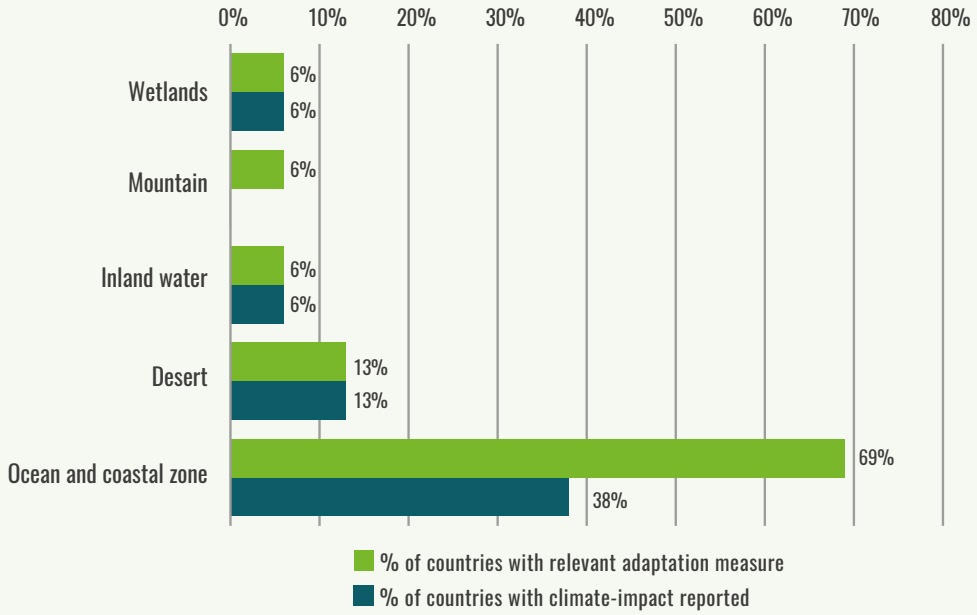
4.3 ADAPTATION POLICY OPPORTUNITIES AND GAPS

A comparative analysis was undertaken to assess the coverage of agriculture, water and land use-related adaptation measures presented in the NDCs against the 'at risk' ecosystems and agro-ecosystems identified in NDC and/or NCs. An 'at risk' ecosystem refers to those ecosystems for which climate-related impacts, vulnerabilities and risks are either observed or projected in the region, as reported in the NDCs and/or NCs. At the ecosystem level, adaptation policy coverage gaps emerge in the NDCs around vulnerable coastal zone ecosystems and mountain ecosystems. **Figure 49** illustrates the adaptation policy coverage gaps in the NDCs in relation to vulnerable ecosystems, represented as the share of countries with climate-impacts reported per ecosystem compared against the share of countries with a relevant adaptation measure.

Some adaptation policy coverage gaps in the NDCs emerge across agro-ecosystems, mostly in crops, fisheries, livestock and grassland systems. Figure 50 illustrates the adaptation policy coverage gaps in the NDCs in relation to vulnerable sub-sectors, represented as the share of countries with climate-impacts reported per sub-sector compared against the share of countries with a relevant adaptation measure.

FIGURE 49.

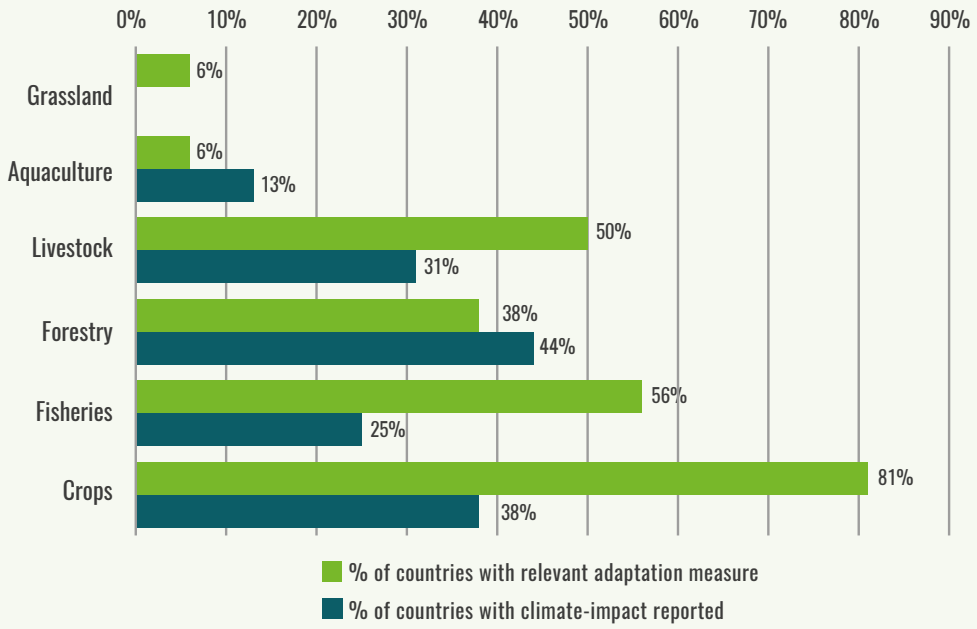
ADAPTATION POLICY COVERAGE GAP ANALYSIS OF VULNERABLE ECOSYSTEMS IN THE NDCs IN THE NENA REGION



Source: FAO analysis of NDCs and NCs in NENA.

FIGURE 50.

ADAPTATION POLICY COVERAGE GAP ANALYSIS OF AGRO-ECOSYSTEMS IN THE NDCs IN NENA



Source: FAO analysis of NDCs and NCs in NENA.

Two countries in the region (Palestine and Jordan) make reference to the gendered impacts of climate change in agriculture, water and land use sectors. For instance, Palestine references how women are likely to experience the impacts of climate change on water resources, sanitation and diseases incidence. Jordan stresses the crucial contribution of women to the rural economy as farmers, animal husbandry, workers, entrepreneurs and holders of indigenous knowledge. However, it is widely documented that climate change affects genders differently and can therefore exacerbate or lead to new gender inequalities (UNFCCC, 2015b).

Only three countries in the region (Sudan, Palestine and Jordan) call for a focus on gender-responsive adaptation in agriculture, water and land use sectors. For instance, Sudan aims to "enhance the participation of women and youth in activities related to adaptation and environmental conservation in order to empower them and enhance their adaptive capacity including through the establishment of rural women development programme." However, evidence and experience suggest that gender-responsive approaches to climate change strengthen resilience as it would lead to the inclusion of the different capacities, experiences, expertise and perspectives possessed by men and women in the adaptation initiatives (UNDP, 2016).

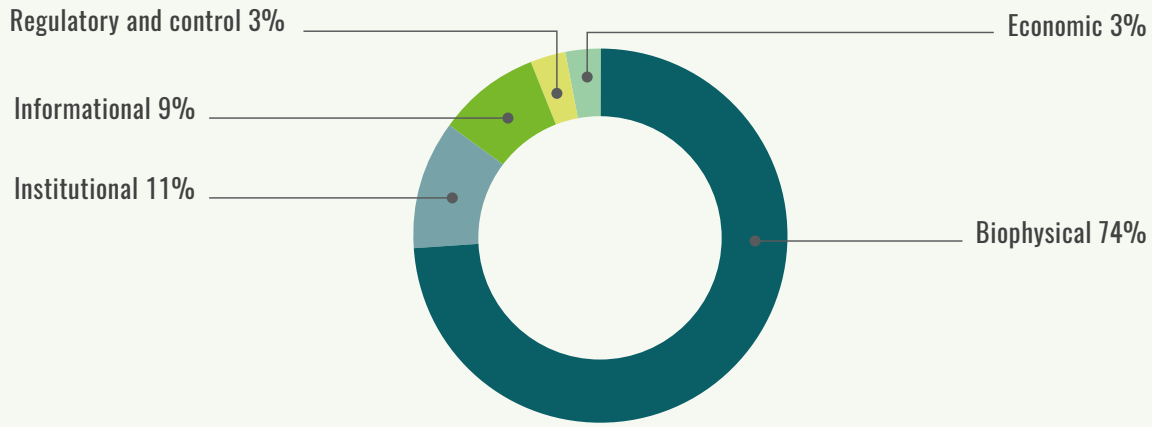
Despite the need to mainstream climate change adaptation in broader development goals, only two countries (Algeria and Morocco) ground their adaptation component within a long-term adaptation vision or goal. For instance, Morocco aims to "preserve its territory and its civilization in the most appropriate manner, effectively responding to the vulnerabilities of its territory and implementing an adaptation policy that builds resilience for all of its population and its economic actors to face these vulnerabilities." Out of the 17 countries in the region with an NDC, five (Morocco, Sudan, Mauritania, Bahrain, Yemen and Palestine) mention that the National Adaptation Plan (NAP) is either under development, developed or a primary document for adaptation priorities and plans. For instance, Sudan and Palestine have both submitted their NAPs to the UNFCCC in 2016 and reference the NAP as their primary adaptation communication.

4.4 POLICY INSTRUMENTS AND VALUE CHAIN ENTRY-POINTS

A diversity of policy instruments will be required to mobilize climate action across sectors and stakeholders. The mitigation and adaptation measures in the agriculture, water and land use sectors presented in the NDCs were characterized by the type of intervention or policy instrument. In the NENA region, almost all mitigation and adaptation policies were biophysical in nature (80 percent), while only around 10 percent were formulated around institutional approaches and another 10 percent around informational approaches. Few policies were focused on regulatory or control (3 percent) instruments, while only one percent were focused on economic incentives or measures. **Figure 51** illustrates the climate action in the agriculture, water and land use sectors, by intervention type (share of total climate actions).

FIGURE 51.

DISTRIBUTION OF CLIMATE ACTIONS IN THE AGRICULTURE, WATER AND LAND USE SECTORS IN THE NDCs IN THE NENA REGION, BY INTERVENTION TYPE



Source: FAO elaboration of NDC data in NENA.

Almost all (95 percent) of the measures in the NDCs in the region were focused on the production phase of the agriculture and food systems, while only two countries include post-harvest operations-related measures (Palestine) and retail-related measures (Morocco). The development of sustainable food value chains is not only critical to reduce hunger and poverty in developing countries but also provides a key opportunity to address priorities for climate change adaptation and mitigation (Wieben, 2019).

4.5 NATIONALLY DETERMINED CONTRIBUTIONS ENHANCEMENT OPPORTUNITIES

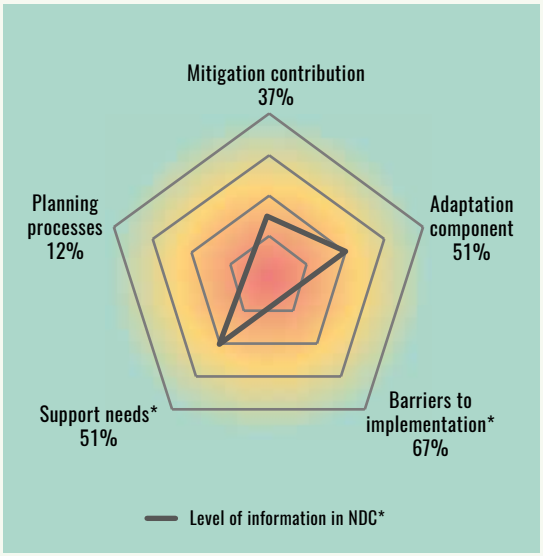
The iterative nature of the NDC cycle allows countries to reflect on implementation gaps to date in five-year cycles, with the opportunity of strengthening their NDCs and enhancing their ambition over time. FAO developed a common framework for formulating and/or assessing the role of the agriculture, water and land use sectors in the NDCs (FAO, 2020d). The "NDC-AFOLU Framework" breaks down the NDCs into five main pillars and sub-components specific to the sector. It can be used as a benchmark against which a given NDC can be compared to identify gaps or opportunities for enhancement.

Each NDC in the NENA region was assessed against five NDC pillars (mitigation, adaptation, barriers, support needs and planning processes) and 32 indicators to determine a country's "NDC ambition level" (i.e. level of information provided for each indicator) and allotted a score based on a set of parameters for each indicator (refer to **Annex 5** for list of parameters).

Overall, a low level of NDC ambition in the agriculture, water and land use sectors was observed as a regional average for the NENA region, particularly in mitigation contributions, planning processes and information on barriers. On the other hand, the adaptation component and information on support needs scored moderately. Hence, there is a significant opportunity to enhance agriculture, water and land use-specific ambition along these five NDC pillars. **Figure 52** illustrates the results of the NDC-AFOLU ambition index, i.e. a comparative analysis of the NDCs in the NENA region against the NDC-AFOLU Framework.

FIGURE 52.

NDC-AFOLU AMBITION INDEX RESULTS FOR THE NENA REGION, BY NDC PILLAR

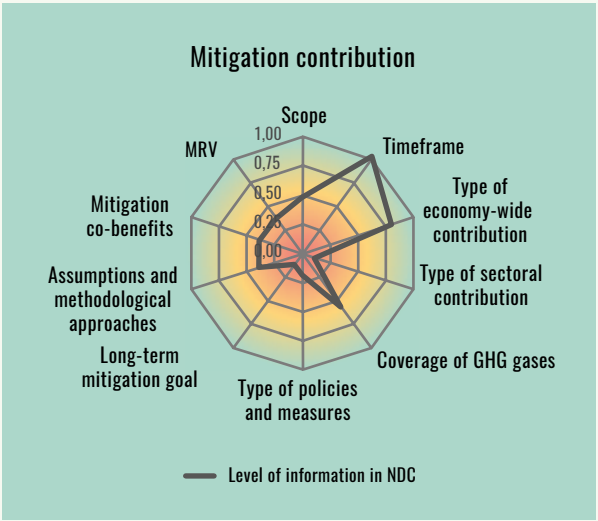


*Source: FAO analysis of NENA country NDCs based on FAO (2020d). *Source of information includes NDC and TNA (if available).*

Under the mitigation contribution pillar, country NDCs in the region reveal gaps in terms of the inclusion of the agriculture and/or land use sectors in economy-wide mitigation contributions and GHG targets, as well as the inclusion of sector-specific mitigation measures specific to the agriculture, water and land use sectors and mitigation co-benefits. Another significant information gap is the communication of a long-term mitigation goal. There is also an opportunity to include more information on MRV systems to track mitigation actions in the sector and at the national level.

FIGURE 53.

NDC-AFOLU AMBITION INDEX RESULTS FOR THE NENA REGION, BY MITIGATION CONTRIBUTION SUB-INDICATORS

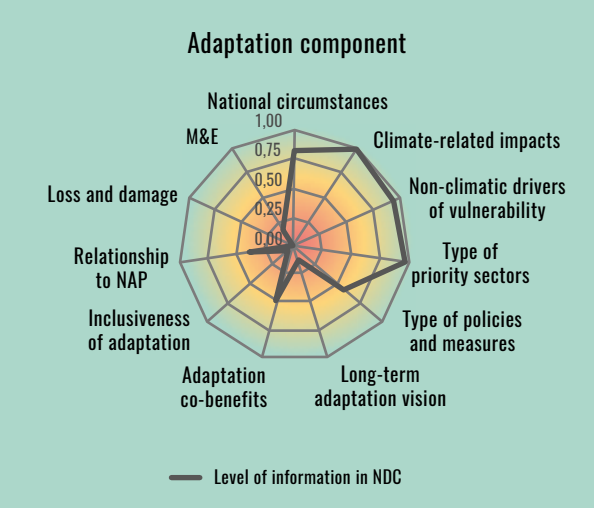


Source: FAO analysis of NENA country NDCs based on FAO (2020d).

Under the adaptation component pillar, while country NDCs in the region widely covered information on climate-related impacts, risks and vulnerabilities in the agriculture, water and land use sectors, there is an opportunity to enhance adaptation priorities and measures in the sector, as well as include information on adaptation co-benefits, NAP processes, loss and damage, inclusiveness and M&E systems at the sectoral and national level.

FIGURE 54.

NDC-AFOLU AMBITION INDEX RESULTS FOR THE NENA REGION, BY ADAPTATION COMPONENT SUB-INDICATORS



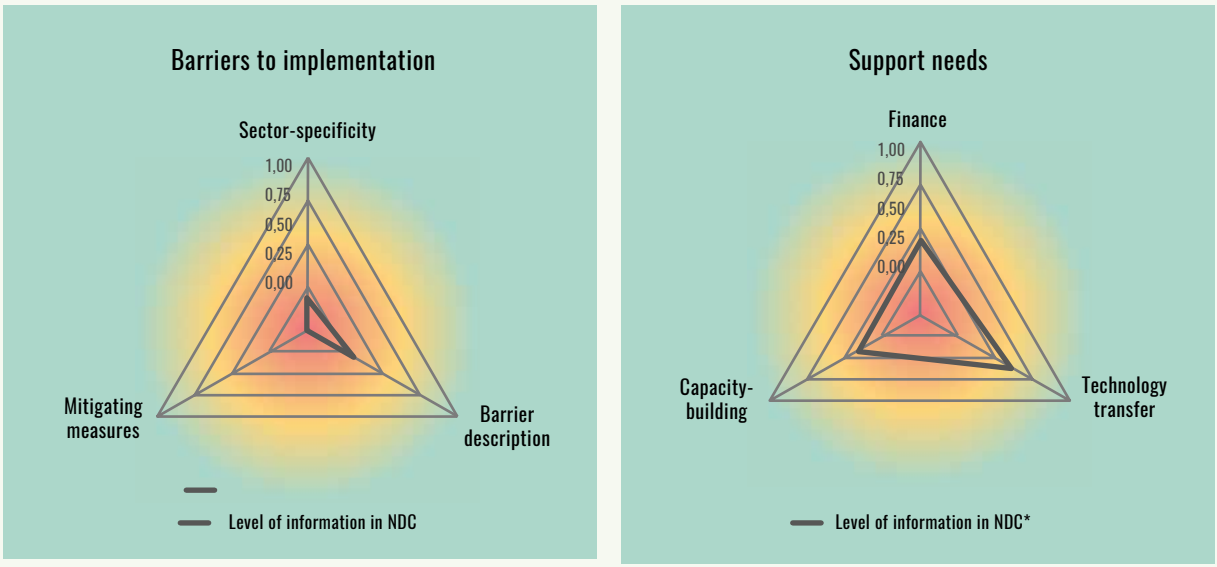
Source: FAO analysis of NENA country NDCs based on FAO (2020d).

Under the barriers to NDC implementation pillar, there is very low coverage of the types of barriers to the uptake of climate action in the agriculture, water and land use sectors, and very few country NDCs and/or TNAs provide proposals on mitigating measures. There is thus an opportunity to assess barriers at the national and sectoral levels to inform national programming and direct international assistance. Similarly, under the support needs pillar, there is moderate coverage of the types of sector-specific support needs and quantification of finance needed for adaptation and mitigation.

Under the NDC planning processes pillar, there is very low information on the types of planning processes underpinning NDC formulation, implementation and monitoring and reporting. For instance, a few country NDCs include a description of the types of domestic institutional arrangements and coordination mechanisms established, such as the establishment of a cross-ministerial group. There are significant gaps, however, in information on knowledge and evidence generation, NDC policy coherence and mainstreaming, domestic implementation and monitoring systems, and international policy processes and cooperation. These elements are all crucial to ensure evidence-based, inclusive and sustainable NDC priority setting, implementation and learning processes.

FIGURE 55.

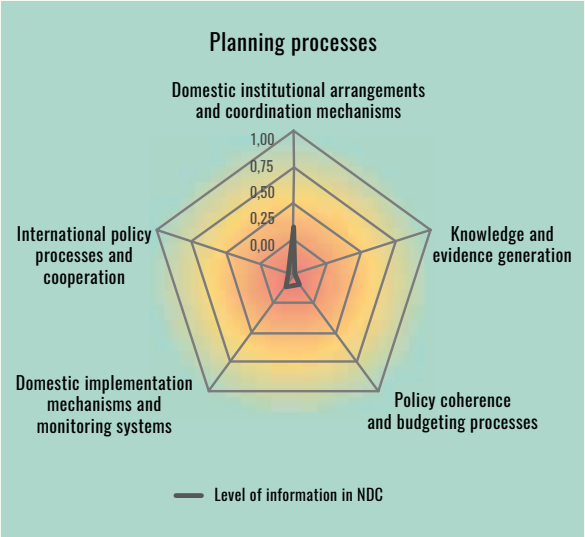
NDC-AFOLU AMBITION INDEX RESULTS FOR THE NENA REGION, BY BARRIER AND SUPPORT NEEDS SUB-INDICATORS



*Source: FAO analysis of NENA country NDCs based on FAO (2020d). *Source of information includes NDC and TNA (if available).*

FIGURE 56.

NDC-AFOLU AMBITION INDEX RESULTS FOR THE NENA REGION, BY NDC PLANNING PROCESSES SUB-INDICATORS



*Source: FAO analysis of NENA country NDCs based on FAO (2020d). *Source of information includes NDC and TNA (if available).*

CHAPTER 5

CHAPTER

5

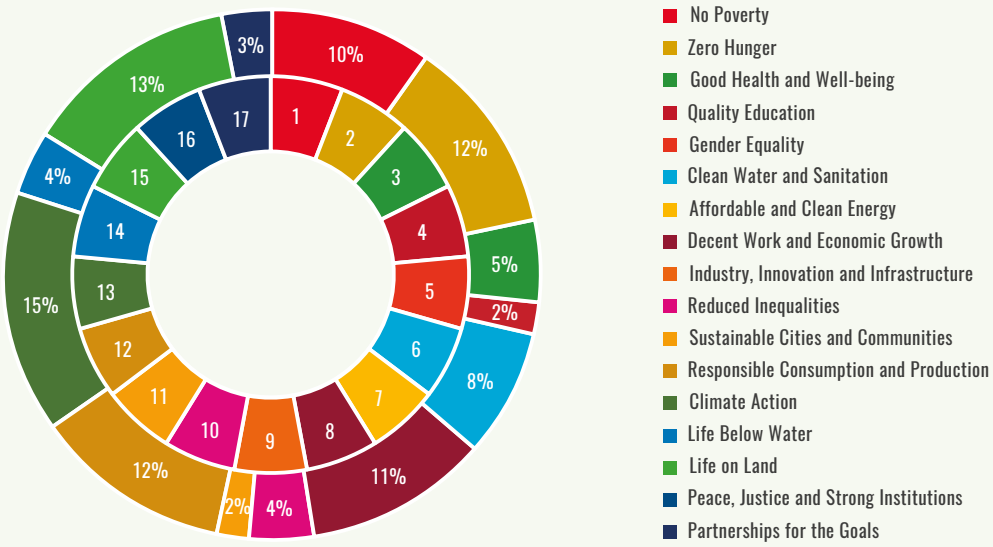
SYNERGIES WITH THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT AND SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

5.1 NATIONALLY DETERMINED CONTRIBUTIONS-SUSTAINABLE DEVELOPMENT GOAL SYNERGIES IN THE AGRICULTURE, WATER AND LAND USE SECTORS

In general, with respect to SDG achievement and based on several critical indicators, the region lags far behind other regions. The reasons for this are often structural and systemic impediments that cut across most Arab countries. The region lacks quality, regular, harmonized and disaggregated data on almost all SDG indicators (Arab States Regional Collaborative Platform, 2020). The success of NDC implementation depends to a great extent on the capacity of governments to integrate climate change mitigation and adaptation priorities into existing national development and sectoral policies and plans (Riva *et al.*, 2020). **An analysis of the alignment (Figure 57) between the climate actions presented in the NDCs in the region and the 17 SDG goals and 169 targets reveals a high degree of convergence around SDG 13 "Climate Action", followed by SDG 15 "Life on Land", SDG 2 "Zero Hunger" and SDG 12 "Sustainable Consumption and production."** Refer to (FAO, 2019d) for the methodology underpinning the analysis.

FIGURE 57.

DEGREE OF ALIGNMENT BETWEEN THE NDC PRIORITIES IN AGRICULTURE, WATER AND LAND USE SECTORS IN THE NENA REGION AND THE SDGs



5.2 NATIONALLY DETERMINED CONTRIBUTIONS-DISASTER RISK REDUCTION SYNERGIES IN THE AGRICULTURE, WATER AND LAND USE SECTORS

As countries are affected by incremental climate change and increasingly frequent and severe climate-related disasters, successful climate change adaptation relies to a large extent on the reduction and management of climate-related disaster risks. The two workstreams are strongly interrelated and mutually complement each other, including in the agriculture, water and land use sectors. The intertwined nature of climate change and disaster impacts on agriculture calls for coherent approaches and working methods that enhance the resilience of individual farmers and entire production systems. Coherence between adaptation and DRR/M can significantly enhance the effectiveness of action on the ground (Bojić, Baas and Wolf, 2019).

The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)[38] presents an opportunity to enhance such coherence across climate and development agendas, by encouraging coordinated implementation, monitoring and reporting processes. The framework comprises four priorities for action:

- Sendai Framework on Disaster Risk Reduction priority I: Understanding disaster risk;
- Sendai Framework on Disaster Risk Reduction priority II: Strengthening disaster risk governance to manage disaster risk;
- Sendai Framework on Disaster Risk Reduction priority III: Investing in disaster risk reduction for resilience;
- Sendai Framework on Disaster Risk Reduction priority IV: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

[38] The SFDRR is a country-driven and non-binding international agreement that recognizes the importance of integrating systematic efforts and strategies at different levels to prevent new and reduce existing disaster risk, by reducing hazard exposure and vulnerability to disaster, increasing preparedness for response and recovery and thus strengthening resilience.

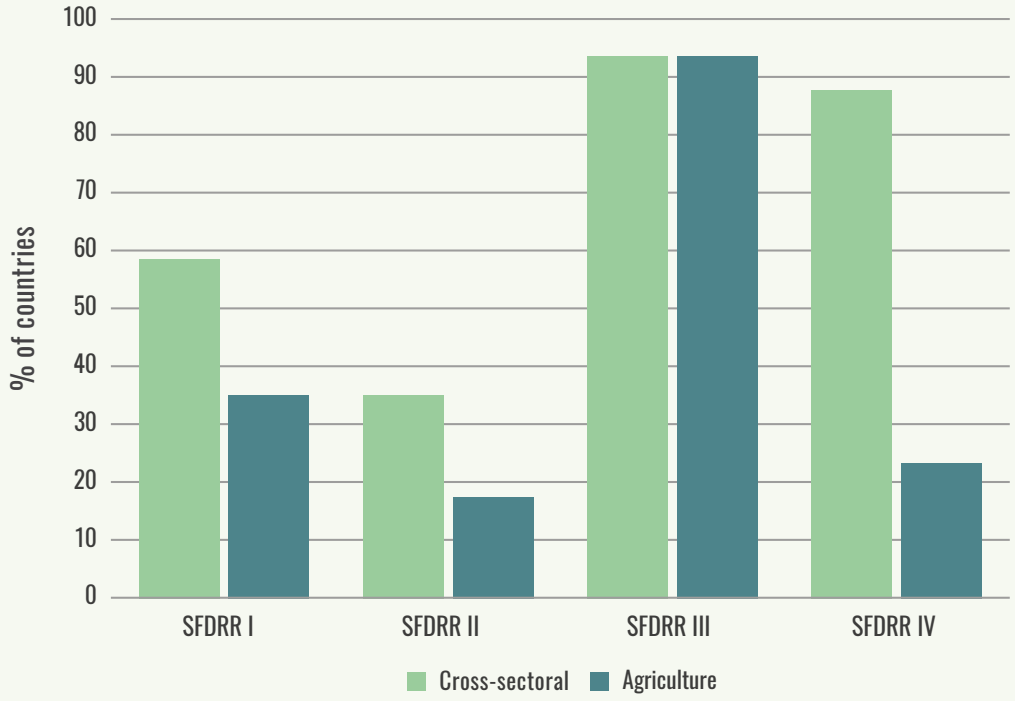
This section analyses the alignment of adaptation priorities set forth in NDCs of the countries in the NENA region, with the four priorities for action of the SFDRR. The aim of this section is to provide a better understanding of the extent to which, in the context of NDCs, CCA and DRR/M in the agriculture, water and land use sectors are mutually reinforcing and promote policy coherence.

Overall, while in most NDCs many DRR/M measures are cross-sectoral, agriculture-specific actions feature prominently. This is true particularly in relation to SFDRR priority III, as 94 percent of the 17 countries with an NDC in the region, include both cross-sectoral and agriculture-specific measures that entail 'investing in disaster risk reduction for resilience'. Around one third and one quarter of countries specify agricultural measures related to SFDRR priorities I and IV, respectively.

Conversely, integration of measures promoting better institutions and governance for climate-related activities in agriculture (related to SFDRR priority II) receives least attention among countries. **Figure 58** illustrates the share of country NDCs with cross-sectoral and agriculture-related adaptation priorities contributing to the SFDRR priorities of action.

FIGURE 58.

CROSS-SECTORAL AND AGRICULTURE-SPECIFIC ADAPTATION PRIORITIES IN THE NDCs WITH RELEVANCE TO THE SENDAI FRAMEWORK, BY SHARE OF NENA COUNTRIES



Source: FAO analysis of NDCs in NENA.

5.2.1 Sendai Framework on Disaster Risk Reduction Priority I: Understanding disaster risk

In order to manage and reduce disaster risks, including those associated with climate-related disasters, a sound understanding of these risks in all their dimensions is necessary. Consensus exists that CCA and DRR/M policies and actions ought to be based on a contextually adequate combination of scientific evidence and indigenous knowledge on causes, forms and consequences of the addressed risks (UNDRR, 2019). Accordingly, more than half (58 percent) of countries in the region refer to measures contributing to an improved understanding of climate-related risks in their NDCs, with 35 percent of countries specifically outlining measures for a better understanding of these risks in the agriculture sectors.

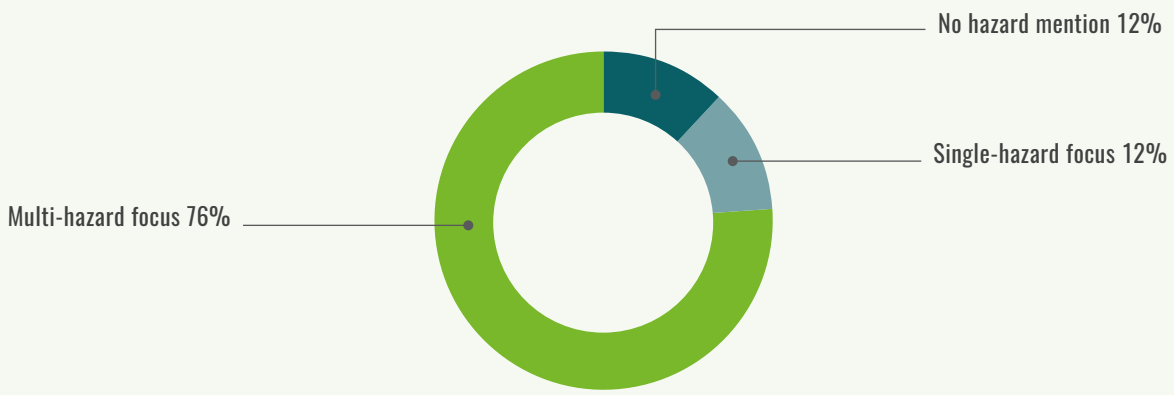
5.2.1.1 Vulnerability and risk assessments

Conducting robust vulnerability and risk assessments is one of the key requirements for gaining a valid, up-to-date understanding of the climate-related risks a country is facing. This analysis finds that the NDCs of countries in the region prominently feature the results of vulnerability assessments, as well as intended action to further develop their scope, quality or periodicity. Many of the NDCs in the region refer to risk information using the IPCC Fifth Assessment Report risk framework that defines *exposure, hazards and vulnerability* as factors contributing to specific risks (IPCC, 2014b).

While often also including information on slow-onset hazards, a significant number of NDCs refer to different types of sudden-onset hazards. More than three-quarters of countries include reference to multiple hazards. Though the varying length and specificity of NDCs complicates comparison, it is interesting to note that a minority of countries (12 percent) focuses on a single such sudden-onset hazard. **Figure 59** illustrates the distribution of single and multiple extreme events referenced in the NDCs of countries in the region (share of total extreme events).

FIGURE 59.

SINGLE AND MULTIPLE EXTREME EVENTS REFERENCED IN THE NDCs IN THE NENA REGION, BY SHARE OF TOTAL



Source: NDCs in NENA.

Nevertheless, a single such hazard, drought, is responsible for the major share of agricultural disaster losses and damages in the region by a large margin, with the sectoral proportion in damages and losses from medium to large-scale disasters being as high as 100 percent for the Near East (FAO, 2016c). Reflecting this trend, droughts are referred to by almost two-thirds (65 percent) of country NDCs, second only to floods (mentioned by 70 percent of countries), followed by storms (53 percent). Wildfires and agricultural pests and diseases are referred to by less than one-third and one-quarter of countries, respectively.

In terms of drivers of *vulnerability* that make countries susceptible to harmful disaster impacts, 53 percent of countries refer to population growth and density, 35 percent to poverty, and only 18 percent to economic and livelihood dependence on natural resources. Other drivers of vulnerability frequently referred to include political conflict and knock-on effects such as economic hardship and population movements. Another common factor perceived to contribute to vulnerability is water scarcity, which is further aggravated by observed or anticipated decreases in rainfall amounts and increases in variability. The lack of freshwater resources can further be argued to play a role in the import dependency of some countries in the region, which in turn exposes countries to distinct climate change-related vulnerabilities. The United Arab Emirates, for instance, expects food imports to double by 2030 as a result of population growth, water scarcity and low agricultural potential, and perceives the import reliance as a 'major challenge'.

Several countries provide quantitative estimates of projected climate risks and impacts in the agriculture sectors. Egypt, for instance, expects a 15 to 19 percent decrease in wheat and maize productivity by 2050

due to both slow- and sudden-onset events, including temperature increase, water stress, and agricultural pests and diseases. In addition, 12 to 15 percent of arable land in the Nile Delta are expected to be negatively affected by sea level rise and salt-water intrusion. Similarly, Tunisia expects agricultural GDP to decrease by 5-10 percent by 2030 following an anticipated 30 percent reduction of land area suitable for cereal production due to increasing drought incidence. While often not quantitative, another common feature of the risk information included in the NDCs is the detailed description of anticipated climate change impacts on the fisheries sector (Mauritania, Egypt, Morocco, Oman).

The need to further improve both cross-sectoral and agriculture-specific risk and vulnerability assessments is an important priority in many countries. Egypt's NDC, for instance, specifies that a vulnerability assessment for all priority sectors will be undertaken, following an indicator-based approach and involving diverse stakeholders. Similarly, Sudan's NDC refers to vulnerability assessments undertaken as part of larger stakeholder consultations and validated through regional and state level workshops.

5.2.1.2 Data collection and management systems

Collection, analysis and management of climatic or meteorological and socio-economic data is a pre-requisite for vulnerability and risk assessments, and, as a result, improved risk understanding. Strengthening national data collection and management systems, as well as climate change research programmes in different sectors is, therefore, frequently referred to by countries in the region.

Iraq, for instance, aims to launch dedicated research initiatives on the impacts of climate change on agriculture. A number of countries also sets out intentions to strengthen climate observation, modelling and monitoring systems. Jordan aims to establish a national monitoring center for climate information that integrates weather and climate information from decentralized centers at the regional level. Morocco lays the focus of its intended 'observation-and-research system' for improved risk management on the most vulnerable areas, which include coastal zones, mountainous and desertification-prone areas as well as oases. In addition, Morocco plans to establish a coastal observation network.

5.2.2 Sendai Framework on Disaster Risk Reduction Priority II: Strengthening disaster risk governance to manage disaster risk

Adequate risk governance is crucial for the implementation of DRR/M and adaptation activities in the agriculture, water and land use sectors. Disaster management structures, policies and plans and the institutional capacity to implement them is a prerequisite for reducing climate-related risks. Yet only 35 percent of countries in the region have indicated the need to strengthen risk governance and institutions, with half of these (3 countries) explicitly mentioning this need for stronger DRR/M governance mechanisms in the agriculture sectors. These figures might reveal a low importance attached to DRR/M governance in agriculture, and, consequently, low interest to integrate DRR/M considerations into agricultural governance structures.

Coherence between adaptation and DRR/M can contribute to strengthened disaster risk governance by integrating climate-specific aspects into disaster risk management and institutions (see above). Three types of coherence can be distinguished (OECD, 2020) and are partially reflected in priorities set forth by countries in the region.

5.2.2.1 Strategic coherence

Strategic coherence manifests itself through aligned visions, goals and priorities on adaptation and DRR/M in plans and strategies. An indication of mediocre levels of strategic coherence, country NDCs in the region do include limited cross-references to related policy documents, with some countries referring to more than one. While 16 percent of countries (3 countries) refer to the ongoing NAP process and the older National Adaptation Plan of Action (NAPA) process each, 32 percent (6 countries) refer to other national climate plans or strategies. Moreover, and of particular relevance for adaptation-DRR/M coherence, no country refers to an existing or to-be-developed overarching DRR/M plan. However, some countries mention plans for particular types of disasters relevant to the agriculture sectors, such as Morocco's National Plan for the Protection Against Floods and Master Plan to Combat Wildfires or Jordan's Water Safety Plans.

5.2.2.2 Operational coherence

Operational coherence, instead, can be achieved when policy frameworks and institutional arrangements are supportive of the implementation of aligned objectives on CCA and DRR/M, and effective in doing so. Supportive policy frameworks are sectoral or cross-sectoral frameworks that promote coherence between adaptation and DRR/M. National climate plans or strategies can be of such supportive nature if they integrate DRR/M considerations. An example of this is Algeria's Climate Plan that aims to mitigate disaster impacts by controlling floods, to protect the coastline, and to combat drought and desertification.

Supportive institutional arrangements require effective co-operation and co-ordination by public institutions and other stakeholders at various levels. In Egypt, this includes the intention to enhance national and regional partnerships in managing crises and disasters related to climate change and the reduction of associated risks. Given the transboundary nature of both natural resources systems and climate change impacts, such partnerships and regional cooperation initiatives are crucial. Accordingly, Egypt aims to increase cooperation on water management with other Nile Basin countries. In addition, for the agriculture sectors specifically the country affirms the intention to "build an effective institutional system to manage climate change associated crises and disasters at the national level".

The actual achieved effectiveness of risk governance structures (policy frameworks and institutional arrangements) in the implementation of aligned adaptation-DRR/M objectives, however, is hardly the subject of NDCs. While many NDCs highlight progress in the implementation of specific adaptation-DRR/M projects or programmes, they do not contain comprehensive evaluations of progress, implementation and effectiveness of the overall risk governance arrangements.

5.2.2.3 Technical coherence

Technical coherence refers to strengthened technical capacities to assess the risks and opportunities, to identify adaptation and DRR/M measures, and to finance them. While additional activity-specific examples can be found under SFDRR priority I and III, the cross-cutting need for strengthened capacities of public sector institutions governing disaster and climate risks receives attention across NDCs. Yemen's NDC, for instance, states the need to build institutional capacity for resilience to climate change through improved planning, programing, monitoring and resources mobilization.

5.2.3 Sendai Framework on Disaster Risk Reduction Priority III: Investing in DRR for resilience

The adverse impact of climate-related disasters on livelihoods and food security can be effectively reduced through investments in DRR/M and adaptation. With two exceptions, all countries in the region commit to invest in DRR/M and climate change adaptation measures for developing climate resilient economies and societies, as well as more resilient agricultural production systems. Most countries identify such DRR/M and adaptation measures for various of the agriculture, water and land use sectors. A trend regarding adaptation priorities for different sectors emerges, with 59 percent of countries referring to measures in the crops sector and 47 percent in the livestock sector. Thirty five percent and 18 percent of countries include measures for the forestry and fisheries and aquaculture sectors, respectively.

5.2.3.1 Adaptive management practices

Adaptive management practices included in the NDCs for each sector are discussed in detail in Chapter 3. Other specific adaptation actions of direct relevance to DRR/M referred to most consistently include those pertaining to water supply and management, which reflects common concerns regarding water scarcity and increasing precipitation variability.

Specifically referring to agricultural water management are Iraq; Jordan; Lebanon; Kuwait; Mauritania; Qatar; Saudi Arabia and Syrian Arab Republic. All of these countries mention intentions to upgrade or expand irrigation infrastructure. Interestingly, in terms of water supply and demand management for these irrigation projects, countries prioritize different solutions, including increased groundwater extraction, desalination, water recycling, and water pricing, with some countries favoring large-scale infrastructure (e.g. dams in Iraq) and others more small-scale localized solutions (e.g. rainwater harvesting in Jordan).

In addition to strategies to cope with water scarcity and precipitation variability, sustainable land management strategies receive attention as means to cope with sudden- and slow-onset disasters, such as drought, desertification and soil erosion. Saudi Arabia, for instance, intends to 'manage' desertification by developing and enhancing arid and semi-arid rural areas through various natural resources conservation activities, biodiversity-centered and ecosystem-based adaptation efforts. Likewise, Morocco intends to develop rangelands in a way that will combat desertification, enhance livestock farmers' income and protect biodiversity.

5.2.4 Sendai Framework on Disaster Risk Reduction Priority IV: Enhancing disaster preparedness for effective response and to "Build back better" in recovery, rehabilitation and reconstruction

Capacities in climate-related disaster preparedness to improve the response to and recovery from extreme weather events are essential to ensure climate-resilient livelihoods. Eighty-eight percent of countries in the region aim to enhance climate-related disaster preparedness for effective response, with 24 percent of countries acknowledging this need for agriculture specifically. In most cases, however, only general measures have been outlined highlighting actions that have been put in place or are being intended to be implemented for better response and preparedness.

5.2.4.1 Emergency plans

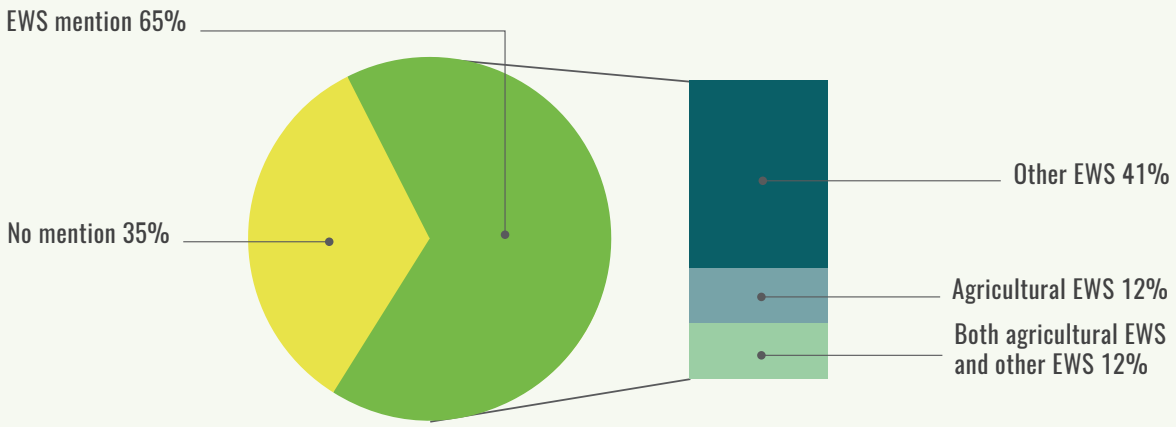
Up-to-date contingency plans specifying responsibilities and standard operating procedures significantly enhance institutional disaster preparedness. Apart from that, funding mechanisms for DRR/M are necessary for timely action. Some countries in the region, accordingly, set out intentions to strengthen disaster preparedness by developing or updating contingency plans and emergency funds. Kuwait, for instance, refers to the recently established Environment Protection Law that requires the preparation of emergency plans for crises as well as Natural Disasters Management Plans. Similarly, Jordan intends to develop emergency and fast response plans that provide emergency relief to population segments affected by snow storms and extreme heat, as well as income support to families affected by drought.

5.2.4.2 Early warning systems

EWS improve climate risk preparedness and enable to respond efficiently to hazards and disasters. Overall, 65 percent of countries refer to existing or planned EWS. **Figure 60** illustrates the share of country NDCs with reference to either existing, or planned EWS.

FIGURE 60.

EXISTING OR PLANNED EARLY WARNING SYSTEMS, BY SHARE OF COUNTRIES WITH NDCs IN THE NENA REGION



Source: NDCs in NENA.

Among these, one-quarter of countries also includes reference to agriculture-specific EWS. While some countries intend to use these systems to anticipate, detect and respond to various or unspecified types of climatic events and impacts (multi-hazard EWS), others identify specific types of events targeted by the EWS, such as droughts (Jordan), agricultural pests and diseases (Lebanon, Iraq) or rainstorms, floods and dust storms (Saudi Arabia).

5.2.4.3 Building back better

In the event of occurrence of a climate-related disaster, "building back better" by ensuring the resilience of new and existing physical infrastructure as well as societal structures can significantly reduce vulnerability and exposure to climatic extreme events and thus reduce future disaster risk. The concept of "building back better" is moreover referred to by countries in the context of a low-emissions and climate-resilient recovery from non-climate but manmade disasters, such as infrastructure destruction caused by conflict and war.

Countries in the region intend to use both grey and green infrastructure for resilience building. Grey infrastructure projects referred to in the NDCs include mainly large-scale coastal and water management infrastructure, such as in Tunisia that aims to rehabilitate and protect existing coastal infrastructure against the risks of climatic impacts. Similarly, some countries plan to better protect other types of off-farm infrastructure of relevance to food systems from climatic hazards, such as Egypt that is planning to equip roads against floods, dust storms and extreme weather conditions.

Besides engineered solutions, 'green infrastructure' such as nature-based solutions and land-use planning are also frequently employed to improve resilience against climatic shocks (Renaud, Sudmeier-Rieux and Estrella, 2013). The main objective of the Great Green Wall Initiative is to strengthen the resilience of the region's natural systems through sound ecosystem management, sustainable development of land resources, protection of rural heritage and improvement of living conditions for local populations. It brings together more than 20 countries, including from the NENA region Algeria, Egypt, Libya, Mauritania, Sudan, and Tunisia. Algeria, for instance, aims to reinforce ecosystem resilience against floods and droughts and to rehabilitate degraded land, including through a "Great Green Dam" of 1 200 km length and 20 km width. Similarly, Sudan's NDC promotes an integrated approach to land use planning, the creation of ecological buffer zones, and the establishment of protected zones to accommodate salt marshes, mangroves and sea grass.

CHAPTER 6

CHAPTER

6

KEY MESSAGES

6.1 CLIMATE CHANGE IMPACTS AND ADAPTATION IN THE AGRICULTURE, WATER AND LAND USE SECTORS

Water scarcity, land degradation and desertification are the most frequently reported climate-related slow onset events in the Near East and North Africa (NENA) region in terrestrial and freshwater ecosystems. Almost all countries make reference to observed or expected increases in the intensity and frequency of climate extremes, namely floods and droughts. Water resources constitute the greatest priority area for adaptation, with a focus on increasing irrigation efficiency through water accounting and improving rainwater harvesting and storage techniques. Afforestation, reforestation and land and soil conservation and restoration efforts are prominent amongst the region's adaptation strategies.

Coastal erosion is frequently mentioned as a climate-related slow onset event affecting countries bordering the sea and ocean. Adaptation measures, such as mangrove restoration and replanting, constitute a means for protecting vulnerable coastal zones.

Agro-ecosystems are considered the most vulnerable of ecosystems to climate change impacts, particularly at risk to biodiversity loss, increased incidence of plant and animal pests and pathogens, losses in primary production and productivity, changes in water quantity and quality and soil erosion. With future changes in precipitation and temperature, pests and pathogens are expected to change their behaviour including transboundary spreading, population fluctuation and alterations in plant-pest interactions (FAO, 2020h).The majority of adaptation strategies in the region include some form of plant genetic resources conservation, management and diversification measures, such as the use of drought- or salt-tolerant varieties. However, agricultural pest and disease management practices are rarely identified as adaptation measures. These have the potential to be augmented by greater awareness of the testing, implementation and scaling up of a wide variety of climate smart agriculture practices and approaches.

Efforts to understand disaster risk and strengthen governance to manage risks in the agriculture, water and land use sectors in particular are still needed in the region. Further, while investments in DRR for resilience in agriculture are evident amongst the region's adaptive management practices set forth in the nationally determined contributions (NDCs), there is still a gap in disaster risk preparedness for effective response. For example, a large number of countries promote improved climate information services and EWS to strengthen climate risk preparedness and resilience but only one-fourth target the agricultural sectors.

Eighty percent of NENA countries project food insecurity and malnutrition, amongst small-scale farmer and pastoralist communities, as a climate-related risk. Observed or expected losses in productive infrastructure and assets due to climate extremes, combined with high levels of dependence on natural resources for sustenance and livelihoods, are expected to threaten food security and nutrition outcomes in the region, further exacerbating conflict and protracted crisis situations. A large number of NENA countries include measures promoting credit and insurance services to enable vulnerable populations to avoid negative coping strategies and invest in adaptive capacities. Some countries also promote on- and off-farm livelihood diversification measures as a means of managing climate-related risks.

Climate-related diseases are amongst the most frequently reported or anticipated climate risks in the region, with over 75 percent of countries referencing the adverse impacts of climate change on human health. Vector- and water-borne diseases are expected to increase in frequency with changes in temperature and precipitation patterns. Some countries include specific adaptation measures focusing on disease management and prevention, as well as more general health and information services.

Half of all countries in the region refer to either observed or projected climate-related migration or displacement. Where there are limits to adaptation, climate change may combine with and exacerbate existing inequalities in the access to and control over productive resources and assets for already marginalized populations, when sufficient social protection schemes are not in place.

There is a need for more gender-responsive approaches to climate action in the region that consider and address the different capacities, experiences, expertise and perspectives possessed by men and women. Despite the role of gender as one of the primary factors that can impact an individual's vulnerability and ability to adapt, only one country (Sudan) in the region promotes women empowerment and gender equality as part of its adaptation strategy.

6.2 GREENHOUSE GAS EMISSION TRENDS AND MITIGATION IN AGRICULTURE, FORESTRY AND OTHER LAND USE SECTOR

The Agriculture, Forestry and Other Land Use (AFOLU) sector generates a 15 percent share of total emissions, second to the energy sector, with net emissions expected to potentially double by 2030.[39] Emissions from livestock, particularly enteric fermentation, constitute a sectoral greenhouse gas (GHG) hotspot in the region, as do emissions from managed soils and croplands. Despite this, few NENA countries promote livestock-specific mitigation measures, such as improved feeding or breeding practices to reduce the GHG intensity of production, in their NDCs.

Under half of all NENA countries overall communicate a mitigation contribution in the AFOLU sector and only two (Morocco and Mauritania) set a sector-specific GHG target. The majority of mitigation contributions focus on enhancing carbon sinks through afforestation, reforestation and sustainable forest management, highlighting areas of synergy with adaptation priorities in the region.

[39] Total net emissions in NENA are expected to double by 2030 without NDC implementation. Only one country (Morocco) projects a sector-specific baseline scenario for AFOLU where net emissions are also expected to double by 2030 compared to the starting level.

There is an opportunity to further enhance carbon sinks in biomass and in soils through land management, conservation and restoration measures. Currently, the greatest sink for removals currently observed in the region is from forest management.[40] With the livestock sector reflective of the greatest GHG hotspot in the AFOLU sector, climate smart practices, including improvements in livestock feeding, breeding, fodder production and manure management practices, may present opportunities for both mitigation, adaptation and productivity gains.

6.3 MONITORING AND REPORTING NATIONALLY DETERMINED CONTRIBUTIONS PROGRESS

The effectiveness of NDC implementation will depend to a large extent on the ability to track mitigation and adaptation progress. Under the Enhanced Transparency Framework of the Paris Agreement, countries will be expected to submit biennial transparency reports (BTR) starting in 2024, which should include information on key elements of the NDC, including indicators to track progress and information on domestic monitoring and reporting systems.

Seven countries[41] in the region report the need to either establish a new, or improve an existing, measurement, reporting and verification (MRV) system to track mitigation actions and progress. On the contrary, only one country(United Arab Emirates) references an existing MRV system.

None of the countries in the region include information on an existing monitoring and evaluation (M&E) system to track adaptation measures and progress. Four countries, on the other hand, report the need to either establish a new or improve an existing national M&E system to track implementation and progress on adaptation.

The extent to which adaptation and mitigation measures are quantified and measurable also influences how actionable or implementable they may be. Less than 10 percent of the region's NDC mitigation and adaptation measures are associated with quantified indicators to track implementation.

6.4 MEANS OF IMPLEMENTATION AND SUPPORT NEEDS

Less than one half of NENA countries identified climate finance needs in the NDCs, totalling 371 billion USD. Of these needs, countries committed to allocating 30 billion USD of domestic resources or mobilizing additional resources. The remaining 341 billion USD for NDC implementation would have to come from international public climate finance over the next ten years. However, Organisation for Economic Co-operation and Development (OECD) data shows that an average of only 4 billion USD international public climate finance flows towards NENA each year. While the quantity of climate finance is insufficient to meet NDC needs, the quality of finance is also not well reflective of the region's needs in terms of climate change adaptation and mitigation. While the region's priority is primarily adaptation, climate finance flows towards mitigation surmount by nearly five times that of adaptation (ESCWA, forthcoming).

[40] IPCC 2006 GHGI category "Forest land remaining forest land".

[41] Algeria, Tunisia, Mauritania, Jordan, Lebanon, Palestine and Saudi Arabia.

From a sectoral perspective, climate finance flows towards the energy, transport and other sectors outnumber those towards water and AFOLU by a factor of five and seven, respectively, despite the critical role of natural resources in sustaining food security and livelihoods (ESCWA, forthcoming). There is a need for greater efforts devoted to developing projects with viable financing models in the AFOLU and water and sanitation sectors to drive inclusive, climate resilient sustainable development (ESCWA, forthcoming).

Achieving adaptation and mitigation goals in the region will require filling the persistent technology and capacity gaps in the agriculture, water and land use sectors. Many countries expressed the need for improved water resource technologies for adaptation, as well as better technologies for natural resources management. Capacity gaps emerged around national GHG inventory management and MRV systems, as well as climate risk and vulnerability assessments. Overall, water and agriculture appear prominently amongst technology and capacity needs in the region.

The analysis reveals that it is of paramount importance to strengthen the capacities of agricultural and land ministries to assess and quantify the overall costs and benefits of NDC implementation, including financial, capacity and technology needs in the sector. In this vein, some countries have undergone in-depth technology needs assessments, as well as needs assessments for other policy processes, such as the National Adaptation Plans (NAP), which can be drawn upon. More specific information on finance, capacity and technology needs could direct more support to the region.

6.5 GOVERNANCE FOR NATIONALLY DETERMINED CONTRIBUTIONS IMPLEMENTATION

Convergence between the NDCs in the region and the four Sendai Framework for Disaster Risk Reduction (SFDRR) priorities for action is strong and thus promotes adaptation and disaster risk reduction and management coherence in the agricultural and other sectors. The degree of alignment varies by SFDRR priority, with investments in disaster risk reduction for resilience (SFDRR Priority III) receiving by far the most attention. While more frequently referred to in relation to other sectors or cross-sectoral actions, the understanding of disaster risk (SFDRR Priority I), improved disaster preparedness and recovery (SFDRR Priority IV) and improved disaster risk governance (SFDRR Priority II) are less frequently seen in the context of the agriculture, water and land use sectors.

Contextualizing NDCs within a long-term goal or vision for adaptation can pave a pathway towards longer-term climate resilience, given the high relevance of the water-energy-food nexus across the region. Five out of the 18 countries in the region make reference to their NAP in the NDC. There is an opportunity to align the adaptation component of NDCs with NAPs processes to ensure coherence and coordination at the national and sub-national levels. Enhancing the enabling environment for adaptation involves taking stock of climate information and early-warning systems for farmers; assessing the cost and impacts of climate change in the region; undertaking systematic prioritization of agricultural practices; and establishing a framework for monitoring and evaluation for adaptation.

The iterative and cyclical NDC review and revision process encourages countries to set short- to mid-term GHG emission milestones as part of their long-term emission development strategies (LEDS). While none of the countries in the region currently make reference to water and sanitation in their NDCs, there is a clear opportunity to make NDC targets compatible with low-emissions, climate-resilient trajectories in future iterations of the NDCs.

The success of NDC implementation depends to a great extent on the capacity of governments to leverage synergies with other national development agendas, requiring cross-sectoral coordination and policy coherence. This analysis reveals a high level of convergence between climate change priorities in the

agriculture, water and land use sectors with the delivery of Sustainable Development Goal 15 (SDG 15) "Life on Land", SDG 2 "Zero Hunger" and SDG 12 "Sustainable Consumption and Production."

New or improved NDCs[42] have the opportunity to better reflect the vulnerabilities, needs and capacities of agricultural and land use sectors. This analysis provides an overview of key climate risks, vulnerabilities and impacts in the agriculture, water and land use sectors, as well as GHG emission trends and hotspots in the region. It also points to opportunities for strengthening the role of the agriculture, water and land use sectors in the region's adaptation plans, including the relationship with ongoing NAP processes, and for leveraging co-benefits for mitigation and sustainable development.

[42] To date (31 July 2021), five countries (United Arab Emirates, Morocco, Oman, Sudan and Lebanon) have communicated a new and updated NDC to the UNFCCC, respectively, while another three (Mauritania, Tunisia and Yemen) have communicated their intention to submit a new or updated NDC this year (Climate Watch, 2021). FAO will develop a 2021 Global NDC Update Report to provide an overview of how the agriculture, water and land use sectors are represented in new/updated NDCs.

REFERENCES

Abiad, M.G. & Meho, L.I. 2018. Food loss and food waste research in the Arab world: a systematic review, 10(2): 311–322. https://doi.org/DOI: 10.1007/s12571-018-0782-7

Bojić, D., Baas, S. & Wolf, J. 2019. *Governance challenges for disaster risk reduction and climate change adaptation convergence in agriculture: guidance for analysis.*

Climate Watch. 2021. *Climate Watch* [online]. https://www.climatewatchdata.org/

Darwish, T., Atallah, T. & Fadel, A. 2018. Challenges of soil carbon sequestration in the NENA region., 4: 225–235. https://doi.org/10.5194/soil-2017-39

EM-DAT. Undated. EM-DAT | The international disasters database. In: EM-DAT | *The International Disaster Database - Centre for Research on the Epidemiology of Disasters (CRED)* [online]. Brussels. [Cited 7 January 2020]. https://www.emdat.be/

ESCWA. Undated. *Background Paper for the FAO Regional State of Land and Water Report for the Near East and North Africa region (unpublished).*

ESCWA. Forthcoming. *Background Paper on climate change: implications for the region's agriculture policies. agriculture policies.*

FAO. 2013. *Our Priorities: FAO Strategic Objectives*. Rome, Food and Agriculture Organization of the United Nations. 16 pp. (also available at http://www.fao.org/3/mi317e/mi317e.pdf).

FAO. 2016a. *The Agriculture Sectors in the Intended Nationally Determined Contributions: Analysis*. Environment and Natural Resources Management Working Paper 61. Rome, Food and Agriculture Organization of the United Nations. 92 pp. (also available at http://www.fao.org/3/a-i5687e.pdf).

FAO. 2016b. *The Agricultural Sectors in Nationally Determined Contributions (NDCs): Priority areas for international support*. Rome, Food and Agriculture Organization of the United Nations. 32 pp. (also available at http://www.fao.org/3/a-i6400e.pdf).

FAO. 2016c. *The State of Food and Agriculture 2016: climate change, agriculture and food security*. Rome, Food and Agriculture Organization of the United Nations. 194 pp. (also available at http://www.fao.org/3/a-i6030e.pdf).

FAO. 2017a. *FAO Strategy on Climate Change*. Rome, Food and Agriculture Organization of the United Nations. 48 pp. (also available at http://www.fao.org/3/a-i7175e.pdf).

FAO. 2017b. *Regional Analysis of the Nationally Determined Contributions of Eastern Africa: Gaps and opportunities in the agriculture sectors*. Environment and Natural Resources Management Working Paper 67. Rome, Food and Agriculture Organization of the United Nations. 120 pp. (also available at http://www.fao.org/3/a-i8165e.pdf).

FAO. 2017c. *Near East and North Africa Regional Overview of Food Insecurity 2016*. Cairo, Food and Agriculture Organization of the United Nations. 27 pp. (also available at http://www.fao.org/3/i6860e/i6860e.pdf).

FAO. 2017d. *Building resilience for in times of conflict and crisis: food security and nutrition a perspective from the Near East and North Africa (NENA) region*. Cairo, Food and Agriculture Organization of the United Nations. 62 pp. (also available at http://www.fao.org/3/I8336EN/i8336en.pdf).

FAO. 2017e. *Tracking adaptation in agricultural sectors: Climate change adaptation indicators*. Rome, Food and Agriculture Organization of the United Nations. 83 pp. (also available at http://www.fao.org/3/a-i8145e.pdf).

FAO. 2018a. *Impacts of climate change on farming systems and livelihoods in the Near Easr and North Africa. **Regional Initiative on Small-scale Family Farming for the Near East and North Africa***. Cairo, Food and Agriculture Organization of the United Nations. 92 pp. (also available at http://www.fao.org/3/ca1439en/CA1439EN.pdf).

FAO. 2018b. *The State of Food Security and Nutrition in the World: Building Climate Resilience for Food Security and Nutrition*. Rome, Food and Agriculture Organization of the United Nations. 202 pp. (also available at http://www.fao.org/3/I9553EN/i9553en.pdf).

FAO. 2019a. *Regional analysis of the Nationally Determined Contributions of the countries in Southern Europe, Eastern Europe and Central Asia: Gaps and opportunities in the agriculture sectors*. Environment and Natural Resources Management Working Paper 72. Rome, Food and Agriculture Organization of the United Nations. 132 pp. (also available at http://www.fao.org/3/CA3141EN/ca3141en.pdf).

FAO. 2019b. *Land and water governance to achieve the SDGs in fragile systems*. Rome, Food and Agriculture Organization of the United Nations. 53 pp. (also available at http://www.fao.org/3/ca5172en/CA5172EN.pdf).

FAO. 2019c. *Rural transformation-key for sustainable development in the near east and North Africa. Overview of Food Security and Nutrition 2018*. Cairo, Food and Agriculture Organization of the United Nations. 80 pp. (also available at http://www.fao.org/3/ca3817en/CA3817EN.pdf).

FAO. 2019d. *Linking Nationally Determined Contributions and the Sustainable Development Goals through Agriculture*. Environment and Natural Resources Management Working Paper 75. Rome, Food and Agriculture Organization of the United Nations. 42 pp. (also available at http://www.fao.org/3/ca5003en/ca5003en.pdf).

FAO. 2020a. FAOSTAT. In: *Food and Agriculture Organization of the United Nations* [online]. Rome. [Cited 7 January 2020]. http://www.fao.org/faostat/en/#home

FAO. 2020b. *Regional analysis of the Nationally Determined Contributions in Asia: Gaps and opportunities in the agriculture and land use sectors*. Rome, Food and Agriculture Organization of the United Nations.

FAO. 2020c. *Regional analysis of the Nationally Determined Contributions in the Pacific: Gaps and opportunities in the agriculture and land use sectors*. Environment and Natural Resources Management Working Paper 82. Rome, Food and Agriculture Organization of the United Nations. 112 pp. (also available at http://www.fao.org/3/ca8681en/CA8681EN.pdf).

FAO. 2020d. *Regional Analysis of the Nationally Determined Contributions in the Caribbean: Gaps and Opportunities in the agriculture and land use sectors*. Environment and Natural Resources Management Working Paper 80. Rome, Food and Agriculture Organization of the United Nations. 114 pp. (also available at http://www.fao.org/3/ca8672en/CA8672EN.pdf).

FAO. 2020e. *Common Framework for Integrating Agriculture and Land Use Sectors into Nationally Determined Contributions*. Rome, Food and Agriculture Organization of the United Nations.

FAO. 2020f. FAO regional conference for Near East: Ensuring environmental sustainability in the context of water scarcity and climate change. Muscat. 12 pp. (also available at http://www.fao.org/3/nc215e/nc215e.pdf).

FAO. 2020g. *The dual threat of extreme weather and the COVID-19 crisis: Anticipating the impacts on food availability*. Rome, Food and Agriculture Organization of the United Nations. 7 pp. (also available at http://www.fao.org/3/cb0206en/CB0206EN.pdf).

FAO. 2020h. *Regional strategy for sustainable management of transboundary plant pests and diseases in the Near East and North Africa region*. Rome, Food and Agriculture Organization. 20 pp. (also available at http://www.fao.org/3/ca7530en/CA7530EN.pdf).

FAO. 2021a. *Climate finance in the agriculture and land use sector - global and regional trends between 2000 and 2018*. FAO. https://doi.org/10.4060/cb6056en

FAO. 2021b. *Assessing policy gaps and opportunities in the nationally determined contributions – A sectoral methodology for agriculture and land use*. Rome, FAO. (also available at http://www.fao.org/3/cb1579en/cb1579en.pdf).

FAO, IFAD, UNICEF, WFP & WHO. 2020. *Regional Overview of Food Security and Nutrition in the Near East and North Africa 2019 – Rethinking food systems for healthy diets and improved nutrition*. Cairo, Food and Agriculture Organization of the United Nations. (also available at https://doi.org/10.4060/ca8684en).

FAO & ITPS. 2015. *Status of the World's Soil Resources (SWSR) - Main Report*. Rome, Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils. 650 pp. (also available at http://www.fao.org/3/a-i5199e.pdf).

FAO & WB, A. 2001. *Farming Systems and Poverty : Improving farmers' livelihoods in a changing world*. Rome and Washington D.C, Food and Agriculture Organization of the United Nations and World Bank. 412 pp. (also available at http://www.fao.org/3/y1860e/y1860e.pdf).

IPCC. 2006. *Guidelines for National Greenhouse Gas Inventories*. Hayama, Institute for Global Environmental Strategies (IGES). (also available at https://www.ipcc-nggip.iges.or.jp/public/2006gl/).

IPCC. 2014a. *Climate Change 2014 Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Core Writing Team, R.K. Pachauri & L.A. Meyer, eds. Geneva, Switzerland. 151 pp. (also available at https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf).

IPCC. 2014b. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, ***et al.***, eds. Cambridge, United Kingdom and New York, NY, USA, Cambridge University Press. 1132 pp. (also available at https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf).

IPCC. 2019. *Summary for Policymakers. In: IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse gas fluxes in Terrestrial Ecosystems*. (also available at https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf).

OECD. 2020. *Common Ground Between the Paris Agreement and the Sendai Framework : Climate Change Adaptation and Disaster Risk Reduction | en | OECD*. (also available at http://www.oecd.org/environment/climate-change-adaptation-and-disaster-risk-reduction-3edc8d09-en.htm).

Renaud, F.G., Sudmeier-Rieux, K. & Estrella, M. eds. 2013. *The role of ecosystems in disaster risk reduction*. Shibuya-ku, Tokyo, United Nations University Press. 486 pp.

RICCAR. 2017. *Arab Climate Change Assessment Report-Main report*. Beirut, United Nations Economic and Social Commission for Western Asia. 329 pp. (also available at https://www.unescwa.org/publications/riccar-arab-climate-change-assessment-report).

Riva, M., Hodes, G., Comstock, M., Huyer, S., Chao, V., Bakhtiari, F., Desgain, D., *et al.* 2020. *Implementing Nationally Determined Contributions (NDCs)*. (also available at https://www.wri.org/publication/implementing-ndcs).

UN Environment & UNEP DTU Partnership. 2018. *Technology needs assessments: summary of country priorities : 2015-2018*. S.l., Technology Needs Assessment. 32 pp. (also available at https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNA_key_doc/137ce42be33c4341a9b9e6679f7f8539/4a057ad243164ac6bbaa62bcb96bc39a.pdf).

UNDP, G. 2016. *Training Module 1. Overview of linkages between gender and climate change*. United Nations Development Programme. 50 pp. (also available at https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/Training%20Modules/Gender_Climate_Change_Training%20Module%201%20Overview.pdf).

UNDRR. 2019. *Global Assessment Report on Disaster Risk Reduction*. (also available at https://gar.undrr.org/sites/default/files/reports/2019-05/full_gar_report.pdf).

UNFCCC. 2015a. Decision 1/CP.21 Adoption of the Paris Agreement. *Decisions adopted by the Conference of the Parties*. p. 36. Paper presented at Conference of the Parties, 2015, Bonn. (also available at https://unfccc.int/sites/default/files/resource/docs/2015/cop21/eng/10a01.pdf).

UNFCCC. 2015b. *Strengthening gender considerations in adaptation planning and implementation in the least developed countries*. United Nations Framework Convention on Climate Change. 56 pp. (also available at https://unfccc.int/files/adaptation/application/pdf/21673_unfccc_leg_gender_low_v5.pdf).

UNFCCC. 2018. Draft decision -/CMA.1 Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement. *Recommendation of the Conference of the Parties*. p. 36. Paper presented at Conference of the Parties, 2018, Bonn. (also available at https://undocs.org/FCCC/CP/2018/L.23).

UNFCCC. undated. *Technology Needs Assessments* [online]. https://unfccc.int/ttclear/tna

UNSD. 2020. Standard country or area codes for statistical use (M49). In: *United Nations Statistics Division* [online]. New York. [Cited 7 January 2020]. https://unstats.un.org/unsd/methodology/m49/

WB. 2020. World Bank Open Data. In: The World Bank [online]. Washington DC. [Cited 7 January 2020]. https://data.worldbank.org/

Wieben, E. 2019. *Priorities related to food value chains and the agri-food sector in the Nationally Determined Contributions (NDCs)*. Rome, Food and Agriculture Organization of the United Nations. (also available at http://www.fao.org/3/ca5740en/ca5740en.pdf).

WRI. 2005. *Millennium Ecosystem Assessment Report: Ecosystems and human well-being: synthesis*. Washington, DC, Island Press. 137 pp. (also available at https://www.millenniumassessment.org/documents/document.356.aspx.pdf).

ANNEXES

ANNEX 1.

NATIONAL DOCUMENTS REVIEWED IN THE NENA REGION, BY COUNTRY AND UNFCCC SUBMISSION DATE

COUNTRY NAME	NDC	INDC	NC	BUR	NGHGI	TNA
ALGERIA	2016		2010		2000	
EGYPT	2017		2016	2019	2015	
MAURITANIA	2017		2019	2016	2015	2017
MOROCCO	2016		2016	2019	2016	2012
SUDAN	2017		2013		2000	2013
TUNISIA	2017		2019	2016	2012	2015/2016
BAHRAIN	2016		2012		2002	
IRAQ		2015	2017		1997	
JORDAN	2016		2014	2017	2012	2016
KUWAIT	2018		2019	2019	2016	
LEBANON	2020		2016	2019	2015	2012
OMAN	2019		2019	2019	2015	
QATAR	2017		2011		2007	
PALESTINE	2017		2016			
SAUDI ARABIA	2016		2016	2018	2012	
SYRIAN ARAB REPUBLIC	2018		2010		2005	
UNITED ARAB EMIRATES	2016		2019		2014	
YEMEN		2015	2018	2018	2012	

ANNEX 2.

GENERAL MITIGATION CONTRIBUTIONS IN THE NENA REGION, BY SCOPE, TYPE AND TARGET

COUNTRY	SCOPE OF CONTRIBUTION	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	GHG TARGET			HISTORICAL LEVEL	BASELINE LEVEL		UNCONDITIONAL LEVEL		CONDITIONAL LEVEL	
				2030 UNCONDITIONAL REDUCTION	2030 CONDITIONAL REDUCTION	2030 COMBINED REDUCTION	2015	2025	2030	2025	2030	2025	2030
				%			MT CO_2 EQ						
NORTH AFRICA													
ALGERIA*	ECONOMY-WIDE	GHG TARGET	BAU	7.00	15.00	22.00	197.30	251.92	279.23	243.10	259.68	224.21	217.80
EGYPT*	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	324.53	478.16	554.97	478.16	554.97	478.16	554.97
MOROCCO	ECONOMY-WIDE	GHG TARGET	BAU	17.00	25.00	42.00	107.75	142.70	170.80	129.47	141.76	110.01	99.06
SUDAN*	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	132.79	169.55	187.93	169.55	187.93	169.55	187.93
TUNISIA	ECONOMY-WIDE	GHG TARGET	BAU	8.80	29.03	37.83	34.05	51.60	68.20	47.40	62.20	35.00	42.40
MAURITANIA	ECONOMY-WIDE	GHG TARGET	BAU	2.68	19.62	22.30	7.14	14.94	18.84	14.72	18.34	13.12	14.64
NEAR EAST													
BAHRAIN*	UNI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	23.72	28.21	30.45	28.21	30.45	28.21	30.45
IRAQ*[43]	MULTI-SECTORAL	GHG TARGET	BAU	1.00	13.00	14.00	98.89	113.47	120.76	112.71	119.55	102.88	103.85
JORDAN*	ECONOMY-WIDE	GHG TARGET	BAU	1.50	12.50	14.00	31.96	51.03	38.44	50.52	37.87	46.27	33.06
KUWAIT*	UNI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	84.60	101.92	110.58	101.92	110.58	101.92	110.58
LEBANON	ECONOMY-WIDE	GHG TARGET	BAU	15.00	15.00	30.00	23.80	37.27	44.00	34.22	37.40	31.17	30.80
OMAN	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	2.00	82.15	87.73	90.52	87.73	90.52	86.86	88.71
QATAR*	UNI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	71.48	83.83	90.01	83.83	90.01	83.83	90.01
SAUDI ARABIA*[44]	UNI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	112.83	171.83	201.34	171.83	201.34	160.45	181.34
SYRIAN ARAB REPUBLIC*	ECONOMY-WIDE	ACTION ONLY	NA	NA	NA	NA	94.26	110.01	117.89	110.01	117.89	110.01	117.89
UNITED ARAB EMIRATES*	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA	195.79	234.30	253.55	234.30	253.55	234.30	253.55
PALESTINE	ECONOMY-WIDE	GHG TARGET	BAU	12.80	NA	12.80	35.00	72.33	91.00	67.28	79.35	67.28	79.35
YEMEN	MULTI-SECTORAL	GHG TARGET	BAU	1.00	13.00	14.00	30.06	39.68	43.81	39.42	43.37	35.98	37.68

**FAO elaboration of GHG baseline emission levels based on regional trend when no country-specific data was provided. Blue text indicates FAO calculation based on country data provided in NDC.*

[43] NDC target year is 2035.

[44] NDC target year is 2040.

ANNEX 3.

MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR IN THE NENA REGION, BY SCOPE, TYPE AND TARGET

COUNTRY	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	GHG TARGET			HISTORICAL LEVEL	BASELINE LEVEL		UNCONDITIONAL LEVEL		CONDITIONAL LEVEL	
			2030 UNCONDITIONAL REDUCTION	2030 CONDITIONAL REDUCTION	2030 COMBINED REDUCTION	2015	2025	2030	2025	2030	2025	2030
			%			MT CO_2 EQ						
NORTH AFRICA												
ALGERIA	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EGYPT	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MOROCCO[45]	GHG TARGET	BAU	19.82	19.01	38.83	16.66	30.78	36.84	24.98	29.24	20.58	22.54
SUDAN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TUNISIA	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MAURITANIA[46]	GHG TARGET	CUMULATIVE NET REDUCTION	-20. 43 (FOR AFOLU SECTOR)			5.14	NA	NA	NA	NA	NA	NA
NEAR EAST												
BAHRAIN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IRAQ	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
JORDAN	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
KUWAIT	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEBANON	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OMAN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
QATAR	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SAUDI ARABIA	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SYRIAN ARAB REPUBLIC	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UNITED ARAB EMIRATES	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PALESTINE	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
YEMEN	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

* *Blue text indicates FAO calculation based on country data provided in NDC.*

[45] Morocco communicates an AFOLU-specific GHG target.

[46] Mauritania expresses an AFOLU-specific GHG target as a cumulative net reduction and does not disaggregate by agriculture and LULUCF contribution.

ANNEX 4.

MITIGATION CONTRIBUTIONS IN THE LULUCF SECTOR IN THE NENA REGION, BY SCOPE, TYPE AND TARGET

COUNTRY	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	GHG TARGET			HISTORICAL LEVEL	BASELINE LEVEL		UNCONDITIONAL LEVEL		CONDITIONAL LEVEL	
			2030 UNCONDITIONAL REDUCTION	2030 CONDITIONAL REDUCTION	2030 COMBINED REDUCTION	2015	2025	2030	2025	2030	2025	2030
			%			MT CO_2 EQ						
NORTH AFRICA												
ALGERIA	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EGYPT	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MOROCCO[47]	GHG TARGET	BAU	19.82	19.01	38.83	16.66	30.78	36.84	24.98	29.24	20.58	22.54
SUDAN	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TUNISIA	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MAURITANIA[48]	GHG TARGET	CUMULATIVE NET REDUCTION	-20. 43 (FOR AFOLU SECTOR)			-0.62	NA	NA	NA	NA	NA	NA
NEAR EAST												
BAHRAIN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IRAQ	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
JORDAN	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
KUWAIT	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEBANON	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OMAN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
QATAR	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SAUDI ARABIA	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SYRIAN ARAB REPUBLIC	SECTOR INCLUDED IN GENERAL CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UNITED ARAB EMIRATES	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PALESTINE	MEASURES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
YEMEN	NO CONTRIBUTION	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

* *Blue text indicates FAO calculation based on country data provided in NDC.*

[47] Morocco communicates an AFOLU-specific GHG target.

[48] Mauritania expresses an AFOLU-specific GHG target as a cumulative net reduction and does not disaggregate by agriculture and LULUCF contribution.

ANNEX 5.

NDC-AFOLU ENHANCEMENT INDEX SCORING PARAMETERS

PILLAR	INDICATOR	LEVEL OF INFORMATION
MITIGATION CONTRIBUTION	SCOPE	AGRICULTURE AND LULUCF
		AGRICULTURE OR LULUCF
		NEITHER
	TIMEFRAME	SPECIFIED
		NOT-SPECIFIED
	TYPE OF ECONOMY-WIDE CONTRIBUTION	GHG TARGET
		ACTION ONLY
		NO CONTRIBUTION
	TYPE OF SECTORAL CONTRIBUTION	GHG TARGETS (AGRICULTURE AND LULUCF)
		GHG AND NON-GHG TARGET (AGRICULTURE AND LULUCF)
		GHG TARGET (AGRICULTURE OR LULUCF)
		NON-GHG TARGET (LULUCF)
		NOT INCLUDED
	COVERAGE OF GHG GASES	SPECIFIED
		NOT SPECIFIED
	TYPE OF MITIGATION POLICIES AND MEASURES	QUANTIFIED (AGRICULTURE AND LULUCF)
		QUANTIFIED AND NON-QUANTIFIED (AGRICULTURE AND LULUCF)
		NON QUANTIFIED (AGRICULTURE AND LULUCF)
		QUANTIFIED (AGRICULTURE OR LULUCF)
		NOT QUANTIFIED (AGRICULTURE OR LULUCF)
		NOT INCLUDED
	TYPE OF POLICIES AND MEASURES	INCLUDED
		NOT INCLUDED
	ASSUMPTIONS AND METHODOLOGICAL APPROACHES	INCLUDED
		NOT INCLUDED
	MITIGATION CO-BENEFITS	INCLUDED
		NOT INCLUDED
	MRV	INCLUDED
		NOT INCLUDED
ADAPTATION COMPONENT	NATIONAL CIRCUMSTANCES	INCLUDED
		NOT INCLUDED
	CLIMATE-RELATED IMPACTS, RISKS AND VULNERABILITIES	ECOSYSTEM (E) AND SOCIAL SYSTEM (SS) SPECIFIC
		ECOSYSTEM OR SOCIAL SYSTEM SPECIFIC
		NOT INCLUDED
	NON-CLIMATIC DRIVERS OF VULNERABILITY	INCLUDED
		NOT INCLUDED
	TYPE OF ADAPTATION	PRIORITY SECTORS AND CROSS-SECTORAL PRIORITIES
		PRIORITY SECTORS OR CROSS-SECTORAL PRIORITIES
		NOT INCLUDED

ADAPTATION COMPONENT	TYPE OF ADAPTATION PRIORITY SECTORS	QUANTIFIED (E AND SS)
		QUANTIFIED AND NON-QUANTIFIED (E AND SS)
		NON-QUANTIFIED (E AND SS)
		QUANTIFIED (E OR SS)
		NON-QUANTIFIED (E OR SS)
		NOT INCLUDED
	TYPE OF ADAPTATION POLICIES AND MEASURES	INCLUDED
		NOT INCLUDED
	LONG-TERM ADAPTATION VISION AND/OR GOAL	INCLUDED
		NOT INCLUDED
	ADAPTATION CO-BENEFITS	INCLUDED
		NOT INCLUDED
	INCLUSIVENESS OF ADAPTATION	INCLUDED
		NOT INCLUDED
	RELATIONSHIP TO NAP	INCLUDED
		NOT INCLUDED
	LOSS AND DAMAGE	INCLUDED
		NOT INCLUDED
	M&E	INCLUDED
		NOT INCLUDED
BARRIERS	SECTOR-SPECIFICITY	SECTOR SPECIFIC
		ECONOMY-WIDE
		NOT INCLUDED
	BARRIER DESCRIPTION	INCLUDED
		NOT INCLUDED
	MITIGATING MEASURES	INCLUDED
		NOT INCLUDED
SUPPORT NEEDS	FINANCE	SECTOR SPECIFIC AND QUANTIFIED
		ECONOMY-WIDE AND QUANTIFIED
		NOT QUANTIFIED
	TECHNOLOGY TRANSFER	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	CAPACITY-BUILDING	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
PLANNING PROCESSES	DOMESTIC INSTITUTIONAL ARRANGEMENTS AND COORDINATION MECHANISMS	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	KNOWLEDGE AND EVIDENCE GENERATION	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED

PLANNING PROCESSES	DOMESTIC INSTITUTIONAL ARRANGEMENTS AND COORDINATION MECHANISMS	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	KNOWLEDGE AND EVIDENCE GENERATION	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	POLICY COHERENCE AND BUDGETING PROCESSES	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	DOMESTIC IMPLEMENTATION MECHANISMS AND MONITORING SYSTEMS	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED
	INTERNATIONAL POLICY PROCESSES AND COOPERATION	SECTOR SPECIFIC
		NOT SECTOR SPECIFIC
		NOT INCLUDED

This report provides a unique, sector-specific synthesis of the agriculture, water and land use sectors in the nationally determined contributions (NDC) from Near East and North Africa. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the region is to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture, water and land use, and associated national climate goals including related targets under the Sustainable Development Goals.

The analysis also helps to make clear the links between the NDCs from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture. Finally, the report serves as a guide to the Food and Agriculture Organization of the United Nations, as well as other organizations and financial institutions, of the support that will be required to help countries in the region move forward to implement agriculture, water and land use priorities in their NDCs and ensure that future commitments from the sector are quantifiable, verifiable and sufficiently ambitious.

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