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Climate Change Adaptation in the Arab States

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Cover photo: A portrait of 16-year-old Yusra Suleiman al Toum Ahmed in El Fasher, Sudan. Ms. Ahmed, an aspiring journalist, is a member of her country's Parliament of Students, Quranic organization and Students' Union. El Fasher, Sudan. UN Photo/Albert Gonzalez Farran.

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Photo: UNDP

Foreword

A turning point

The Sustainable Development Goals (SDGs), the new Paris Agreement on Climate Change and the Sendai Framework for Disaster Risk Reduction together mark a turning point in development policy globally and in the Arab region.

The vision these instruments set for a new balance between people and planet represents a shift in the trajectory of development cooperation. The new 2030 Agenda for Sustainable Development highlights that for development to be sustainable it must become resilient to increasingly complex risks faced in the world today. This is particularly relevant for the Arab region.

The Arab region was the birthplace of agricultural civilization and for thousands of years has been able to cope with risks from climatic hazards. But climate change is now happening at a pace unlike anything before, stretching the ability of societies to cope. Alongside the spread of war and conflict, climate change has now emerged as one of the greatest drivers of change in the region today, accelerating the rise of social vulnerability and exacerbating trends of resource insecurity and displacement. Over the past decade, the region has witnessed cycles of drought, the frequency and severity of which are beyond anything seen for hundreds of years in the region. This has contributed to situations of famine and food insecurity, loss of livelihoods and life, and the displacement of millions. While the Arab region is already the planet's most water insecure and food import dependent region, temperatures in the region are now rising faster than the global average, with climate change threatening to reduce food and water productivity by a further twenty percent by 2030.

In response, countries across the region now seek to expand international cooperation and take action under the Paris Agreement to build climate resilient societies. To this end, UNDP works closely with our national partners to build resilience of institutions and communities to anticipate, absorb and adapt to increasingly complex risks from climate change. UNDP has rapidly expanded its support in recent years in this regard, through a strong partnership with the Global Environment Facility (GEF), the Green Climate Fund (GCF), the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF) and key bilateral donors. As we empower countries and communities, UNDP promotes integrated solutions to achieve SDG 13 on climate action and the Paris Agreement, while bringing co-benefits for SDGs on food and water security, health, gender equality, combating land degradation and reducing the loss of biodiversity.

Climate change poses one of the single greatest threats to the future of development in the Arab region, but it also presents an opportunity to innovate and transition to a more resilient future in line with the vision set forth in the 2030 Agenda. As elaborated in this report, innovative bottom up solutions are emerging, which if scaled up, can help sustain communities and ecosystems towards 2030 and beyond. UNDP stands ready to continue and expand our cooperation with national partners and local communities, who may today stand on the front lines of climate risks, but with dedicated support from the international community may well emerge as the new innovators and success stories for the sustainable, resilient society of 2030.

Mr. Mourad Wahba
Assistant Administrator and Director
UNDP Regional Bureau for Arab States

Photo: UNDP Egypt

Fostering climate resilience

Leveraging finance from the Global Environment Facility to foster climate resilience in Arab States

The shift to a low-carbon economy will take creative thinking and innovative financing. Based on our quarter century of experience and wide network of partners, including partner countries in Arab States as well as the United Nations Development Programme (UNDP), the Global Environment Facility is dedicated to achieving transformational change that will allow economies and societies in the Arab States to adapt to climate change.

The GEF invests in energy efficiency, renewable energy, sustainable transport and climate-smart agriculture to support climate change mitigation. We must continue mitigation efforts to reduce greenhouse gas emissions. But, increasingly, the world needs to also focus on adaptation, especially for the poorest countries and vulnerable nations in the Arab States – not just to build resilience against future changes, but also to preserve local, national and global efforts to fight poverty, build equality, empower women and support peaceful development in these communities.

There are persistent barriers to scale up and mainstream climate change adaptation. Resources for adaptation fall far short of demand, and finance is unpredictable. As a result, vulnerable countries have few incentives for long-term planning. Even if they want to pursue adaptation, these countries often lack institutional and technical capacity to do so.

The GEF plays a pivotal role in the climate finance architecture by: (a) piloting and demonstrating technologies, techniques, and business models for adaptation; (b) supporting policy and strategy frameworks that enable adaptation and resilience mainstreaming; and (c) identifying opportunities for scale-up through other sources of climate and development finance.

With the adoption of the 2030 Agenda and the Sustainable Development Goals (SDGs) in 2015 along with the Paris Agreement, the global community has entered a new era with a focus on implementation. Looking forward, implementation of climate adaptation needs to address national priorities, while also achieving the global adaptation goal articulated in the Paris Agreement.

The GEF, including the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF), have been designated as part of the operating entity of the financial mechanism for the Paris Agreement and UNFCCC, entrusted to assist with strengthening developing countries' resilience to climate change.

For a quarter of a century, the Global Environment Facility and its partners have implemented projects that have contributed to shifting the future of Arab States countries towards more sustainable development. The GEF is therefore pleased to co-publish this piece together with UNDP, which showcases some of the results being built by nations through financing from the GEF Adaptation Programme in Arab States. We will continue our collaboration to support vulnerable countries to reach their development priorities in a sustainable way amid a changing climate.

Gustavo Fonseca
Director of Programs
Global Environment Facility

Evan Schneider/UN

Supporting peace and equality

Supporting peace, equality and achievement of the Paris Goals and 2030 Agenda in Arab States through low-carbon, climate-resilient development

The Arab region is full of potential. Over the past decades, the region has increased electricity production from renewable resources seven-fold, decreased infant mortality significantly, achieved near universal primary education with around 73 percent of young people able to enroll in secondary education, and closed the gender gap by promoting parity across all stages of education. More people than ever have access to safe drinking water, electricity, and game-changing technologies like the internet.

Climate risks threaten to derail these development gains. This could disrupt efforts to build peace, cause a spike in "eco-migrants," and undermine efforts to end hunger, poverty and inequality by 2030.

In the Arab States, the causes of crises, food insecurity, malnutrition and vulnerability to climate change impacts are deeply interlinked and require multifaceted responses. The Arab region is home to rising levels of conflict and the world's largest population of refugees and displaced people. Simultaneously, it is now the planet's most water scarce and food-import-dependent region, and the only region where malnutrition rates have been rising.

To build the climate resilience in Arab States, including highly vulnerable Least Developed Countries such as Djibouti, Somalia, Sudan and the Republic of Yemen - where droughts, changing rainfall patterns and conflict are putting millions of people at risk and spiking hunger and malnutrition numbers – we need to assist nations and communities in building agile, innovative and bold interventions that allows them to better adapt to our changing climate.

Six out of ten people in the Arab Region are under 30 years old. These youth will lead the way. But they will require stronger institutions, increased capacity and modernized policies in order to achieve the type of transformational change needed to promote low-carbon, climate-resilient development.

By supporting countries in Arab States to mobilize partnerships between donors such as the Global Environment Facility, the Adaptation Fund and the Green Climate Fund, as well as bilateral donors, important sectors of civil society, and the broader UN System, UNDP is serving as a broker to connect vulnerable nations with the resources, capacity and tools they need to achieve the Paris Goals and 2030 agenda, and leverage creative financial mechanisms to fill the climate change adaptation funding gap.

Under the leadership of our new Administrator Achim Steiner, UNDP has a new strategic plan for 2018-2021. Anchored in the 2030 Agenda for Sustainable Development and committed to the principles of universality, equality and leaving no one behind, the UNDP vision for the Strategic Plan for the next four years is to help countries achieve sustainable development by eradicating poverty in all its forms and dimensions. In the Arab States, this work will be achieved by accelerating structural transformations for sustainable development and building resilience to crises and shocks.

This work is already taking place. It means, for example, that a new sand dam built in Somalia was able to provide a fresh water source during a recent drought. It means increased capacity to address climate change vulnerabilities and risks in the coastal areas of Tunisia. It means that Morocco will be able to build more effective plans for climate change adaptation and have strong institutions required to foster transformational change.

Over the past 10 years, we have seen many pilot projects for climate change adaptation yield significant results in Arab States and across the globe. It's time we brought these projects to scale.

In Egypt, for instance, a new GCF-financed project will expand the use of low-cost dikes system to prevent the flooding of the low-lying lands of the Nile Delta from sea surges during extreme weather events. The Nile Delta is home to 25 percent of the Egyptian population. By insulating this vulnerable population from the short- and long-term impacts of climate change, UNDP is dedicated to developing the partnerships, capacities, and opportunities nations need to end poverty and ensure sustainable economic and social development.

To address the myriad challenges that climate change is bringing to the Arab States, we need to be innovative, we need to be bold, and we need to support the people in building the enabling environments they need to thrive in our fast-changing world.

Adriana Dinu

Director, Sustainable Development (Environment)

Executive Coordinator, Global Environmental Finance

UNDP

Photo: UNDP Egypt

Executive summary

The Arab region contains 14 of the world's 20 most water-stressed countries.[1] In fact, the region's annual internal water resources amount to only 6 percent of its average annual precipitation, against a world average of 38 percent. Overexploitation of natural resources in the region has also led to severe ecosystem degradation. Poor land and water management are reducing the potential provision of already limited ecosystem services. For example, annual deforestation rates can be as high as 4 percent[2] in the region due to charcoal production for fuel and/or to profit from the *Gum arabic* trade.[3]

Urbanization and population growth are putting severe strains on dwindling natural resources. The population of the Arab countries, estimated at approximately 407 million (2016), with 100 million considered to be in poverty, is expected to reach approximately 635 million by 2050.[4] Middle East North Africa (MENA) is the only region in the world where poverty increased between 2011 and 2016; and poverty is projected to increase further by 2030.[5] Furthermore, unemployment is increasing with current rates as high as 70 percent.[6] With low human development index (HDI) rankings for many Arab countries and rampant poverty, the region is also facing internal conflicts over scarce natural resources such as conflicts between rain-fed farmers and pastoralists.

The impacts of climate change are exacerbating the existing challenges of sustainably managing limited natural resources. Climate change-related desertification has expanded in the Arab region, greatly increasing the vulnerability of the local population. In fragile countries such as Somalia, illegal armed groups such as Al-Shabaab have increasingly attracted young people who are affected by drought-induced food insecurity and who have limited job prospects.[7]

Current climate change projections show that by the year 2025, the water supply in the Arab region will be only 15 percent of levels in 1960.[1] By 2030 the predominant effects of climate change will include a decrease in precipitation, a drastic rise in average temperatures and an increase in seawater intrusion into coastal aquifers as sea levels rise and groundwater overexploitation continues. With increased urbanization, the urban heat island effect is projected to increase nighttime temperatures by 3 °Celsius.[8] Climate change will also have disproportionate consequences for women, poor and marginalized communities who are especially at risk due to their dependence on natural resources.

To conquer such challenges, the United Nations Development Programme (UNDP) is supporting countries in the four sub-regions of the Arab region (Mashreq, Maghreb, Arab Gulf and Horn of Africa) to adapt to climate change impacts and to prepare for disaster risks. These countries include some of the least developed countries (LDCs), namely: Djibouti, Somalia, Sudan, and the Republic of Yemen; Tunisia in the Maghreb; and the Arab Republic of Egypt, Iraq, Jordan, Lebanon and the occupied Palestinian territories in the Mashreq. [9] UNDP projects have aimed to improve natural resource governance and management while balancing socio-economic needs and environmental protection. Currently, UNDP's Climate Change Adaptation (CCA) portfolio includes two projects in Djibouti and Sudan in addition to single projects in Egypt, Somalia, Tunisia and Yemen. The first UNDP CCA project in the Arab region was launched in Egypt in 2010 with financing from the Global Environment Facility's (GEFs) Special Climate Change Fund (SCCF). Since then, the portfolio includes ongoing projects with a total financing of approximately US$42 million, primarily financed by GEF, the Adaptation Fund (AF) and UNDP. Most recently, UNDP has also supported Egypt in accessing financing from the Green Climate Fund (GCF) for coastal adaptation. In parallel to GEF supported initiatives, UNDP has also supported Djibouti, Egypt, Iraq, Jordan, Lebanon, the occupied Palestinian territories, Somalia, Sudan and Tunisia in disaster risk reduction and recovery with projects from 2005-2016 valued at US$151 million, through support of UNDP resources and bilateral donors like Canada, European Commission, Iceland, Japan, Kuwait, Switzerland and the US.

The purpose of this publication is to detail lessons learned from UNDP's Climate Change Adaptation work and achievements in the Arab region on achieving sustainable and lasting results. Some lessons include building local capacity at all levels to ensure a project's long-term viability, decentralizing infrastructure management, implicating community-based organizations, and promoting resilience of vulnerable populations through livelihood diversification. Providing populations with access to adapted financial services such as Weather Index Insurances (WII) linked with microfinance services was found to support rural populations to become more resilient to climate induced damages.

The immediate objective of this publication is not only to share experiences with a wider audience, but also to inform future CCA programming. The publication furthermore acts as a call to action to facilitate a long-term coordinated approach to increasing the resilience of countries most vulnerable to climate change in the region.

1 UNDP-RBAS and Sida. Water Governance in the Arab Region: Managing Scarcity and Securing the Future. 2013

2 Somalia annual deforestation rate is 4% (Ref: Hussein, S.M.S.H., Somali Institute for Development and Research Analysis (SIDRA) 2017 Understanding the Drivers of Drought in Somalia: Environmental Degradation as a Drought Determinant)

3 Sudan being the largest exporter of Gum arabic producing 80% of the world's total output. (Ref: Omer A.F., Agricultural Policy in Sudan. Agricultural Science Research Journal Vol 1(1) pp. 1 – 29., February 2011)

4 World Bank Data Portal Arab World: https://data.worldbank.org/region/arab-world, Last Updated 2 May 2018

5 World Bank. 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC.

6 Somalia unemployment rate is 70% 47% (Ref: ILO Somalia Jan 2016)

7 Igarapé Institute: Somalia: The Role of Climate Change in Recurring Violence (Nov 2017)

8 Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report, World Bank 2012

9 Classification used by the UN and the League of Arab States: The Cooperation Council for the Arab States of the Gulf (GCC): Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates; The Least Developed Countries (LDCs): the Comoros, Djibouti, Mauritania, Somalia, the Sudan and Yemen; Maghreb: Algeria, Libya, Morocco and Tunisia; and Mashreq: Egypt, Iraq, Jordan, Lebanon, Palestine and the Syrian Arab Republic

Photo: Fadhl Al-amdi /UNDP

The United Nations Development Programme provides support to countries to adapt to climate change. Assistance to countries is provided in the context of the 2030 Agenda for Sustainable Development, seeking to promote pro-poor and pro-growth adaptation, which encourages climate-resilient economic development and sustainable livelihoods in the face of climate change.

To help achieve these goals, UNDP supports developing countries to access financing for climate change adaptation through several sources of funding including resources managed by the Global Environment Facility (GEF), such as the Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF); the Adaptation Fund (AF); the Green Climate Find GCF); as well as from bilateral donors. These programmes and projects cover a wide range of sectors and involve national governments, local authorities, and civil society.

UNDP-supported projects and programmes at the country level are organized around six Signature Programmes: Supporting Integrated Climate Change Strategies; Advancing Cross-sectoral Climate Resilient Livelihoods; Ecosystem-based Adaptation (EbA); Fostering Resilient Food Security; Climate Resilient Integrated Water Resource and Coastal Management; and Promoting Climate Resilient Infrastructure and Energy. [10]

[10] Under UNDP Administrator Achim Steiner, UNDP has a new strategic plan for 2018-2021. Learn more at http://strategicplan.undp.org/.

Acknowledgements

This publication content draws on the experiences of a variety of UNDP-supported policy and programme initiatives in the Arab States over the last six years. It is grounded on experiences at the national, subnational, and community levels. It is intended to pull together lessons learned about what makes for effective adaptation programming to inform future investment efforts and so enable adaptation investments to generate long-lasting benefits to people that are the most vulnerable to the effects of climate change.

We would like to thank the many people who contributed thoughtful discussions and ideas that helped shape this report. The report preparation was led by Tom Twining-Ward in close collaboration with Kishan Khoday, with Cara Tobin as lead author and Fadhel Baccar, Janine Twyman Mills, Walid Ali and Zubair Murshed as contributing authors.

The publication was professionally reviewed by fellow UNDP colleagues, Greg Benchwick, Hanan Mutwaki, Mohamed Bayoumi, and Walid Ali. Valuable external expert review, comments, and suggestions were provided by Hussein El-Atfy (Arab Water Council), Ibrahim Abdel Gelil (Arabian Gulf University), Amal Dababseh and William Dougherty (Climate Change Research Group). The dedicated time, expertise, knowledge and input of all reviewers is deeply appreciated.

Our thanks extend especially to the UNDP Country Offices in the Arab Region for their insight and ongoing guidance in managing each of their programmes and projects. The continued dedication, experienced oversight, passion, and depth of knowledge into their respective country portfolios is demonstrated by the notable positive impact they continue to have in their environments as they address the challenges of a changing climate.

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The publication was prepared with the guidance and oversight of Pradeep Kurukulasuriya, Head of Climate Change Adaptation Programming and Global Focal Point (Adaptation/Mitigation) Green Climate Fund Programming, UNDP Global Environmental Finance Sustainable Development Cluster; and Janine Twyman Mills, UNDP Climate Change Adaptation.

The publication was financed by the United Nations Development Programme.

Photo: UNDP Djibouti

Photo: UNDP Djibouti

Abbreviations and acronyms

ACRI	Arab Climate Resilience Initiative
ADDS	Agence Djiboutienne de Développement Social (Djibouti)
AETTA	Agricultural Extension and Technology Transfer Administrations
AF	Adaptation Fund
AFAPCC	Arab Framework Action Plan on Climate Change
AFED	Arab Forum for Environment and Development
AGEDI	Abu Dhabi Global Environment Data Initiative
ALM	Adaptation Learning Mechanism
APAL	Coastal Protection and Planning Agency (Tunisia)
AR4	Fourth Assessment Report of the Intergovernmental Panel on Climate Change
AR5	Fifth Assessment Report of the Intergovernmental Panel on Climate Change
ARP	Agriculture Review Plan
ASAL	arid and semi-arid land
ASDRR	Arab Strategy for Disaster Risk Reduction
ASEZA	Aqaba Special Economic Zone Authority (Jordon)
AWC	Arab Water Council
CAMRE	Council of Arab Ministers Responsible for the Environment
CBO	community-based organization
CCA	climate change adaptation
CCRG	Climate Change Research Group
cm	centimetre
CNRS	National Council for Scientific Research (Lebanon)
COP	Conference of the Parties
CPAP	Country Programme Action Plan
CSO	civil society organization
CVF	Climate Vulnerable Forum
DDF	District Development Framework
DRM	disaster risk management
DRR	disaster risk reduction
DDMC	District Disaster Management Committee
EbA	ecosystem-based adaptation
EFSeCC	Emirates Food Security under Climate Change model
EIA	environmental impact assessment
EWS	early warning system
FEWSNET	Famine Early Warning Systems Network
FSNAU	Food Security and Nutrition Analysis Unit
GCF	Green Climate Fund
GDP	gross domestic product
GEF	Global Environment Facility
ha	hectare
HDI	human development index
HFA	Hyogo Framework for Action
ICE	Inventory of Conflict and Environment
ICT	information and communications technology
ICZM	integrated coastal zone management
IDBG	Islamic Development Bank Group
IDP	internally displaced person
IDSC	Information Decision Support Center (Egypt)
IFI	international financial institution
IFRC	International Federation for Red Cross and Red Crescent Societies
IGAD	Intergovernmental Authority on Development
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change
ISIS	Islamic State of Iraq and Syria
IWRM	integrated water resources management
KM	knowledge management
LAS	League of Arab States
LDC	least developed country
LDCF	Least Developed Countries Fund
LECZ	low elevation coastal zone

m	metre
m2	square metre
m3	cubic metre
M&E	monitoring and evaluation
MDG	Millennium Development Goal
MENA	Middle East and North Africa
MF	microfinance
MFI	microfinance institution
MHUE	Ministry on Habitat, Urbanism and the Environment (Djibouti)
NAP	National Adaptation Plan
NAP	National Action Programme to Combat Desertification
NAPA	National Adaptation Programme of Action
NCAR	National Centre for Atmospheric Research
NCCC	National Climate Change Committee
NCRS	National Council for Scientific Research
NCSA	National Capacity Self-Assessment
NDC	nationally determined contribution
NEFMS	National Environment Fund Management System
NERAD	National Environment Research and Disaster Preparedness Authority (Somalia)
NGO	non-governmental organization
NHMS	National Hydro-Meteorological Services
NRM	natural resources management
OPEC	Organization of the Petroleum Exporting Countries
PANE	National Programme of Action for the Environment (Djibouti)
PDTRA	Petra Development and Tourism Region Authority (Jordon)
PNAS	Proceedings of the National Academy of Sciences of the United States of America
RBAS	Regional Bureau for Arab States (UNDP)
RCP	representative concentration pathways
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
SCCF	Special Climate Change Fund
SDG	Sustainable Development Goal
SEGRC	Executive Secretariat for Risk and Disaster Management
Sida	Swedish International Development Cooperation Agency
SLR	sea level rise
SMA	Sudan Meteorology Authority
SMS	Short Message Service
SRFP	smallholder rain-fed farmers and pastoralists
SSC	South-South cooperation
SPA	Strategic Priority of Action
t	tonne
TC	technical committee
UN	United Nations
UNDP	United Nations Development Programme
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNEP	United Nations Environment Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
UNISDR	United Nations Office for Disaster Risk Reduction
UNITAR	United Nations Institute for Training and Research
UNTFHS	United Nations Trust Fund for Human Security
US$	United States Dollar
USAID	United States Agency for International Development
VDC	village development committee
WB	World Bank
WFP	World Food Programme
WII	weather-based index insurance
WPMC	water point management committee
WUA	water user association

Photo: UNDP Djibouti

1 Introduction

1.1. Purpose of the report

The Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change and the Sendai Framework on Disaster Risk Reduction (DRR) highlight that for development to be sustainable it must be resilient to growing risks from both climate change and natural disasters. This is of critical importance in the Arab region, already the world's most water-scarce, food-import dependent region, with growing impacts from climate change (particularly droughts) creating even greater forms of social vulnerability.

UNDPs support for climate action began over 25 years ago, following the entry into force of the United Nations Framework Convention on Climate Change (UNFCCC), with a major focus on making development results climate resilient. UNDP is currently the United Nation's largest provider of country assistance for climate change, with close to US$3 billion in funding provided to projects in over 170 countries around the world. This includes an important set of initiatives in the Arab region, and its four sub-regions - the Middle East, North Africa, the Arabian Peninsula and the Horn of Africa. UNDP uses its local presence and support to countries in the region to address issues such as poverty reduction, land use, food security and water access.

In follow-up to the entry into force of the new Paris Agreement on Climate Change at the 22nd Conference of the Parties (COP22) in Morocco, this report seeks to elaborate UNDP's vision for helping countries achieve the sustainable development goals (SDGs) and goals elaborated in their nationally determined contributions (NDCs) to climate change. As climate change moves up the development agenda in the region, as a means of sustaining development goals and preventing crisis, this report offers a timely overview of practical bottom-up solutions based on lessons learned that can be applied to future CCA and DRR projects and programmes.

What follows is an elaboration of key results from recent cooperation between UNDP and its local partners across the Arab region. Through the successful efforts of governments and communities across the region, the technical assistance projects noted below have helped align action on climate change with broader development goals on food security, access to water, sustainable use of ecosystems, reducing risks from drought and other climatic disasters, and combating land degradation. The identification of lessons learned, bottom-up solutions and success stories are intended to serve as an important basis for charting the road ahead to address climate risks to the SDGs and to help countries implement the Paris Agreement.

1.2 Problem declaration

The diverse Arab region can be characterized as predominantly energy rich, water scarce, and food deficient.[1] While the region has a history of dealing with a harsh climate including low precipitation, frequent floods, droughts and extreme temperatures; the convergence of these age-old challenges with more recent societal developments such as rapid population and urban growth, political instability and widespread poverty, make it among the world's most vulnerable regions to climate change.[2] Since 1970, the Arab region has seen massive population growth, from 122 million in 1970 to over 407 million in 2016[3] For example, Somalia's current population growth rate is 4 percent, which is significantly higher than the 1.3 percent average rate for other developing countries.[4] In 2012, the United Nations Human Settlements Programme (UN-Habitat) estimated that the region's population would reach 646 million by 2050. The urban population, which has more than quadrupled from 1970 to 2010, is poised to more than double again by 2050 and reach over 439 million people.[5]

The population of the Arab States is marked by tremendous diversity. Wealth disparities among countries in the region are among the highest in the world.[6] While the annual per capita gross domestic product (GDP) of Qatar is just under US$130,000, six countries in the region are Least Developed Countries (LDCs) with predominantly rural populations and a GDP as low as US$600 (Somalia).[7] Adult literacy rates range from 56 percent in Morocco to close to 95 percent in Qatar. Women's labour participation rates range from 13.9 percent (Iraq) to 73.7 percent (Comoros). The human development index (HDI), which summarizes several indicators of average achievement in key dimensions of human development[8] runs from 0.4 (Sudan) to 0.85 (United Arab Emirates).[9]

Largely located in the arid horse latitudes[10], the region has the world's lowest freshwater resource endowment. All but four Arab countries (the Arab Republic of Egypt, Iraq, Saudi Arabia, and Sudan) suffer from chronic water scarcity and fall below the water poverty line of 1,000 cubic metres (m^3) per capita per year.[11] Rural populations are heavily dependent on climate sensitive subsistence farming and pastoralism and are therefore vulnerable to increasing rainfall variability caused by climate change. An arid climate and scarce water resources make countries in the region heavily dependent on food imports to feed their populations. Under-nourishment is a challenge in some of the region's poorest countries, where non-farm rural households living in remote areas are the most affected.[12]

Currently, the livelihoods of rural populations are at risk in the Arab States due to repeated water shortages during periods of severe drought in conjunction with an inability to adapt to the impacts of climate change. Somalia is facing extreme drought that has caused near total crop failure, shortage of water and pasture, and rapidly diminishing food access among poor households as staple food prices continue to rise sharply and livestock prices decrease significantly. Approximately 360,000 acutely malnourished children need urgent treatment and nutrition support.[13] Throughout the Arab region, an additional 80 to 100 million people are expected to experience water stress by 2025 as a result of drier conditions and decreased rivers flows and groundwater recharge rates.[14] Additionally, many of the region's economic activities and urban centres are located in flood-prone coastal zones, as are the region's most fertile agricultural lands, making them vulnerable to sea level rise (SLR), storm surges, and coastal erosion.[15]

1.3. The SDGs and the 2030 Agenda for Sustainable Development

As leaders in the region strive to achieve stability and put the region back on a development trajectory, they do so in the face of risks from climate change and climatic disasters. These trends pose risks for achieving the SDGs, and for

1 AFED (2015). Arab Environment: Sustainable Consumption. Annual Report of Arab Forum for Environment and Development, 2015; Abdel Gelil, I. and Saab, N. (Eds.); Beirut, Lebanon. Technical Publications

2 AFED (2016). Arab Environment: Sustainable Development In A Changing Arab Climate. Annual Report of Arab Forum for Environment and Development, 2016; Saab, N. and Sadik, A. (Eds.); Beirut, Lebanon. Technical Publications

3 World Bank Data Portal Arab World: https://data.worldbank.org/region/arab-world, Last Updated 2 May 2018

4 Hussein, S.M.S.H., Somali Institute for Development and Research Analysis (SIDRA) 2017 Understanding the Drivers of Drought in Somalia: Environmental Degradation as a Drought Determinant

5 The State of Arab Cities 2012, Challenges of Urban Transition, UN-Habitat

6 Arab Human Development Report, Research Paper Series, Population Levels, Trends and Policies in the Arab Region: Challenges and Opportunities, Barry Mirkin, United Nations Development Programme Regional Bureau for Arab States

7 Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report, World Bank 2012

8 http://hdr.undp.org/en/content/human-development-index-hdi

9 http://www.arab-hdr.org/data/indicators/

10 The horse latitudes are subtropical latitudes 30 to 38 degrees north and south of the equator and characterized by calm winds and low precipitation https://oceanservice.noaa.gov/facts/horse-latitudes.html

11 UNDP-RBAS Climate Change Paper Series: Elasha, B.O.2010. Mapping of Climate Change Threats and Human Development Impacts in the Arab States. Arab Human Development Report

12 FAO (2015), Towards a Regional Collaborative Strategy on Sustainable Agricultural Water Management and Food Security in the Near East and North Africa Region, Food and Agriculture Organization of the United Nations

13 FSNAU and FEWSNET Technical Release 2 Feb 2017. Risk of Famine Increases in Somalia

14 UNDP-RBAS Climate Change Paper Series: Elasha, B.O. 2010. Desk Review and Mapping of Climate Change Issues, Initiatives and Actors in Arab States. December 2009. Arab Human Development Report Papers

15 AFED (2016). Arab Environment: Sustainable Development in A Changing Arab Climate. Annual Report of Arab Forum for Environment and Development, 2016; Saab, N. and Sadik, A. (Eds.); Beirut, Lebanon. Technical Publications

achieving long-term recovery in fragile contexts.

The 2030 Agenda for Sustainable Development and the affiliated SDGs mark a turning point in development policy globally and in the region. Achieving the SDGs in an era of climate disruption will be impossible unless countries and communities are able to anticipate, shape and adapt to this new driver of change. Climate change is inextricably linked to all the SDGs.

In taking action on SDG 13 on climate change, countries are also building resilience of results under SDG 1 on poverty, SDG 2 on food security, SDG 5 on women's empowerment, SDG 6 on access to water, SDG 10 on inequality, SDG 15 on land and ecosystems, and SDG 16 on peace and security, among others.

Box 1: Implementation of the Sustainable Development Goals

The Addis Ababa Action Agenda that came out of the Third International Conference on Financing for Development provided concrete policies and actions to support the implementation of the new agenda. Implementation and success will rely on countries' own sustainable development policies, plans and programmes, and will be led by countries. The Sustainable Development Goals (SDGs) will be a compass for aligning countries' plans with their global commitments. Nationally owned and country-led sustainable development strategies will require resource mobilization and financing strategies. All stakeholders: governments, civil society, the private sector, and others, are expected to contribute to the realisation of the new agenda. A revitalized global partnership at the global level is needed to support national efforts. This is recognized in the 2030 Agenda. Multi-stakeholder partnerships have been recognized as an important component of strategies that seek to mobilize all stakeholders around the new agenda. Read more at www.un.org/sustainabledevelopment/development-agenda/.

SDG 13: Take urgent action to combat climate change and its impacts

13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 - Integrate climate change measures into national policies, strategies, planning

13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

1.4. Implementing the Paris Agreement on Climate Change

On 4 November 2016, the Paris Agreement on Climate Change entered into force, a historic step in addressing climate change. From the Arab region, a total of 13 countries have ratified the Paris Agreement to date. All countries in the region have established their NDCs. This has delivered a strong and united signal of the region's continued commitment to climate action. With a view to bottom-up local actions, NDCs serve as the main basis for achieving results under the Paris Agreement. Climate-resilient development pathways stand at the center of most NDCs in the region, with intended actions to address vulnerability of food, land and water resources to climate impacts, building capacities for early warning systems (EWS), resilience of communities to droughts, floods and sea-level rise, and addressing risks of climate change to the onset of conflicts and displacement.

The launch of the Paris Agreement and NDCs creates a new, ambitious agenda for climate resilient development in the region, calling on all involved to come together and scale-up partnerships and finance in support of the implementation agenda. In support of this transformative shift, UNDP has a series of climate change initiatives underway across the region, as expressed further below which will help countries achieve the vision set forth in their NDCs. Through these initiatives, UNDP helps climate-vulnerable communities in the region use their NDCs as a tool for realizing climate-resilient development.

As shown below, UNDP cooperation is helping strengthen capacity to 1) Integrate gender-sensitive climate resilience measures into development policy and planning; 2) Establish improved EWS and improved climate monitoring systems; 3) Ensure access to scaled-up climate finance including from the GCF; and 4) Support innovation in climate finance such as through weather-indexed insurance, to support community-based resilience. In the post-Paris era, UNDP will scale-up its work with national partners in the region to find climate solutions that work for them, with cooperation focused on four areas of work:

1. Strengthening Integrated Adaptation Policies, Plans and Strategies, which includes strengthening the adaptation actions emerging from NDCs for water and food security;

2. Advancing Adaptation Action including scaling-up climate resilient livelihood options for the poor and vulnerable, improving climate information and EWS, expanding ecosystem-based adaptation (EbA) solutions and resilient infrastructure;

3. Addressing Climate and Disaster Risks through an integrated approach by identifying and incorporating the management of climate risks with DRR into all governance, planning, implementation and monitoring; and

4. Instilling Risk-Informed Disaster Recovery, which includes integrating climate change into disaster recovery efforts, and using this as an opportunity to build better disaster preparation mechanisms and more resilient infrastructure.

Photo: JC McIlwaine/UNMISS

Photo: Andrea Egan;/UNDP Somalia

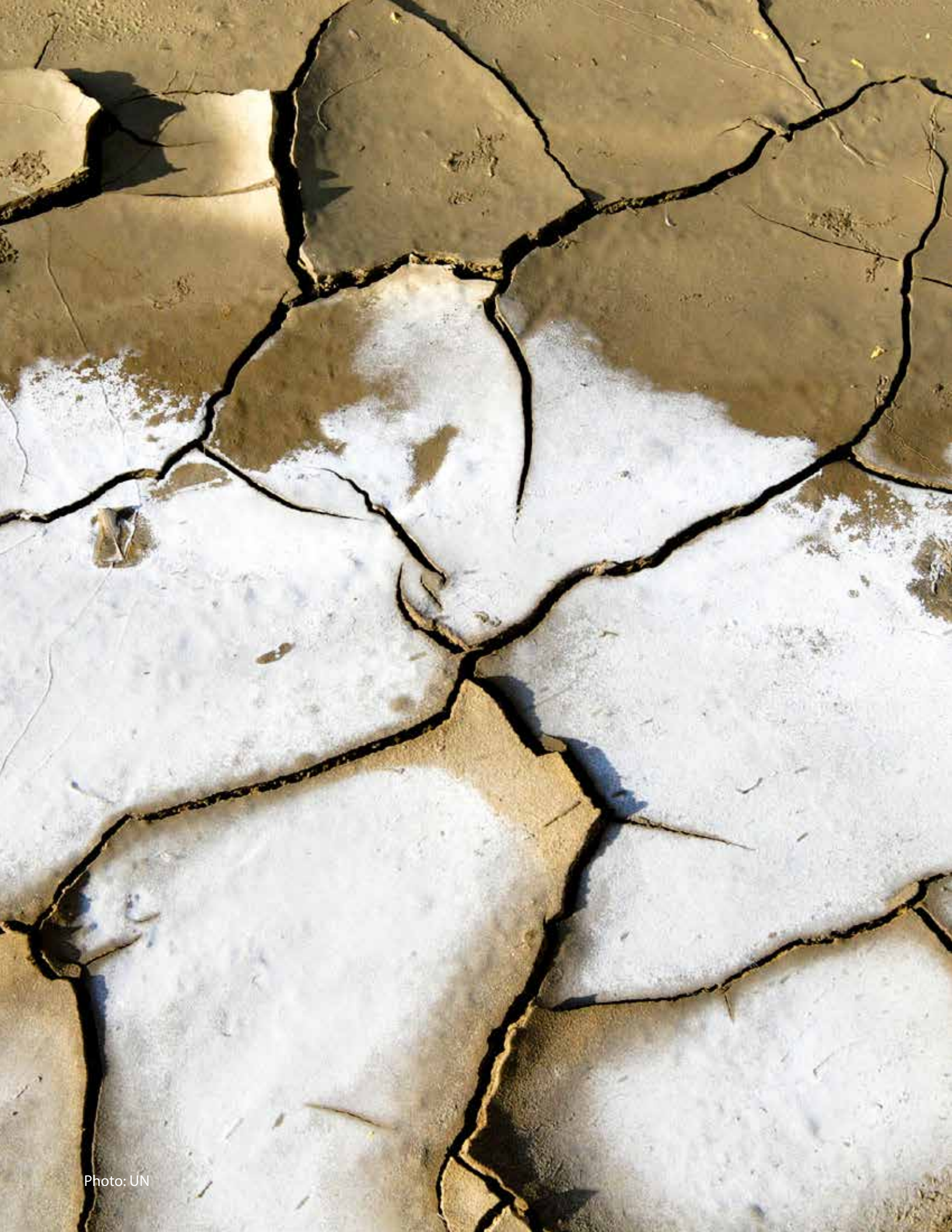

Photo: UN

2

Climate change scenarios and projected impacts in the Arab region

During the period 2006-2010 in the lead up to the Arab Uprisings the region saw one of its most severe drought cycles in the past century, leading to a loss of livelihoods, high food prices, and decreased purchasing power for the average citizen. In Syria, the drought decimated the livelihoods of 20 percent of the rural population, displacing up to 1 million people and fueled mass internal displacement and social tensions in advance of broader conflicts that have more recently emerged. Similarly, in Somalia approximately 100,000 people perished and 4 million were displaced by 2011 and again Somalia had close to 900,000 people displaced solely due to the drought between November 2016 and August 2017.[1] More than 40 percent of the people in the Arab region have already been exposed to drought and other climatic disasters.[2]

1 UN Office for the Coordination of Humanitarian Affairs. Humanitarian Bulletin Somalia 26 Sep 2017, https://reliefweb.int/report/somalia/humanitarian-bulletin-somalia-september-2017-issued-26-september-2017

2 The International Policy Centre for Inclusive Growth, Koday, K. 2017. Social protection after the Arab Spring. Volume 14, Issue No. 3 December.

Understanding how climate risks converge and interact with broader challenges of development and crisis prevention is becoming a top priority for all countries in the region. All people in the Arab region are in some way or another vulnerable to climate change. However, because climate change aggravates and multiplies existing threats, poorer populations lacking the resources to adapt to the changes are likely to be most severely impacted, particularly as resource security declines.[3] Table 1 outlines how the climate is expected to change throughout the Arab region.

2.1 Temperature

According to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), mean annual temperatures in East Africa and the Maghreb states are likely to exceed 2° degrees Celsius (°C) with maximum projected increases up to 6° C - based on the (representative concentration pathways (RCP) 2.6 and RCP 8.5 emissions scenarios respectively by the year 2100.[4] Downscaled regional climate modelling for the Arab Region shows that, for the period 2011-2041, both models predict similar increases in temperature of 0-2 °C.[5]

2.2 Precipitation

Overall, precipitation projections present greater variability than temperature projections.[6] A reduction in precipitation, up to 40 percent, is likely over North Africa by the end of the 21st Century.[7] Total precipitation and the frequency of wet days have declined significantly across North Africa.[8] Erratic and insufficient rainfall is being compounded by an increase in extreme temperatures.[9]

2.3 Sea level rise

By the end of the century, climate change is likely to cause global mean sea level to rise by 26 to 82 centimetres (cms).[10] Combined with an increased frequency of storm surges and saltwater intrusion into rivers and aquifers it is likely to affect water quality and agricultural productivity in the low-lying coastal regions. Projections show that Egypt, Libya, Morocco and Tunisia have been identified as the most exposed African countries in terms of total population that will be affected by sea level rise.[11] A 1m SLR is expected to put 12 percent of Egypt's agricultural land at risk. The Nile Delta is also threatened by saltwater intrusion and soil salinization. Between 23 and 49 percent of the total area of coastal governorates of the Nile Delta will be susceptible to inundation according to the AR5.[12] The value of property in the Nile River Delta threatened SLR could be between 400 to 910 million US$ by 2060. [13] Assuming no protection or adaptation to the seawater rise in Egypt, annual damages have been projected in the range of US$5 billion by 2100 for a 1.26 metre (m) sea level rise.[14]

2.4 Natural hazards

Natural calamities are projected to worsen, and temperatures continue to reach record highs: Africa's nine hottest years[15] have been recorded since 2003. In 2017 extreme heat waves were recorded across the Arab region with the hottest temperature in the World recorded in Kuwait. Droughts that used to occur every six to eight years now take place every one to two years, and the Horn of Africa recently experienced its most severe drought in 60 years. Tropical cyclone events such as Phet and Gonu, which ravaged the Arabian Peninsula in 2007 and 2010 respectively, are predicted to continue to propagate across the peninsula due to increases in humidity and temperature. The single cyclone events will have such heavy precipitation associated with the storms that they will likely skew the average annual amount of rainfall data.[16]

Crop production is also severely affected by rainfall, which is becoming more intense in volume but shorter in duration.[17] According to a report by the World Bank, while globally the number of natural disasters has almost doubled since the 1980s, the average number of such disasters in the Middle East and Northern Africa has almost tripled over the same period.[18]

The World Bank's Natural Hotspots Study[19] found that several of the countries evaluated herein are at relatively high risk from multiple hazards. For instance, 43 percent of Somalia's

3 Ibid.

4 IPCC, 2014: 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 and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

5 Climate Change in the Arab Region, United Nations Environment Programme, Issues brief for the Arab Sustainable Development Report, Regional Office for West Asia (UNEP/ROWA) (2015)

6 Climate Change in the Arab Region, United Nations Environment Programme, Issues brief for the Arab Sustainable Development Report, Regional Office for West Asia (UNEP/ROWA) (2015)

7 IPCC, 2014: 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 and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

8 Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, 2014: Africa. In: 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 [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA, Ch 22. Africa pp. 1199-1265

9 Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang, 2012: Changes in climate extremes and their impacts on the natural physical environment. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK and New York, USA, pp. 109-230

10 IPCC, 2014: 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 and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

11 World Bank. 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC

12 IPCC, 2014: 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 and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

13 http://www.eg.undp.org/content/egypt/en/home/library/environment_energy/publication_1.html

14 World Bank. 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC

15 https://www.ncdc.noaa.gov/cag/time-series/global/africa/land/12/12/1998-2016

16 Abu Dhabi Global Environment Data Initiative (AGEDI), NCAR and the Climate Change Research Group. January 2015. Regional Atmospheric Modelling. Policymaker Summary for AGEDI's Local, National, and Regional Climate Change Programme

17 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

18 Natural Disasters in the Middle East and North Africa: A Regional Overview, 2014, The International Bank for Reconstruction and Development / World Bank

19 Natural Hotspots Study: A Global Risks Analysis (Disaster Risk Management Series No. 5, World Bank, 2005

land area is exposed to flooding and droughts, which entails that 54 percent of the population is highly exposed to extreme weather and natural risks. Similarly, Sudan and Djibouti have 29 percent and 32 percent of its population in areas at risk respectively. Officially, Djibouti and Somalia rank 6th and 15th respectively among the developing countries with economies highly vulnerable to natural disasters.[20]

2.5 Impacts and fragilities

The paragraphs below illustrate the convergence and intertwined nature of the negative impacts of climate change on human well-being.

2.5.1 Economy

Climate change and poor land-water management practices are negatively impacting the key economic sectors in the region. Due to food insecurity in the Arab region, as a result of unsustainable and inefficient agricultural practices, an estimated US$1 billion is needed to provide immediate relief to those who are food insecure, a figure likely to grow in the future.[21] More than 50 million people are considered undernourished and 21.2 million people are food insecure, especially in Palestine, Somalia, the Sudan, the Syrian Arab Republic and Yemen.

The value of the agricultural contribution to the GDP has declined in most Arab countries in the last two decades. Overall in the region, it fell from 11.6 percent of GDP in 1996 to 6 percent in 2016.[22] The decrease was most dramatic in Jordan, the Sudan, the Syrian Arab Republic, Tunisia and Yemen.[23] Tunisian farmers are now the most vulnerable group in the country to the impacts of climate change. They have experienced losses of US$700 million (3 percent of the 2010 GDP).

Similarly, a 1 metre rise in sea level is expected to put over 2 percent of Tunisia's GDP at risk. The Tunisian coast houses two-thirds of the total population, more than 70 percent of economic activities, 90 percent of the total capacity for tourist accommodation and a great part of the irrigated agriculture in the country. Similarly, in Egypt the economic impacts of SLR on the Nile Delta are expected to range between US$130 million and US$260 million by 2030 and between E£2 and E£16 billion by 2060 (A1FI[24] and B1[25] emission scenarios). A 1 metre rise, which is now well accepted by the AR4 and AR5 reports prepared by the IPCC, is expected to decrease the GDP by 6 percent in Egypt.[26] Similarly, predictions on the potential impacts of climate change on Egypt's agriculture economy indicate that agricultural production will likely decrease by up to 47 percent by 2060. [27]

Furthermore, due to poor water quality, Sudan had the second highest costs attributed to diarrheal deaths relative to all Arab States and spent a total of US$668 million in 2010.[28] Approximately 2 percent of Sudan's GDP is spent on buying water resources and treating diarrheal cases. Climate change is expected to increase the incidence and spread of epidemics (e.g. Rift Valley fever), malaria, and other diseases, which will put an additional burden on already struggling economies in the Arab region.[29]

20 UK Department for International Development, 2006. Reducing the Risk of Disasters – Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World

21 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

22 World Bank Data Portal Arab World: https://data.worldbank.org/region/arab-world, Last Updated 2 May 2018

23 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

24 The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. A1FI represents fossil intensive. http://www.ipcc.ch/ipccreports/tar/wg1/029.htm#storya1

25 The B1 storyline and scenario family describes a convergent world with the same global population, that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives http://www.ipcc.ch/ipccreports/tar/wg1/029.htm#storya1

26 El Raey, M. 2011. Impact of Sea Level Rise on the Arab Region. University of Alexandria and Regional Center for Disaster Risk Reduction Arab Academy of Science, Technology and Maritime Transport

27 http://www.eg.undp.org/content/egypt/en/home/library/environment_energy/publication_1.html

28 UNDP-RBAS and Sida. Water Governance in the Arab Region: Managing Scarcity and Securing the Future. 2013. Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report, World Bank 2012

29 Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang, 2012: Changes in climate extremes and their impacts on the natural physical environment. In: Managing the Risks

Table 1: Expected climate changes and exposure

Maghreb	Mashreq	Gulf countries	Least developed countries
Overall a hotter drier region	Overall a hotter drier region	Relatively uniform warming	Changes in river flows
Temperature increase of up to 5° C	Higher temperatures in both summer and winter	Possible increase in summer precipitation, but highly uncertain and localized	Variable changes in wetness and aridity, with areas nearer the tropics becoming wetter
Decrease in precipitation, fewer rainy days	Generally drier, especially in the rainy (winter) season	More severe rainfalls	More severe rainfalls
More droughts, especially in summer	Rainfall drop below growth threshold for some areas	Seawater intrusion	
Overall increase in aridity, with 20% less rainfall	Seawater intrusion and salinization, particularly in Egypt		
Seawater intrusion			

Source: Adapted from Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report (World Bank 2012.)

2.5.2 Food security

The Arab world has the highest food-deficit and is the highest food-importing region globally.[30] The average annual increase in the food production and consumption gap was 7.3 percent during the period 2005-2014.[31] After the food crisis in 2008, many Arab countries put agriculture and food security on top of their national policy agenda. Climate change is expected to impact the region's agriculture and food production systems, with potentially severe impacts on food security, most notably countries that depend on rainfed systems. Most of the agricultural area in the Arab countries is rainfed, and a large portion of the region's agricultural production is based on dryland farming systems, with a variable annual rainfall in the range of 200 to 600 mm.[32]

Crop yields are expected to drop by 30 percent with a 1.5 to 2.5°C increase in temperature and by 60 percent with a 3 to 4 °C increase, with geographical variation and without considering adaptation.[33] In North Africa, a 3 °C temperature increase could cause rain fed maize yields to drop by 15 to 25 percent by 2080.[34] As a result of a shift in agro-climatic zones and an increase in temperature, the growing season has become shorter by about two weeks in the eastern part of the Mediterranean region.[35] Agricultural yields are expected to be both less predictable and less abundant.[36]

Climate change could confront countries reliant on imports to meet food demand with increasingly volatile global food prices, as during the 2007-2008 global food crisis.[37] This has been confirmed by the AGEDI project via recent simulations run under the Emirates Food Security under Climate Change model (EFSeCC). The analysis concluded that "with climate change, current challenges of soil destruction, inadequate water supply, and stagnant mono-cultured crop yields will likely be seriously exacerbated, leading to reduced crop productivity in food-exporting countries, steady increases in food prices, and increased food insecurity around the world."[38] Prime examples include the results of the drought in Syria and Somalia. A prolonged drought in Syria from 2006 to 2010 caused 800,000 Syrians to lose their livelihoods and exposed almost 1 million people to food insecurity. [39] The recent drought in Somalia reduced average harvests by 70 percent, caused significant livestock deaths and has caused over 360,000 children to be acutely malnourished.[40] Nearly 3 million people, predominantly the rural communities, are facing acute food insecurity.

2.5.3 Water security

Lack of water is already a defining challenge in the Arab region. The region's annual internal renewable water resources amount to only 6 percent of its average annual precipitation, against a world average of 38 percent. During the period 2005 to 2015, annual per capita freshwater availability in the region dropped by about 20 percent, from about 990 to 800 m^3. The world average of 7,525 m^3/capita/year was about ten times more.[41] Increasing temperatures and evaporation rates associated with climate change will only further accentuate the problem.[42] Impacts will vary across the region. The most vulnerable countries have been said to be those that depend on rainfall or rivers.[43] Nonetheless, the Arabian Peninsula, which lacks freshwater resources and thus depends heavily on desalination, will also be impacted by increasing salinity levels associated with climate change; Desalination activities may become technologically problematic with reverse osmosis (the preferred technology) being unable to function above salinity levels of 50 ppm.[44] With growing populations and increasing per capita water use, water demand in the Arab region is projected to increase by 60 percent by 2045, while climate change is expected to reduce water runoff by 10 percent by 2050. In the last 10 years, groundwater levels in the Arab region have decreased by 1 to 2 m annually, depending on rainfall.[45] Groundwater exploitation mainly used for agriculture has caused a deterioration of water quality, most notably salinization. Beside the aforementioned impacts, water scarce regions will have fewer resources to support their industries as well as their populations. Poor populations that are heavily dependent on natural resources for their survival will likely be most hard hit.[46]

2.5.4 Displacements

Rural livelihoods are likely to be undermined as climate change shifts rainfall patterns and decreases agricultural productivity, spurring migration to cities. From 2006 to 2011, Somalia suffered a prolonged drought that may have been made more likely by climate change,[47] which led to the displacement of four million people.[48] Similarly, a prolonged

of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK and New York, USA, pp. 109-230

30 AFED (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications

31 Ibid.

32 El Solh, Mahmoud, 2016. Contributing to Zero Hunger in the Arab World. in AFED (2016) Arab Environment: Sustainable in a Changing Arab Climate. Annual Report of Arab Forum for Environmental Development

33 World Bank. 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC

34 FAO (2015), Towards a Regional Collaborative Strategy on Sustainable Agricultural Water Management and Food Security in the Near East and North Africa Region, Food and Agriculture Organization of the United Nations

35 AFED (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications

36 Arab Human Development Report, Research Paper Series, Mapping of Climate Change Threats and Human Development Impacts in the Arab Region, Balgis Osman Elasha United Nations Development Programme Regional Bureau for Arab States

37 Arab Sustainable Development Report, First Edition, United Nations Economic and Social Commission for Western Asia. ESCWA. 2015

38 Abu Dhabi Global Environment Data Initiative (AGEDI). 2015. Food Security and Climate Change. LNRCCP. CCRG

39 http://www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2010.206

40 FSNAU and FEWSNET Technical Release 2 Feb 2017. Risk of Famine Increases in Somalia

41 AFED (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications

42 Arab Human Development Report, Research Paper Series, Mapping of Climate Change Threats and Human Development Impacts in the Arab Region, Balgis Osman Elasha United Nations Development Programme Regional Bureau for Arab States

43 Climate Change in the Arab Region, United Nations Environment Programme, Issues brief for the Arab Sustainable Development Report, Regional Office for West Asia (UNEP/ROWA) (2015)

44 Abu Dhabi Global Environmental Initiative (AGEDI). 2016. Final Technical: Regional Desalination and Climate Change. LNRCCP. CCRG/IO

45 AFED (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications

46 Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report, World Bank 2012

47 Fraser C. Lott, Nikolaos Christidis and Peter A. Stott, Can the 2011 East African drought be attributed to human-induced climate change?, Geophysical Research Letters, Volume 40, Issue 6, 28 March 2013, pp. 1177–1181

48 http://www.undp.org/content/undp/en/home/blog/2016/10/12/The-nexus-of-climate-change-and-conflict-in-the-Arab-region.html

drought in Syria from 2006 to 2010, which has been attributed in part to human interference in the climate system,[49] led to a mass migration of 200,000-300,000 people from farmlands to urban centres.[50] Currently, over half of the world's refugees originate from the Arab region.[51] Such displacements are likely to become more commonplace as tensions mount over sharing increasingly scarce natural resources, heightened risk of drought, desertification, and changes in land and water availability due to climate change. Particularly vulnerable are indigenous and pastoral communities, whose land and territorial rights are often not recognized.[52]

In the low-lying coastal regions, rising sea levels are also expected to lead to displacements as storm surges causing saltwater intrusion into rivers and aquifers degrades agricultural land and land is reclaimed by the sea. Coastal erosion is expected to threaten industrial and touristic infrastructure located near the coast.[53] Across the region, over 43 port cities in the region could be impacted.[54] Egypt and Tunisia are considered highly vulnerable to SLR. A 0.5 m rise in sea level in Alexandria, Egypt, could force 1.5 million of the city's population to leave their homes,[55] while a 1 m rise could directly impact 41.500 m^2 of territory and at least 37 million people across the region.[56]

2.5.5 Human health

Human health is likely to be impacted directly and indirectly by climate change. Heat-stress and vector borne, and water borne diseases could be detrimental to the health of the population.[57] Research by Pal and Eltahir, 2016, suggests that climate change could push temperatures in some regions of the Arabian Gulf beyond a threshold of human adaptability.[58] Decreases in water availability and food security caused by a changing climate could further impact human health.[59]

2.5.6 Gender aspects

Women are likely to suffer disproportionally from climate change, with increased maternal mortality associated to heat-stress, and gender-based violence in the aftermath of natural disasters or conflicts. If, as is common today, men in rural areas move to cities to seek paid employment when they lose their traditional livelihoods, rural women would be under pressure to take over their husbands' activities on top of their own daily activities. In the Republic of Yemen and in Sudan, daily activities for women and children include the necessity of traveling increasing distances to fetch potable water (e.g. up to 4 km in the West Kordofan state in Sudan).[60] This additional labour has forced girls in rural areas to drop out of schools.

2.5.7 Conflict

Particularly in fragile states, the convergence of conflict and climate change can create new forms of social vulnerability.[61] Because climate change acts on many fronts and one event can trigger a cascade of responses, many indirect and hard to predict consequences of climate change may occur. For instance, Al-Shabaab and the Islamic State of Iraq and Syria (ISIS), the terrorist organizations based in Somalia and Iraq respectively, were shown to recruit in regions where natural resources, increasingly impacted by climate change, can no longer support nature-based livelihoods such as agro-pastoralism.[62] In Somalia, resources like food and water are not only a basic need but also a source of power.[63] Food insecurity is thought to have contributed to the discontent that motivated recent socio-political upheavals in the region. Climate change with its direct impact on decreasing water and food security is feeding armed conflict.

2.6 Maladaptive practices

Many Arab countries have overlooked the strong nexus between poverty and poor management of natural resources. Sustainable environmental management can be considered the region's most serious long-term development challenge.[64] There has been little investment in maximizing the contribution of the region's scarce water towards increasing agricultural productivity, such as through water efficient irrigation methods and purchase of seeds for drought-resistant crops.

Agriculture absorbs more than 85 percent of the region's water. Intensive agriculture in some cases has accelerated groundwater depletion, especially in the Arabian Peninsula, and has increased agro-pollution and soil salinity. In fact, irrigation efficiency is low, at 30 percent to 45 percent.[65] Excessive and unsustainable pumping of often non-renewable groundwater resources, such as in the Arabian Peninsula, has also resulted in increases in the groundwater's salt content due to salt water intrusion.[66]

Compounding the issue of limited groundwater resources is the lack of permanent river systems (wadis) in the dry Arab

49 Colin P. Kelly, Shahrzad Mohtadib, Mark A. Canec, Richard Seagerc, and Yochanan Kushnir, Climate change in the Fertile Crescent and implications of the recent Syrian drought, PNAS, March 17, 2015, vol. 112, no. 11, pp. 3241–3246 (2015)

50 http://www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2010.206

51 ESCWA, UNICEF and United Nations Beirut: 2017, Arab Multi-dimensional Poverty Report. E/ESCWA/EDID/2017/2

52 OCHA Occasional Policy Briefing Series – No. 2, Climate Change and Humanitarian Action: Key Emerging Trends and Challenges, August 2009

53 Arab Human Development Report, Research Paper Series, Mapping of Climate Change Threats and Human Development Impacts in the Arab Region, Balgis Osman Elasha United Nations Development Programme Regional Bureau for Arab States

54 Climate Change in the Arab Region, United Nations Environment Programme, Issues brief for the Arab Sustainable Development Report, Regional Office for West Asia (UNEP/ROWA) (2015)

55 Verner, Dorte, Adaptation to a Changing Climate in the Arab Countries, MENA Development Report, World Bank 2012

56 Climate Change in the Arab Region, United Nations Environment Programme, Issues brief for the Arab Sustainable Development Report, Regional Office for West Asia (UNEP/ROWA) (2015)

57 Arab Human Development Report, Research Paper Series, Mapping of Climate Change Threats and Human Development Impacts in the Arab Region, Balgis Osman Elasha United Nations Development Programme Regional Bureau for Arab States

58 Jeremy S. Pal and Elfatih A. B. Eltahir. Future temperature in southwest Asia projected to exceed a threshold for human adaptability, Nature Climate Change, Vol 6, February 2016

59 Arab Human Development Report, Research Paper Series, Mapping of Climate Change Threats and Human Development Impacts in the Arab Region, Balgis Osman Elasha United Nations Development Programme Regional Bureau for Arab States

60 Field survey by SWC in West Kordofan, Sudan, 2015, Abu Zabad locality

61 http://www.undp.org/content/undp/en/home/blog/2016/10/12/The-nexus-of-climate-change-and-conflict-in-the-Arab-region.html

62 https://news.nationalgeographic.com/2017/11/climate-change-drought-drove-isis-terrorist-recruiting-iraq/

63 Igarapé Institute: Somalia: the Role of Climate Change in Recurring Violence Nov 2017

64 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

65 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League, entire paragraph

66 Maliva R., Missimer T. (2012) Non-Renewable Groundwater Resources. In: Arid Lands Water Evaluation and Management. Environmental Science and Engineering (Environmental Engineering). Springer, Berlin, Heidelberg

region, which, when subject to infrequent rainy periods, are characterized by disastrous floods with significant erosion. Limited water diversion infrastructure exists to reduce the impacts of floods and most water supply infrastructure is not climate-proofed. The number of people affected by flash floods has doubled over the past 10 years to 500,000 people across the region.[12] Extreme flooding such as in Yemen has led to the loss of productive land, the uprooting of fruit trees, the deaths of animals caught in floodwaters and the destruction of infrastructure such as irrigation facilities.

Furthermore, disaster risk reduction capacities in the region are extremely weak. Few drought and flood warnings are communicated to rural populations, and information on best practices to reduce their vulnerability to extreme events is not effectively relayed to rural communities. Hydro-meteorological equipment, such as rain and flow gauges and weather and climate stations are also very limited across most of the Arab region compared to most other parts of the world. Conflict in parts of the region disrupts both the collection and sharing of data, and existing data are often not digitized or publically available. The lack of data undermines informed decision-making. Additionally, although the region is at the fringes of the influence of different climate drivers from Europe, Asia and Africa, it remains poorly analyzed in peer-reviewed literature with respect to climate model performances.[67] Consequently, regional predictions are poor and National Hydro-Meteorological Services (NHMS) have limited information to support informed disaster risk management (DRM).

Additionally, knowledge transfer and extension service support mechanisms to promote sustainable land and water management are limited in availability. Viable and innovative region-specific agricultural techniques must be reviewed and identified. Consequently, small farmers in all Arab countries, particularly in the Maghreb, are experiencing reduced crop yields and lost outputs. Similarly, in the drought-prone arid and semi-arid Lands (ASALs), which account for much of the land types in Somalia, Sudan and Djibouti, pastoralists have become sedentary around water points because range resources are decreasing. This has led to over-exploitation of water points, changes in nomadic grazing patterns and an increase in the frequency of conflicts between farmers and pastoralists.

Over-exploitation of natural resources is another major concern. For instance, charcoal production has become a major source of income for 70 percent of poor and middle-income pastoralists in some areas of Somaliland, with resultant deforestation. Deforestation is often exacerbated by the lack of restrictions on grazing and biomass use. Additionally, many of the rural populations in the Arab region are actively destroying Hashab trees (Acacia senegal) to profit from the Gum arabic market.[68] Similarly, intensive fishing and pollution are exerting a mounting pressure on marine resources in the Arab region.[69]

2.7 Challenges for effective governance

Extreme climate conditions have created conflicts over scarce natural resources. For example, the impacts of climate variability on pastoral and nomadic groups in the semi-arid areas of Sudan are worsening and causing clashes between nomads and farmers. Clashes are worsening with climate change, because it has caused farmers to intensify continuous cultivation (limit fallow periods), expand land use, construct more fencing and abandon previous mutual interdependencies between cultivation and pastoralism (e.g., fertilization with manure, sharing of crop residues, animal transport of crops).[70]

Similarly, effective transboundary water management is becoming more challenging because precious and unpredictable flows from rivers and wadis traverse country boundaries. Also, water usage and data is not coordinated from upstream to downstream. Currently, countries have limited experience in sharing data other than through the support of external regional initiatives such as the Intergovernmental Authority on Development (IGAD).[71]

Climate change has also forced thousands within the region to leave climate-sensitive livelihoods and to move to the outskirts of major cities, contributing to greater urbanization. Farmers and pastoralists are leaving their livelihoods for insecure, ill-paid and temporary jobs, such as gold mining,[72] thereby increasing already high unemployment rates. Urban centres are expanding rapidly due to accelerating population growth and migrant influx. With cities, there is a growing lack of infrastructure to serve an increase in population.

Climate-induced stresses such as famine are also forcing many rural populations to find natural resources in neighbouring regions or countries. For instance, over one million Somalis live as refugees in the Horn of Africa and Yemen and 1.1 million remain inside Somalia as internally displaced persons (IDPs).[73] Similarly, climate refugees in Sudan are moving from the north to the south due to increasing desertification. The highest levels of food insecurity are registered in southern conflict areas: North and South Darfur, and parts of South Kordofan and Blue Nile states.[74] Conflicts have disrupted national and cross-border trade flows which otherwise support livelihoods and food security - a problem compounded by restrictions on commodity trading with South Sudan.

These challenges related to climate change are compounded by instability in the region. Arab Uprisings and ongoing conflicts in the region have created obstacles for effective governance. Within and among the countries of the Arab region, distracted governments have prevented countries from focusing efforts and financial resources on climate change adaptation planning.

67 Christensen, J.H., K. Krishna Kumar, E. Aldrian, S.-I. An, I.F.A. Cavalcanti, M. de Castro, W. Dong, P. Goswami, A. Hall, J.K. Kanyanga, A. Kitoh, J. Kossin, N.-C. Lau, J. Renwick, D.B. Stephenson, S.-P. Xie and T. Zhou, 2013: Climate Phenomena and their Relevance for Future Regional Climate Change. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA. Ch 14

68 Sudan's National Adaptation Programmes of Action

69 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

70 Feinstein/UNEP Study, 2013, Standing Wealth: Pastoralist Livestock Production and Local Livelihoods in Sudan

71 www.igad.int

72 Feinstein International Center, Tufts University and UNEP Study, Standing Wealth: Pastoralism Livestock Production and Local Livelihoods in Sudan, 2013

73 World Bank Interim Strategy Note for Somalia, 2014-2016 (World Bank, 2013)

74 United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League

Photo: UNDP

Photo: Tobin Jones/UN

3

Regional collaborations to build climate resilience

3.1. Regional Frameworks for Action

3.1.1 The League of Arab States

The League of Arab States (LAS) is an intergovernmental organization comprising 22 Arab States, 10 of which are located in North Africa and 12 in West Asia. The League of Arab States is an umbrella system which includes around 20 specialized Arab technical agencies, 13 specialized ministerial councils including the Council for Arab Ministers Responsible for Environment (CAMRE), which falls under overarching coordination mechanism of the LAS Economic and Social Council. CAMRE is the regional mechanism through which the council aims to facilitate and support cooperation between Arab countries in areas relating to the environment including setting regional strategies on climate change and DRR as elaborated further below. A new LAS Department of Sustainable Development and International Cooperation established in 2016 leads coordination for forging new partnerships to achieve the goals of such strategies.

The League of Arab States has been a strategic regional partner to UNDP for many years, with numerous initiatives being designed and implemented to address developmental challenges. UNDP is now collaborating with LAS to help develop capacities of member states in the region to implement the new Paris Agreement on Climate Change and achieve progress under SDG 13 on climate action. The Arab Water Council (AWC) and the Regional Center for Renewable Energy and Energy Efficiency (RCREEE) are among the regional entities affiliated to LAS with which UNDP also collaborates on regional initiatives related to climate change.

The League of Arab States recognizes the emerging challenge of climate change, and its nexus with development and SDG achievement in general, plus food and water insecurity as well as social vulnerability across the region. It has also recognized the emergence of climate change as a catalyst of conflict and displacement in the region. The League of Arab States aims to cooperate with the UN partners in the region to help coordinate and facilitate actions that ensure climate and disaster risks in the region do not exacerbate social vulnerability, with actions seen as opportunities to build resilience and stability in a region facing an unprecedented period of turmoil.

3.1.2 The Arab Framework Action Plan on Climate Change

The Arab Framework Action Plan on Climate Change (AFAPCC; 2010-2020) is a strategic regional climate policy framework developed by the LAS CAMRE, in partnership with UN agencies in 2009 with its goal to coordinate climate action in the Arab region. The Arab Framework Action Plan on Climate Change responds to the requirements for implementation of the Arab Ministerial Declaration on Climate Change in 2007, including its principles and objectives, which constitute the foundation for future action on climate change in the Arab region. The overall objective of AFAPCC is to strengthen capacities of LAS member states to take appropriate measures to address the urgent challenge of climate change and ensure climate-resilient development in the Arab region.

In its climate work, UNDP is aligned with AFAPCC by supporting interventions that: 1) reduce climate risks and strengthen readiness to combat the causes and impacts of climate change through mitigation and adaptation; 2) preserve natural and human resources to ensure better standards of living; and 3) ensure sustainable development in the Arab region.

Adaptation has been highlighted as the major priority for the Arab region under AFAPCC, with the poor being the most vulnerable to the dire impacts of climate change while having done little to cause its emergence. The United Nations Development Programme supports a range of adaptation measures highlighted by the AFAPCC that address climate change impacts across eleven sectors and cover cross-sectoral issues including climate financing, capacity building and awareness raising.

The sectors outlined for adaptation measures cover wide-ranging thematic areas including: water, land and biodiversity, agriculture and forests, human settlements, seas and coastal areas, health, energy, transport and industry. Disaster risk reduction is referred to and prioritized in the context of adaptation to climate change under AFAPCC including through EWS and adequate preparedness as mechanisms to manage climate induced disaster risk scenarios.

The United Nations Development Programme is supporting a range of priority measures to manage climate risks in the Arab region highlighted by AFAPCC including: mapping climate risks in the region, conducting integrated vulnerability assessments; developing cross-sectoral adaptation strategies; formulating implementation strategies for DRR and creating an enabling environment for regional action.

3.1.3 Arab Strategies for Sustainable Development and Water Security

In 2010, the Arab Ministerial Water Council (AMWC) launched the Arab Water Security Strategy 2010-2030. The strategy addresses future water challenges in order to achieve sustainable development in Arab countries. Some years later, the Arab Strategic Framework for Sustainable Development (ASFSD) was developed to address the key challenges faced by Arab countries in achieving sustainable development during the period 2015-2025. Most recently in 2016, the Cooperation Council for the Arab States of the Gulf (GCC) developed the Water Strategy and Implementation Plan 2016-2035. The strategy is founded on five strategic themes:

1. Development and sustainability of water resources;
2. Efficient and equitable water resources utilization;
3. Enhanced municipal water supply security;
4. Effective water governance and awareness; and
5. Economic efficiency and financial sustainability.

The strategy's vision is to establish a sustainable, efficient, equitable and secure water resources management systems in every GCC country. However, heavy subsidies of water services have prevailed in the region for decades and have led to water inefficiency, overuse and environmental degradation.[1] While water pricing has been advocated for a long time, it is seldom enacted.[2] The development of both the Arab Water Security Strategy and the GCC Unified Water Strategy represents a major milestone for the long and intricate path for coping with the water scarcity in the arid Arab countries.

1 AFED (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications

2 Ibid

Box 2: Arab Strategy for Disaster Risk Reduction

The specific purpose of the ASDRR is two-fold: 1) to outline a vision, strategic priorities and core areas of implementation for DRR in the Arab region; and 2) to enhance institutional and coordination mechanisms and monitoring arrangements to support the implementation of the strategy at the regional, national and local levels through the elaboration of a Programme of Action. The ASDRR strategy also responds to the commitments under related global frameworks including Hyogo Framework for Action. UNDP is aligned with the ASDRR by promoting projects that promote a substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries across the Arab region. The implementation of ASDRR strategy hinges on the role of key stakeholders, which include LAS, UN agencies, regional entities, national agencies, civil society organizations, and media.

3.1.4 The Arab Strategy for Disaster Risk Reduction

The Arab Strategy for Disaster Risk Reduction (ASDRR; 2020) is the commonly agreed regional framework to integrate DRR measures into development, while also helping to build regional, national and local capacities in DRR. The ASDRR strategy was adopted by the CAMRE in its 22nd session, which was held at the LAS from 19-20 December 2010. The development of the ASDRR was also supported by the United Nations Office for Disaster Risk Reduction (UNISDR) with contributions by specialized agencies, Arab technical organizations, the International Federation for Red Cross and Red Crescent Societies (IFRC), and the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR). The adoption of the ASDRR strategy was driven by the commitment made by LAS to promote integration of DRR measures into regional policies on sustainable development, CCA, and environment and disaster management.

3.2. Regional initiatives

3.2.1 The UNDP Arab Climate Resilience Initiative

The Arab Climate Resilience Initiative (ACRI; 2011-2017) was a regional initiative of the UNDP Regional Bureau for Arab States (RBAS), developed in coordination with regional and national partners. ACRI responded to growing climate risks in the Arab region.

As Arab leaders seek options to build resilience against climate risks, ACRI helped countries understand potential climate impacts, while also promoting integrated and cross-sectoral approaches for low-emission, climate resilient pathways. The Arab Climate Resilience Initiative focused its assistance on: 1) building knowledge related to climate change trends and priorities; 2) developing countries' capacities to access climate finance; 3) implementing strategic policies around priority areas such as water security, drought, and access to sustainable energy; and 4) establishing new partnerships to scale-up local actions for climate resilient development.

One key track of activities under ACRI was to convene policy dialogues on climate challenges and solutions in the region. ACRI convened policy decision-makers and climate negotiators from across the Arab region to deepen knowledge and strengthen preparedness of climate negotiators on the road to the Paris Agreement on Climate Change. It also helped convene partner dialogues with regional entities such as the Islamic Development Bank on ways to achieve the SDGs through low-carbon solutions. A series of side events were supported at annual climate COP gatherings including at COP18 on climate resilient food security, and at COP21 and COP22 on climate change, peace and security with the Islamic Development Bank, member states and bilateral donors.

The Arab Climate Resilience Initiative also provided catalytic support to project development. Four countries in the region – Djibouti, Egypt, Somalia and Sudan – were provided small grants to support the formulation of new project submissions to Green Climate Fund (GCF) on the theme of climate resilience. ACRI also supported the design of several new multi-country initiatives set to emerge as a regional platform to achieve the SDGs and Paris Agreement. These include a new initiative on the nexus of climate risk to SDG achievement, as elaborated further below, as well as new regional initiatives on climate change, peace and security, and sustainable energy solutions for communities displaced by conflict.

3.2.2. One UN Partnerships: The SDG Climate Nexus Facility

As a follow-up to the climate COP22 summit hosted in the Arab region in 2016, a SDG-Climate Nexus Facility is under establishment by UNDP in partnership with United Nations Environment Programme Finance Initiative (UNEP-FI), World Food Programme (WFP), World Meteorological Organization (WMO), UNISDR and regional partners LAS and the Arab Water Council (AWC).[3] Set to be launched in 2018, the facility will serve as a multi-country platform to support bottom-up local actions to achieve SDG 13 on climate action and the Paris Agreement in ways that bring clear co-benefits to SDGs on poverty reduction, food security, water access, inequality and land degradation, and addresses the role of climate action in achieving crisis prevention and recovery goals in areas affected by conflict. Specifically, it supports capacity development and country actions in four key areas:

1. Improving science and data on vulnerabilities to climate/disaster risks for decision-making;
2. Enhancing tools and technology for risk-informed development such as EWS;
3. Building leadership and governance capacities for taking climate action in a way that achieves broader development and crisis prevention/recovery goals; and
4. Catalyzing innovative green finance mechanisms to scale up climate finance for development and crisis prevention/recovery goals.

Most development policy making in the region remains focused on sectoral, linear approaches to decision-making that fail to engage the complexity of converging risks and challenges and fail to engage the benefits of a nexus approach. This is particularly the case in crisis contexts in the Arab region, where communities face convergent pressures from both climate change and conflict. While initiatives for climate and disaster resilience, land, water and food security, social empowerment, and peace and security all proceed in parallel, they each face gaps in achieving their individual aspired results, often owing to lack of means to address converging risks and cross-thematic issues that would be more in focus from a nexus approach.

The SDG Climate Nexus Facility will build bridges among development and humanitarian goals, actors and initiatives, and address multi-dimensional nature of risk in the region bringing forth added-value from synergies and complementarities. The facility will serve as a platform for joint programming between LAS, AWC and partner UN agencies to bring about a series of outcomes that exemplify UN system-wide approaches to resilience.

3.2.3 International Financial Institution Partnerships: UNDP and the Islamic Development Bank

The Islamic Development Bank Group (IDBG) has been a large provider of development assistance in the Arab region for more than 50 years. Its membership spans 57 countries across Africa, Asia and Arab regions, with support provided to various sectors of importance for climate resilience. Major areas of investments include agriculture and water security with an increasing focus on ways to make such investments climate resilient.

In 2016, UNDP and IDBG forged a new phase of partnership signing a new global Memorandum of Understanding to synergize efforts and collaborate on several strategic areas of work. Climate change is one key area. New cooperation

3 See Khoday K and Ekdahl O (2017) http://www.undp.org/content/undp/en/home/blog/2017/confronting-climate-change-as-an-accelerator-of-crisis.html and Khoday K and Hadad (2017) http://www.undp.org/content/undp/en/home/blog/2017/the-sdg-climate-nexus--un-partnerships-in-the-arab-region.html

is being developed between UNDP and IDBG to bring together UNDP's role as the UN's largest provider of grant assistance on climate change, with IDBGs role as a leading provider of concessional finance for poverty reduction and the SDGs.

The support of UNDP and IDBG under this initiative has one goal: supporting governments to achieve transformational change for risk-informed resilient development in agriculture, water, energy and infrastructure sectors, using NDC implementation as a medium to scale up investments in CCA with clear development benefits. Special focus will be support to member countries where poverty, food and water insecurity converge with growing levels of climate vulnerability. This is meant to bring together UNDP's bottom-up presence and experiences across the region building climate resilience, with IDBG's role as a provider of large-scale finance.

Photo: Albert Gonzalez Farran/UN

Photo: UNDP

Photo: Tobin Jones/UN

4

Country actions to build climate resilience

4.1 UNDP projects in the Arab region

UNDP is supporting eight CCA projects in the Arab region, benefiting approximately 42 million individuals in six countries. Additionally, UNDP has implemented in parallel numerous projects to develop capacities for reducing the risks of impacts from natural and climatic disasters in the Arab region, which also contribute to strengthening climate adaptation.

4.1.1 Climate change adaptation projects

The projects help local communities and ecosystems adapt to a diverse range of climate change-induced threats, from flash floods and storm surges to extreme drought. The projects can be categorized into two general themes:

1. Increasing the climate change resilience of agro-pastoralists/pastoralists; and
2. Increasing the resilience of coastal communities against SLR and erosion impacts.

Those in the first theme (Djibouti, Somalia, Sudan and Yemen) are contributing towards building the resilience of rural communities by mobilizing, capturing and diverting water resources, and by conducting on-the-farm and on-the-pasture training to facilitate sustainable land and water management. Projects in countries of the second theme (Egypt and Tunisia) are reinforcing capacities to implement sustainable coastal zone management by focusing on ecosystem-centric approaches for building resilience.

4.1.2 Disaster risk reduction projects

In addition to the GEF affiliated CCA projects in focus, UNDP has also supported countries in the Arab region in Disaster Risk Reduction and Recovery funded by UNDP and bilateral donors including Canada, EC, Iceland, Japan, Kuwait, Switzerland, and the US, with initiatives since 2005 valued at approximately US$151 million in grants. The projects help countries to:

- Develop policies and build institutional capacities in risk reduction and recovery
- Establish early warning systems and synergies with broader crisis prevention mechanisms
- Strengthen crisis preparedness, response and recovery mechanisms

The countries in the region supported include Djibouti, Egypt, Iraq, Jordan, Lebanon, Palestine, Somalia, Sudan and Tunisia. The projects help strengthen resilience of the most vulnerable populations to risks from climatic and natural hazards. They help build institutional capacities for risk reduction and recovery to strengthen early warning systems for monitoring and forecasting natural hazards for proactive decision-making and build urban resilience against meteorological hazards particularly floods and drought.

For example, support was provided to Djibouti in the aftermath of the 2011 drought disaster to help the Executive Secretariat for Risk and Disaster Management (SEGRC) to improve disaster preparedness and response coordination; establish early warning system for drought and flood hazards; develop contingency plans; expand weather, water and pastureland monitoring systems; and build community resilience to droughts and floods. In Somalia, UNDP support focused on assessment of 2016-2017 drought impacts and famine risks, putting in place immediate response measures, and helping establish a new Ministry for Humanitarian Affairs and Disaster Management to lead efforts to synergize prevention, response and recovery measures across climatic shocks and conflict impacts. Support also focused on improving institutional and technical capacities for managing multi-dimensional risks and on strengthening technical capacities for climate forecasting through early warning systems in the region of Somaliland.

In Egypt, the Information Decision Support Center (IDSC) in the Prime Minister's office was supported to develop a disaster and climate risk management system. Egypt was also supported to develop a National Strategy for Adaptation to Climate Change and Disaster Risk Reduction which defined the institutional roles, coordination mechanisms and partnership opportunities to promote climate and disaster risk management in Egypt. Early warning systems were also established across five governorates including Port Said, Cairo, Luxor and Alexandria. In Jordan support was provided to build urban resilience through building capacities to manage disaster and climate risks in an integrated manner. Support was provided to mainstream DRR and CCA into city local development strategies of Petra and Aqaba. Also, support was provided to the Petra Development and Tourism Region Authority (PDTRA) and the Aqaba Special Economic Zone Authority (ASEZA) to establish institutional systems, protocols and physical capacities for disaster risk management that accounts for climate risks.

In Iraq UNDP support has focused on establishing a national risk management council and improving early warning capacities for Mosul Dam collapse related flooding risks, in contexts of the conflict with the Islamic State and broader challenges in the post-conflict setting. The project also helps strengthen coordination among national stakeholders and emergency response agencies to facilitate timely evacuation and response, while helping to enhance community awareness on the involved hazards and risks, including preparedness measures to ensure safety of vulnerable cities and their inhabitants. In Lebanon UNDP supported establishment of a Disaster Risk Management Unit at the Prime Minister's Office, which has served as the National Focal Point for DRR. Also, Lebanon was helped to set up the National Emergency Operations Centre at the Governorate level as well as Sectoral Emergency Response Centers. The project also worked with a national task force to design a National Disaster Response Framework to improve multi-sectoral cooperation and coordination on DRR and disaster management. Support was also provided to help Lebanon conduct risk assessments for critical infrastructure such as in the water and power sectors at the sectoral and municipality levels.

4.1.3 Barriers for the region

The designs of the projects herein address several institutional, financial, technological and informational barriers that plague the region including:

Weak institutional capacities to address climate change across sectors: Institutional structures with a mandate to address climate change concerns are required to effectively coordinate efforts in the Arab region. This mandate, which is currently limited to one ministry per country, needs to be integrated across all relevant ministries such as environment, finance, agriculture, water, energy and foreign affairs. A multi-sectoral approach will facilitate the integration of climate change into development plans, annual budgets and policies.

Lack of transparent, cross-sectoral finance mechanisms to build climate resilience: In the Arab region, there are minimal fiscal incentives and direct financing mechanisms to support climate change resilience options. In the LDCs there is limited availability of funds at the national level to support adaptation actions, and communities often depend on humanitarian aid to buffer climate change induced risks. The lack of prioritization of climate change and resilience at national levels has also deterred the creation of an enabling environment for investment in adaptation and mitigation technologies and practices. Capacities must be built within institutions to access available climate-related financing mechanisms (GCF, GEF, AF), particularly from the private sector.[1] Transparent monitoring mechanisms are required to ensure that funds are spent effectively and to capture lessons learned to facilitate upscaling and replication of successful interventions.

Limited systematic observation and monitoring of climate variables: Weather forecasts and climate projections are currently constrained by insufficient monitoring of climate and

1 Private sector funds already significantly outnumber government funds that currently provide climate change financing (50 international public funds and 6,000 private equity funds)

weather variables, making regional climate predictions the poorest in the world as indicated by the AR5 report.[2] This has led to uninformed, ineffective decision-making with regards to implementing adaptation interventions to increase resilience.

Unsustainable water management, agricultural and pastoral production practices: Poor surface and groundwater mobilization have left agro-pastoral practices, already characterized by low productivity, underdeveloped in the context of emerging climate pressures. Options for forage growth to absorb shocks during severe drought periods are limited, as is the diversification of produce to spread risks across seasons. Also lacking is a knowledge transfer mechanism to improve awareness of adaptation technologies (e.g. rainwater harvesting) and water conservation practices among the rural population. The practice of tree removal for grazing and fuel wood further compounds productivity problems[3] by exacerbating the impacts of flash floods, such as soil erosion and desertification.

Poor awareness or understanding of effective measures to build resilience against climate change among national leaders and the public: A recent poll conducted by the Arab Forum for Environment and Development (AFED) showed that 84 percent of the Arab public believes that climate change poses a serious challenge to their countries. However, the same poll found education and awareness to be widely lacking despite being considered one of the most important measures for adapting to the effects of climate change.[4] The limited information and research that is currently available within the region has not been widely disseminated or has yet to be promoted among and tailored to the diverse communities in the countries of the Arab region. Opportunities and strategies for adaptation that have proven successful in other regions are not being exploited.

2 Christensen, J.H., K. Krishna Kumar, E. Aldrian, S.-I. An, I.F.A. Cavalcanti, M. de Castro, W. Dong, P. Goswami, A. Hall, J.K. Kanyanga, A. Kitoh, J. Kossin, N.-C. Lau, J. Renwick, D.B. Stephenson, S.-P. Xie and T. Zhou, 2013: Climate Phenomena and their Relevance for Future Regional Climate Change. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA. Ch 14

3 Deforestation is occurring at rates of 3% per year in Djibouti and 2.3% in Sudan

4 AFED, 2009. Arab Environment: Climate Change, Impact of Climate Change on Arab Countries. Beirut, Lebanon, p. xv

Box 3: Project design

All projects are designed to adhere to the following requirements:

- Support country ownership
- Provide sustainability
- Develop monitoring and evaluation (M&E) mechanisms
- Support replicability
- Promote cost-effectiveness
- Facilitate stakeholder involvement
- Ensure knowledge transfer and scalability
- Enable a multi-disciplinary approach
- Provide gender equality
- Offer complementarity with other projects and programs
- Maximize national, regional and local socio-economic and environmental benefits

4.2 Case Studies

Case study 1: REDUCING CLIMATE-RELATED VULNERABILITIES OF AGRO-PASTORALISTS LOCATED IN MOUNTAINOUS REGIONS OF DJIBOUTI

Project Title	Reducing climate-related vulnerability of the inhabitants of mountainous regions of Djibouti through institutional strengthening, smart water management and targeted investment
Implementing Partner	Ministry on Habitat, Urbanism and the Environment (MHUE)
Project Budget	US$5.4 million (GEF LDCF)
Period	2014-2018
Location	Select mountainous regions of Djibouti
Beneficiaries	Mountain villages of Adailou and Assamo

Project summary

Objective: To reduce climate-change vulnerabilities facing the inhabitants of mountainous regions of Djibouti through institutional strengthening, climate-smart water management and targeted investment.

Background: In Djibouti there is a need to develop approaches to build the resilience of farmers and pastoralists facing increasing rainfall variability, especially in upland regions where severe floods cause significant erosion and damage to livelihoods. The absence of a national climate change strategy and institutional mechanisms to promote cross-sectoral/cross-ministerial coordination and to mobilize funds hampers efforts to address long-term climate-related risks in rural regions. At regional and local levels, particularly in remote mountain regions, communities lack the financial, technical and informational resources needed to build their resilience to climate change as well as the knowledge of how to prepare for extreme weather impacts. Additionally, the rural mountain regions targeted by this initiative have no other major alternative livelihood options (such as industry or mining) besides migrating to the capital, Djibouti Ville, where the unemployment rate is already extremely high (approximately 60%).

Strategy: This project supports the reactivation of the National Climate Change Committee (NCCC) to coordinate cross-sectoral actions and to ensure effective use of resources and generation of co-benefits for activities supporting adaptation to climate change. At the regional (subnational) level, the project is developing targeted drought and flood preparedness plans and building capacity to support disaster risk management and reduction. At the local level, the project is reducing the vulnerability of rural mountain populations to climate change by mobilizing and storing surface and groundwater resources, diversifying livelihoods, enabling access to markets, and reducing erosion through reforestation and re-vegetation. Local-level activities are being facilitated by strong coordination with locally based NGOs/civil society organizations (CSOs.)

Specifically, the project aims to address the following key issues:

- Limited market access and opportunities to generate sufficient earnings and capital base to make livelihood systems more resilient to highly variable climate risks;
- Deforestation (3% annually) for fuel wood and grazing land leading to increased erosion during flooding and reduced water retention;
- Inadequate water management and storage;
- Limited linkages between agro-pastoralists and sustainable farming and grazing practices;
- Lacking hydro-meteorological monitoring equipment to inform decision-making on extreme events, provide warnings and improve regional weather forecasts and climate predictions.

Implementation: The strategy will be implemented through the following three project components:

1. Improving governance
2. Providing technical support and training
3. Building resilience on the ground

Innovative approaches of this project design include:

- Ensuring complementary and coordination of CCA activities by having the NCCC meet and communicate regularly with national and regional (e.g. IGAD) project operational focal points;
- Aligning CCA and DRM in the National climate change strategy particularly at the community level due to the recognized similarities in impacts and required measures required to address both;
- Promoting national capacities to use scarce public funds to collect, blend and channel appropriate private investment into its National Environment and Climate Change Fund to ensure CCA actions are prioritized and Government funds are earmarked specifically for adaptation without compromising other development priorities;
- Developing national dynamic modelling expertise to ensure adaptation is relevant, cost-effective and well-integrated into strategies across a range of sectors (e.g. Health, Finance, Economy, and Environment);
- Creating Catchment Management Committees to i) understand and manage catchment/sub-catchment scale watershed resources for effective flood control and drought management and to ensure sufficient potable and irrigation supplies for all communities; and ii) transfer water management best practices and water quality control methods to the community-based water point management committees (WPMCs), which will be concerned with managing their specific water points;
- Creating gabion construction cooperatives for livelihood diversification;
- Facilitating inter-community knowledge exchange on nursery development, reforestation and artisanal product marketing;
- Empowering locally based NGOs, (the Village Ecology Association in Adailou and the Agricultural Cooperative in Assamo) to support activity implementation through capacity building and project support.

Key results expected: Reactivation of the National Climate Change Committee; Development of a National Climate Change Strategy; Establishment of an Environment and Climate Change Fund; Construction of new water mobilisation infrastructure; Support to expand and strengthen agro-pastoralism and pastoralism in the Weima and Assamo watersheds; Reforestation and re-vegetation; Development of Catchment Management Committees and Water Point Management Committees; Support for women's livelihood diversification with the introduction of nurseries and training on fruit cultivation, Local NGOs/CSOs supported to assist with project implementation.

Main risks: Delays due to the lack of nationally-available expertise and human resources; Threats to investments by an unanticipated increase in the frequency of flood events and continued drought; Poor financial literacy and capacity to establish funds and financial instruments and to assess the costs and measures of different adaptation options on the part of institutions working in adaptation; Scepticism and unwillingness of targeted farmers and pastoralists to engage in poultry breeding, bee-keeping and gabion fabrication.

Main assumptions: Sufficient political support and capacity within the agencies dealing with adaptation for successful execution and implementation of the project; Interest on the part of relevant to fully integrate adaptation strategies into their long-term planning; Accuracy of initial hydrogeological studies and technical assessments in their predictions of water capture and storage capacities; One weather station in each project zone is sufficient to extend the weather and climate monitoring network to help with forecasts and previsions.

Alignment with national initiatives: National Programme for Food Security, National Programme of Action for the Environment (PANE) and National Action Programme to Combat Desertification (NAP), National Initiative for Social Development (l'Initiative Nationale de Developpement Sociale, 2008 – 2016), National Food Security Strategy, Djibouti National Programme for Food Security (Programme National de Securité Alimentaire), National Environmental Impact Assessment Procedures and Guidelines, 2009 Poverty Reduction Strategy Paper, Decree No. 2006-0192/Pr/Mid, Institutional Framework for Disaster Risk Management, Initial and Second National Communications.

Photo: Canal system feeding into covered reservoir outside of Adailou to serve agro-pastoralists; Chicken coup near Assamo. UNDP

Case study 2: IMPROVING THE RESILIENCE OF RURAL COMMUNITIES OF DJIBOUTI WITH SHADE GARDEN DEVELOPMENT

Project Title	Improving the resilience of rural communities of Djibouti to recurrent climate change induced droughts by developing agro-pastoral shade gardens as an adaptation strategy for poor rural communities
Implementing Partner	Ministry on Habitat, Urbanism and the Environment (MHUE)
Project Budget	US$4.66 million (AF)
Period	2012-2017
Location	Grand and Petit Bara
Beneficiaries	Local residents; pastoralists and agro-pastoralists; local cooperatives, including women groups; the Agence Djiboutienne de Développement Social (ADDS).

Project summary

Objective: To improve the resilience of poor, rural communities of Djibouti to recurrent climate change induced droughts by developing agro-pastoral shade gardens linked with microfinance provision as adaptation strategies.

Background: Over 51% of all extracted water in Djibouti is currently used for agriculture. However, the return value and generated productivity of agriculture in Djibouti remain low. Although it accounts for only a small part of rural livelihoods, agriculture plays an important role in diversifying sources of revenue and improving the health status of vulnerable groups and livestock, as well as the food security of agro-pastoralists. However, traditionally pastoral communities lack farming skills needed to maximize benefits of hybrid, agro-pastoral productive systems.

To facilitate shade garden development, pastoralists need credit schemes specifically geared towards their livelihoods. Pastoral communities have no real possibilities to build up assets and increase income to better absorb shocks and cope with sudden and slow-onset disasters, or with more complex emergencies that combine multiple inter-related disasters (food crises, malnutrition, disease outbreaks and human losses).

Strategy: This project supports a strategy to increase the resilience of rural communities by promoting the transition from pastoralism to a new and more resilient multi-functional practice of agro-pastoral shade gardening. It first seeks to use climate resilient water mobilization and management practices to improve and secure access to surface and groundwater as a key requisite for developing agro-pastoral systems that are highly resilient to increasing aridity. This water will then be used to develop family and community oasis-like shade gardens providing 1 ha plots for each family using date palms as tree cover to limit evaporation and create favourable microclimates for forage and vegetable growth, replicating the traditional practices imported by Yemeni populations in Djibouti centuries ago. Finally, these systems will be facilitated and stimulated during and beyond the project lifetime by developing adaptation microfinance (MF) services that provide suitable financial means and incentives for rural communities to accumulate capital in anticipation of climate shocks and diversify livelihoods.

Specifically, the project aims to address the following key issues:

- Lacking water sources and good quality forage due to climate;
- Need for water points and drought-resistant irrigation techniques to develop agro-pastoralism;
- Lacking knowledge on efficient and sustainable farming techniques (e.g., crop rotation, water and soil conservation methods);
- Current MF not suited to help low income households build and diversify assets and thereby expand their range of coping strategies.

Implementation: The strategy will be implemented through the following three project components:

1. Improving access to water
2. Development of locally managed shade garden plots
3. Expanding Microfinance opportunities through a three-tiered approach:

i. Safety net loans for small cooperatives
ii. Nanofinance loans
iii. Standard MF loans

Innovative approaches of this project design include:

- Progressive MF product development and assessment to ensure that the products are geared towards lending to activities, which assist the beneficiaries in adapting to climate change;
- Preparation of technical guides for each category of adaptation activities for which it is possible to obtain a loan (e.g., seed purchase, drip irrigation), including interest and repayment schedules for loans;
- Creation of community water management committees;
- Training of lead farmers capable of sharing best agro-pastoral practices; and
- Provisions of loans for adaptation activities to ensure environmental benefits that do not deplete natural resources and contribute to maladaptation. Principal categories of the loans include the following:
  - o Purchasing date palm varieties to establish multi-tier shade garden for fodder and vegetable production;
  - o Purchasing hybrid crop varieties which are resistant to salt and water stress;
  - o Purchasing drip irrigation material after accruing agricultural experience over the course of the project so that significant water resources can be conserved;
  - o Purchasing productive cows and goats which can withstand water stress so that a limited number of livestock will prevent land and vegetation degradation; and
  - o Developing a value chain of milk products to promote the diversification of livelihoods.

Key results expected: Development of capacities to mobilize and secure sustainable water resources in the face of climate change to agro-pastoral communities; Development of climate resilient agro-pastoral systems increasing forage production capacities, diversifying agricultural production and creating capacities for replication; Establishment of four agro-pastoral cooperatives; Organization of at least 300 agro-pastoralists in agro-pastoral cooperatives. Establishment of six sets of 38 pilot community-managed agro-pastoral shade garden plots (1 ha per family) benefiting 228 agro-pastoral families - approximately 2,800 people.

Main risks: Reluctance of farmers or pastoralists to engage in agro-pastoralist practices of shade gardens; Repeated drought; Delays in project implementation due to simultaneous construction works for complementary projects

Main assumptions: Sufficient water availability and quality as revealed by initial studies; Effective cooperation between executing institutions

Alignment with national initiatives: National Programme for Food Security, National Microfinance Policy 2012-2016, PANE and National Plan to Combat Desertification (PAN), the Comprehensive Africa Agriculture Development Programme (CAADP), National Initiative for Social Development (l'Initiative Nationale de Developpement Sociale, 2008 – 2016), National Food Security Strategy, Djibouti National Programme for Food Security (Programme National de Securité Alimentaire, National Environmental Impact Assessment Procedures and Guidelines, Initial and Second National Communications.

Photo: Example of solar panels used to power well pumps in Djibouti; Shade garden example. UNDP

Case study 3: DEVELOPING NATIONAL CAPACITIES FOR DISASTER RISK MANAGEMENT IN DJIBOUTI

In parallel to GEF funded CCA initiative above, UNDP also implemented in Djibouti DRR initiatives with support of bilateral donors. Djibouti faces moderate to high risks of drought, flooding and earthquakes. In the period 2006-2011, the Horn of Africa suffered the dramatic consequences of a climate-induced drought that caused severe human impacts including drastic loss of livelihoods, lives, famine, and displacement of tens of thousands. In Djibouti, the drought affected 164,000 people and added to an already fragile situation, with Djibouti hosting refugees and displaced communities from Eritrea, Somalia and Yemen. In response, UNDP with support of Japan initiated an initiative on 'National Capacities for Disaster Risk Management' to develop institutional capacities to manage risks from flash floods and prolonged drought, providing support to the Executive Secretariat for Risk and Disaster Management (SEGRC) at the Ministry of Interior for:

1. Improving disaster preparedness and response coordination;
2. Enhancing technical capacities of Government Ministries;
3. Establishing effective EWS for drought and flood hazards;
4. Developing contingency plans; and
5. Introducing community level good practices for drought and flood mitigation.

The project also strengthened the capacity of the relevant government agencies and ministries to coordinate and manage climate induced disaster risks more effectively, including through training on DRR and EWS. It helped activate regional councils for DRM coordination and deploy technical staff at the regional level to facilitate coordination and preparedness. Finally, the project supported expanding weather, water and pasture land monitoring systems by supplying technical equipment to the Djibouti Meteorology Service.

Following recent El Nino events in 2016-2017 and with risks from droughts, floods and other climatic disasters becoming more frequent and severe, UNDP is now working with the Government to develop new initiatives with bilateral support to further develop capacities for DRR and crisis recovery, including increasing alignment with overall fragility in Djibouti created by its role as a host to refugees and displaced communities from Eritrea, Somalia and Yemen.

Photo: UNDP Djibouti

Photo: UNDP Djibouti

Case study 4: ADAPTING TO RISKS OF CLIMATE CHANGE ASSOCIATED SEA-LEVEL RISE IN THE NILE DELTA THROUGH INTEGRATED COASTAL ZONE MANAGEMENT

Project Title	Adapting to risks of climate change associated sea-level rise in the Nile Delta through integrated coastal zone management
Implementing Partner	Ministry of Water Resources and Irrigation
Project Budget	US$4.51 million (GEF SCCF)
Period	2010-2014
Location	Egypt's northern coastal zone and Nile Delta: Damietta Port, Burullus Lagoon and the International Coastal Road
Beneficiaries	Farmers in the Nile Delta plain and national and city government institutions.

Project summary

Objective: To promote innovative adaptation strategies, technologies and financing options to address the additional risks posed by climate change on populations and key socio-economic sectors in Egypt's most vulnerable coastal areas.

Background: The low-lying Nile Delta with its large cities, industry, agriculture and tourism, is the dominant feature of Egypt's Northern Coastal Zone. The delta and the Nile Valley comprise 5.5% of the total area of Egypt, and approximately 25% of the country's population lives in the low elevation coastal zone (LECZ) areas. 30-40% of Egypt's agricultural production is in the Nile Delta and on the Mediterranean Coast, and half of the country's industrial production is concentrated in Alexandria, Damietta and Port Said. Coastal tourism represents 11.3% of GDP. The Nile Delta also supports aquaculture, which is the largest single source of fish in Egypt, accounting for over 50% of the country's total fish production, 98% of which is produced on privately owned farms.

Climate change is expected to increase coastal inundation and saline intrusion associated with SLR in this sensitive region, directly and critically impacting Egypt's entire economy. The Nile Delta's coastal lagoons, sometimes referred to as lakes, are key ecosystems that act as a protective zone for inland economic activities. Lake Manzala, Burullus, Idku and Maryut, however, are only separated from the Mediterranean by a 0.5-3 km stretch of land that is being impacted by erosion and sand dune destabilization.

Climate change is expected to produce varied impacts on the local lagoon population, which will be exacerbated by existing stresses including population growth, poverty and poor nutrition, accumulating levels of air, land and water pollution and ever-growing gender and class inequalities. Rising seas would destroy parts of the protective offshore sand belt, already weakened by reduced sediment flows following the construction of the Aswan Dam in 1964. In the coming decade and in the absence of adaptive action (Coastal Research Institute, 2009), 3.3% of total land area of the Nile Delta will be lost to the sea, including the submersion of approximately 16 km2 of valuable currently cultivated land.

To combat beach erosion and reduce shoaling processes in lakes and navigation channels, the Egyptian Shore Protection Authority has been focusing on the construction of 'hard' coastal protection structures including jetties, groins, seawalls and breakwaters. The total cost of the required activities was estimated at US$200 million (World Bank, 2005). Only a small fraction of these infrastructural solutions were implemented due to lack of financial resources and poor coordination across responsible entities, accelerating beach erosion. Even if fully implemented, these solutions would lead to more negative impacts such as sediment transport and blockage of waterways due to an improper understanding of longer-term coastal dynamics associated with climate change.

Special Note: The observed negative impacts of climate change in the Nile Delta area during project implementation have markedly increased the relevance of the project's objective and strategy. For the first time, high tides coupled with large storm surges flooded large areas including areas extending up to the International Coastal Road. Also, coastal erosion caused by SLR has affected near shore areas and respective populations.

Strategy: The project aimed to integrate SLR risk management into the development of Egypt's LECZ in the Nile Delta by i) Strengthening the regulatory framework and building institutional capacity to improve resilience of coastal settlements and development infrastructure; ii) Implementing innovative and environmentally friendly measures that facilitate and promote adaptation in the Nile Delta, and; iii) Establishing a monitoring and assessment framework and knowledge management systems on adaptation. It further aimed to minimize the likelihood of coastal disasters by using the most effective adaptation policy options including a combination of upgrading protection, managing subsidence, land use planning (focusing new development away from the floodplain) and (in the worst case) selective relocation away from vulnerable, existing city areas. Existing protection mechanisms were upgraded by introducing environmentally friendly 'soft' shoreline protection, as well as through modifications to the regulatory framework and institutional capacity to ensure sustainable land use planning and zoning that account for climate risks.

Specifically, the project aimed to address the following key issues:

- Soft integrated coastal zone management (ICZM) (see Section 3 for a description of ICZM) approaches alone had been determined to be infeasible and combatting high energy SLR impacts including erosion using soft approaches prioritizing the environment had been deemed unrealistic.
- Vitally important ecosystem services provided by Egypt's coastal lagoons threatened, including groundwater recharging, nutrient recycling, nutrient retention, water quality control, water flux control, erosion control, coastline stabilization, sediment retention, and storm protection.

Implementation: The strategy was implemented through the following three project components:

1. Strengthening the regulatory framework and building institutional capacity for ICZM
2. Financing measures to promote CCA
3. Knowledge management

Innovative approaches of this project design include:

- Internal capacity development within government agencies responsible for implementing ICZM policy and adaptation measures, as well as with stakeholders in local fishing and farming communities;
- Ensuring community ownership and buy-in by engaging and mobilizing local communities around the lagoons around the design and monitoring of on-the-ground 'soft' measures;
- Implicating farmers with a stake in protecting agricultural lands from future SLR, as well as fisherman whose current and future livelihoods are directly impacted by the lagoon ecosystem in monitoring the coastal adaptation measures.

Key results achieved:
The project has successfully piloted several low-cost dike systems to protect the international coastal road crossing the Nile Delta from storm surges. Stretches of three different types of dikes, each 250 meters long, were constructed along the beach to test their performance during storms: The first dike was formed from a geotube core covered by sand and local rocks. The second dike was constructed from a clay core covered with sand and vegetation. The third was based on the local, indigenous idea to construct fences from native plants to accumulate sand and form artificial sand dunes. The performance of the dikes was tested during 2017 winter storms. Based on their performance, a fourth model of dike system is now being piloted. A second soft engineering pilot involved the nourishment of eroded beaches. Dredged materials were recycled from a nearby Mediterranean port to nourish the eroded beaches.

All of these techniques are being showcased against other hard structure techniques to show their suitability and effectiveness for providing necessary protection at much lower costs. An economic feasibility study of using the dredged material is also being conducted. Most significantly, the government acknowledged the innovative work of these coastal protection structures and the need to expand their application in Egypt. The pilot sites are currently being visited by other developed and developing countries.

The project also completed the implementation of a National Observation System for monitoring relevant oceanographic parameters along the North Coast of Egypt to enable assessing the impacts of climate change with the collection and analysis of seal level and wave data. Trainings on coastal engineering, numerical modelling and dike construction have been successfully provided at the National Observation System.

Main risks: Unwillingness of appropriate ministries and agencies to engage with project staff for the creation of National Coastal Zone Management Committee; Insufficient technical capability of local stakeholders to implement adaptation measures on the ground; Reluctance on the part of government agencies to use "soft" shoreline protection strategies as an alternative to 'hard' infrastructure solutions.

Main assumptions: Commitment of local stakeholders to implement adaptation measures on the ground; Sufficient governmental support and engagement in the ICZM policy planning process; Sustained commitment by the government to coastal protection and willingness to improve current practices by introducing more innovative, environmentally friendly and cost-effective adaptation measures; Adaptation Learning Mechanism operational and effective in time to document best practices from the project.

Alignment with national initiatives: National Environmental Action Plan, National Coastal Zone Management Committee (NCZMC), Framework of ICZM, Egypt's First and Second National Communication to the UNFCCC.

Photo: UNDP Egypt

Case study 5: Enhancing Climate Change Adaptation in the North Coast and Nile Delta Regions in Egypt

Project Title	Enhancing Climate Change Adaptation in the North Coast of Egypt
Implementing Partner	Ministry of Water Resources and Irrigation
Project Budget	US$31.4 million (GCF)
Period	2018 - 2024
Location	Nile Delta: Port Said, Damietta, Beheira, Dakahlia, and Kafr El-Sheikh
Beneficiaries	Approximately 768,164 people along the coast and indirectly benefit 16.9 million people in urban/rural communities

Project summary

Objective: To reduce coastal flooding risks in Egypt's North Coast due to the combination of projected sea level rise and more frequent and intense extreme storm events.

Background: Coastal areas in the Nile Delta are especially vulnerable to climate variability and changes in sea level. Extreme events that result in increased sea level events, driven by the combination of high tides associated with sea level rise and surges, have led to devastating coastal flooding and millions of dollars in damages. The impacts, including the loss of life during coastal floods in Alexandria in 2015, as well as flood waters reaching and threatening to damage the international coastal road located hundreds of meters inland were significant. The rate of sea level rise for the Nile Delta ranges between 3.2 - 6.6mm/year and is due to three major factors; globally rising sea due to thermal ocean expansion; locally sinking land due to compaction of sediments; and loss of annual replenishment of sediments.

As of 2017, much of Egypt's population, industry, agriculture, private sector and tourism infrastructure and development is located along the northern low coastal lands, and the reliance on the Nile Delta for prime agricultural land is critically important to the country's economy. Studies on the vulnerability of Alexandria, indicated that sea level rise of 0.3m would lead to infrastructure damage worth billions of dollars, displacement of over half a million inhabitants, and a loss of about 70,000 jobs. Moreover, the Nile Delta's coastal lagoons are among the most productive natural systems in Egypt and they are internationally renowned for their abundant bird life. Approximately 60% of Egypt's annual fish catch are from three main Delta lagoons, Idku, Burullus and Manzalla, separated from the Mediterranean by 0.5- 3km sand belt and dune system. Coastal flooding and/or permanent inundation of these areas would lead to a decline in water quality in coastal freshwater lagoons and corresponding adverse impacts on fisheries and biodiversity.

Strategy: The project will directly contribute to safeguarding human development progress in the North Coast of Egypt through the installation of soft coastal protection measures along 69 km of high vulnerable coastline while also launching an integrated coastal zone management process that directly addresses climate change risks. The project approach combines concrete coastal protection investments, long-term integrated planning under climate change, capacity building, and data generation/management, thereby facilitating a paradigm shift to enhance climate resilience in highly vulnerable settings. The proposed project will facilitate transformational change in in the short-term by reducing coastal flooding threats along vulnerable hotspots in the Delta and in the long-term by integrating additional risks of climate change into coastal management and planning, budgeting and implementation of risk reduction measures.

Specifically, the project aims to address the following key issues:
- lack of high quality data to inform planning decisions;
- absence of a suitable framework for implementing integrated approaches to coastal adaptation;
- weak institutional coordination to build coastline resilience to sea level rise impacts;
- the significant reduction of dredge material that would otherwise be disposed into the marine environment; and
- low institutional capacity to anticipate and manage expected sea level rise impacts.

Implementation: The strategy will be implemented through the following two project outputs:

1. Output 1 includes the installation of 69 km of sand dune dikes along five (5) vulnerable hotspots within the Nile Delta that were identified during an engineering scoping assessment and technical feasibility study. This output will provide a "beneficial reuse" for existing maintenance dredged material from a number of local sources that are operating under existing Government of Egypt approvals.

2. Output 2 focuses on the development of an integrated coastal zone management (ICZM) plan for the entire North Coast, to manage long-term climate change risks and provide Egypt with adaptability to impending flood risks. The ICZM plan will provide benefits through capacity building to enable high resolution diagnosis of coastal threats, updated regulatory and institutional frameworks to account for sea level rise, and a coastal observation system for ongoing data collection/analysis.

Innovative approaches of this project design include:

- Mirroring natural coastal features and/or sand dunes to transform areas from high to low risk zones for coastal flooding.
- Stabilizing the sand dunes with a combination of rocks and local vegetation species to encourage dune growth by trapping and stabilizing blown sand.
- Reuse of existing dredge material that would otherwise be disposed into the marine environment.

Key results expected:

- Development of the ICZM Plan
- At least 17 million people who are in flood prone areas protected by soft coastal defenses
- At least 20 technical officers (men and women) trained on modeling and other skills associated with ICZM
- Set up of a National Coastal Observation System as a precursor to a EWS
- 69 km of vulnerable hotspots protected

Main risks: i) Implementing a new coastal planning framework within an existing planning context with sharply delineated lines of responsibility could create resistance, ii) Low skills and staff limitations could impede the monitoring and follow-up of implementation, iii) Extreme climatic events disrupt implementation or damages investments, resulting in delays and additional costs. Egypt is at increased risk of climate-related natural hazards, such as storm surges and flash floods which could impact implementation as well as long term sustainability of investments.

Main assumptions: i) There is no conflicts that will disrupt construction or supply chains required for materials both within Egypt and outside Egypt, ii) There is not a sudden and unexpected migration of people from other parts of Egypt, ii) There is political stability that allows for the review and adoption of the ICZM plan, iii) There is not turnover of staff beyond what is expected for natural reasons technical officers (men and women) trained on modelling and other skills associated with ICZM.

Alignment with national initiatives: The project is aligned with GoE's priorities as outlined in its Nationally Determined Contribution to the Paris Agreement and is line with Egypt's Country Work Programme, as submitted to the Green Climate Fund (GCF). Based on a request made to UNDP by the National Designated Authority (Egyptian Environmental Affairs Agency NDA; Coastal Research Institute (CoRI) and Shore Protection Authority (SPA)), the project is also a part of UNDP's Work Programme to the GCF and is aligned with Government's priorities to focus on as per the Country Programme Document, which outlines UNDP's foci in Egypt.

Photo: UNDP Egypt

Case study 6: Capacity building for crisis, disaster and risk management in Egypt

In addition to the above GEF and GCF-affiliated initiatives, UNDP also supported through its core resources crisis and disaster risk reduction initiatives in Egypt. Egypt is vulnerable to hydro-meteorological hazards including flooding and storms. UNDP has supported the government of Egypt in developing its disaster risk management system and strengthening its capacities to deal with disasters and climate risks. To help Egypt build resilience to the impacts of climate risks and disaster hazards, UNDP launched the project Capacity Building for Crisis, Disaster and Risk Management in Egypt 2007-2013 to support the Information Decision Support Center (IDSC) in the Prime Minister's office to develop a disaster and climate risk management system. An important contribution under the project was the design of the Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction in December 2011. The strategy defines the climate and disaster risks and the institutional roles, coordination mechanisms and partnership opportunities to promote climate and disaster risk management in Egypt. The IDSC serves as the national focal point for coordination for implementation of the strategy.

Also, under the project UNDP has supported the establishment of EWS in five governorates of Egypt, including Port Said, Cairo, Luxor and Alexandria. In this regard, Governorate Emergency Management Centers have been established or existing centers have been strengthened to enable them to receive timely early warnings about hazards and crises and act for preparedness and response. The centres have been provided with necessary equipment and information and communications technology (ICT) infrastructure. Warning and preparedness drills have been organized with participation of multiple stakeholders to respond to disasters. The project delivered substantial impacts in terms of the capacity of Egypt to take a proactive approach to de-risk its development results from the impacts of disaster risks including climate change.

Case study 7: Enhancing institutional capacities to reduce disaster risk and integrate climate change adaptation in Jordan

Flooding risks affect a number of areas in Jordan, including in the cities of Petra (Wadi Musa) and Aqaba. Flash floods have become more severe in recent years due to upstream deforestation and new construction on steep slopes of the wadis, and due also to the impacts of climate change. Aqaba is an economic free zone in Jordan, while Petra is an important historic site with significant attractions to tourists. Aqaba has attracted billions of dollars of investment for development of new infrastructure. Incorporating DRR and CCA into its development planning would therefore be necessary to ensure their sustainability. Petra is dealing with growing pressure from international tourists, increasing pressure on the region's natural resources and exacerbating the risks of disasters and climate impacts.

To address the vulnerability in these two cities, hubs of national tourism and trade facilities, and to build their resilience to growing climate and disaster risks, through support of the Switzerland, the UNDP project 'Enhancing Institutional Capacities to Reduce Disaster Risk and to Integrate Climate Change in the Hashemite Kingdom of Jordan 2011-2013', supported integrated approaches to maximize synergies between DRR and CCA for building resilient cities. The project helped Jordan to mainstream DRR and CCA into city local development strategies of Petra and Aqaba, and helped the Petra Development and Tourism Region Authority (PDTRA) and the Aqaba Special Economic Zone Authority (ASEZA) to establish institutional systems, protocols and physical capacities to manage risks from climate change and natural hazards.

In addition, the project helped design a DRR Mainstreaming Strategy to scale up local actions to manage disasters and climate risks in Aqaba and Petra, and catalyze the implementation of climatic disaster risk assessments and a flash flood EWS in Wadi Musa targeting local communities. The project has produced significant impacts by strengthening the capacities of two urban cities to manage risks from climate change and disasters more sustainably and building the resilience of local communities.

Photo: Salah Malkawi/UNDP

Photo: UNDP Lebanon

Case study 8: Developing disaster risk management capacities in Iraq

UNDP has been collaborating with the Government of Iraq on DRR since 2009 through the Project Developing Disaster Risk Management Capacities, which aims to improve the country's national disaster risk management capacities. The project provided technical support to the National Committee for Disaster Management through South-South cooperation (SSC), which helped Iraq to prepare its Disaster Risk Management Law. The project has focused on improving multi-sectoral coordination, information management systems and technical capacity development including through training. It is anticipated that the collapse of the Mosul Dam could put over 12 million people at risk, including inhabitants of many of the largest cities such as Mosul and Baghdad. Given the growing risk of the dam's collapse, which has increasingly become national and international concern, UNDP in partnership with the United States Agency for International Development (USAID), the Prime Minister's National Operations Centre, and the Iraqi Red Crescent Society have implemented initiatives including a comprehensive campaign to improve early warning capacities for Mosul Dam collapse related flooding risks.

The project further aimed to strengthen coordination among national stakeholders and emergency response agencies to facilitate timely evacuation and response, while also helping to enhance community awareness on the involved hazards and risks, including preparedness measures to ensure safety of vulnerable cities and their inhabitants. The project is now supporting most of the at-risk governorates to improve their capacities with regards to local level early warning, coordination, emergency response and community awareness. This initiative has had a significant impact at the national and governorate level through the improved flood preparedness, the provision of EWS, and the establishment of early warning networks for stakeholders and drills for flood warning and response.

Case study 9: Disaster risk reduction and management in Lebanon

Lebanon is vulnerable to several natural and climatic hazards including flooding, forest fires, earthquake, tsunamis and landslides. To address these vulnerabilities, UNDP has supported the Lebanese government since 2009 through the Project "Disaster Reduction and Management in Lebanon," which has developed national capacities on disaster risk management. The project provided support for risk analysis and technical and institutional capacities to strengthen disaster preparedness and enhance public awareness. To address institutional gaps in DRR and disaster management, the project helped to establish a Disaster Risk Management Unit at the Prime Minister's Office, which has served as the National Focal Point for DRR. The project has also facilitated the setup of the National Emergency Operations Centre at the Governorate level as well as Sectoral Emergency Response Centres. The project also worked with a national task force to design a National Disaster Response Framework to improve multi-sectoral cooperation and coordination on DRR and disaster management.

In addition, the project supported the National Council for Scientific Research (CNRS) through provision of equipment and training to improve national early warning capacities for enhanced management of related disaster risks including floods, forest fires and other natural hazards. The project also supported Lebanon to conduct risk assessments for critical infrastructure such as in the water and power sectors at the sectoral and municipality levels and further supported the development of sectoral strategies for DRR. Moreover, it facilitated multi-sectoral drills from national to municipal levels with the aim to improve emergency response in Lebanon in which the Prime Minister's office and national ministers participated. Additionally, the project implemented a national level public awareness campaign with the involvement of government agencies and through the schools, including a resilient cities campaign across 300 municipalities.

With Lebanon facing increased levels of fragility owing to its role as a major host of Syrian refugees, a new phase of the DRR cooperation project has been launched with support of EC and Kuwait to continue strengthening capacities for risk reduction and response mechanisms, including a special focus on reducing vulnerability of refugee host communities. Building on results over the past decade, UNDP is helping ensure stability and resilience of Lebanon to manage multi-dimensional risks and build community resilience. This will support the overall goals of the Regional Refugee and Resilience (3RP).

Case study 10: Enhancing capacities for disaster risk management in Palestine

The Occupied Palestinian Territories are highly vulnerable to hydro-meteorological hazards, namely flooding, drought and storms. With support of Iceland, UNDP supported the Palestinian Authority to strengthen capacities for improved disaster risk management through the project 'Resilience Against Natural Disasters'. The project supported activities related to disaster preparedness, education and awareness raising, transboundary cooperation, and integration of disaster and climate risk reduction into development strategies and urban planning.

Outputs included a national institutional assessment to identify key stakeholders concerned with disaster and climate risk management in Palestine, and national risk assessments to identify key risks and vulnerable areas, cities, infrastructure and population groups. The process fed into the design a National Disaster Risk Management Strategy, focused on hydro-metrological and climate related hazards such as flooding, droughts and storms. The National Disaster Risk Management Strategy helps de-risk development in Palestine and boosts the resilience of vulnerable populations, cities and economic assets already facing impacts and pressures from years of conflict.

Case study 11: Enhancing resilience and adaptive capacities of vulnerable Somali communities and ecosystems to climate change

Project Title	Enhancing resilience and adaptive capacities of vulnerable communities and ecosystems to climate change by integrating climate change risks into natural resource management and disaster preparedness efforts in Somalia
Implementing Partner	UNDP
Project Budget	US$8 million (GEF LDCF)
Period	2014-2018
Location	Somaliland (2 districts), Puntland (two districts), South Central (4 districts) [5]
Beneficiaries	Rural populations and relevant national and state agencies

Project summary

Objective: To enhance resilience and improve adaptive capacities of vulnerable Somali agro-pastoral communities and the ecosystems on which they depend, to the adverse impacts of climate change.

Background: As floods and droughts become more severe and frequent in Somalia, there is a need to find approaches to reduce the sensitivity of farmers and pastoralists to increasing rainfall variability. Somalia's ASALs, which make up more than 80% of the country's landmass, house the greatest national proportion of pastoralists in Africa, which make up approximately 70% of the population. Natural resource degradation is rampant throughout Somalia, most notably to produce charcoal, making Somalia increasingly vulnerable to conflicts over scarce resources and threatening the country's ecosystem services. The situation is aggravated by extreme weather and climate change impacts, most notably increasing spatial and temporal variability of the rainy and dry seasons, floods and droughts.

At the national level, climate change and resource scarcity are exacerbated by the absence of policies on land-use and DRM. At local levels, communities lack the financial, technical and informational resources to build their resilience to climate change as well as the knowledge to prepare for extreme weather impacts. In the absence of effective strategies to link natural resources management (NRM) with livelihood generation and job creation, Somalia's interlinked crises of unemployed youth, forced displacement, contested land, drought and natural resource depletion present a risk to the country's peaceful development.

Strategy: This project uses LDCF financing to support ministries, districts, NGOs and community-based organizations (CBOs) to integrate climate change risks into natural resource management and disaster preparedness efforts. It further provides support to institutionalize capacities to plan for climate risk management from national to local levels, reducing Somalia's dependency on humanitarian aid. CBOs are being revitalized to take the lead in implementing ecosystem-based flood preparedness and other adaptation measures at the community level. To support community-led activities, water will be captured using small-scale infrastructure. Flood impacts will be reduced with water diversion techniques and reforestation. With 73% of the population under 30 years of age, youth are being sensitised with climate change knowledge so that they can serve in understaffed ministries and support CBO efforts on the ground. Furthermore, the project is empowering women to market and to scale-up the distribution of adaptation technologies, providing women an improved asset base. The project aims to create a solid foundation for communities to have access to improved ecosystem services and to develop more climate-resilient livelihoods by mainstreaming CCA and NRM in Somalia's nascent national and community governance structures. Policy development will create an enabling environment for sustainable land management to combat the deleterious impacts caused by extensive deforestation and over-grazing. Women and youth will be empowered with climate change knowledge so that they can seize employment and business opportunities, and women will become agents of change, with the capacity to make decisions on the use, management and protection of natural resources.

Specifically, the project aims to address the following key issues:

- Lacking legal means to promote and enforce sustainable natural resource practices and an absence of strategies to link NRM with livelihoods;
- Limited budget to train technical personnel on adaptation and conservation actions;
- Loss of trained technical personnel from ministries to international NGOs or more lucrative positions abroad; [6]
- High youth joblessness and few opportunities for positive engagement, making them a ready pool of recruits for extremists (e.g., al Shabaab);
- Limited proactive community-based natural resource management and disaster preparedness;
- Lacking knowledge of effective rainwater harvesting techniques at the community level and efficient capture and storage of runoff during heavy rains for use during the dry season; and
- Inability of rural populations to practice sustainable rangeland/pasture management to ensure sufficient food and fodder supplies during periods of drought. [7]

Implementation: The strategy will be implemented through the following three project components:

1. Policy development and capacity building
2. Agro-Pastoral Field School Training
3. Revitalization of CBOs for integrated land and water management

Innovative approaches of this project design will include:

- Developing climate sensitive land use policies for all zones in Somalia;
- Developing a National Climate Change Policy to guide the selection of prioritized adaptation options and fund mobilization to upscale adaptation interventions;
- Creating climate monitoring/EWS centres in Somaliland and Puntland;
- Providing small grants to agro-pastoralists to implement small-scale community-based EbA and NRM measures such as construction of soil bunds and food storage facilities;
- Supporting Agro-Pastoral Field Schools to build rural capacities to have improved climate change sensitive farm and pastoral practices through a learning-by-doing training approach;
- Supporting the diversification of women's livelihoods by building their capacities to use and sell adaptation technologies;
- Mainstreaming climate change in university curricula to train technical graduates to train graduates to be able to effectively serve as a pool of qualified, skilled personnel to serve the understaffed ministries;
- Increasing employment opportunities for youth by building their technical expertise in climate change and natural resource management.

Key results expected: Policies, plans and tools reviewed, revised, developed, adopted and implemented by the government to mainstream and enhance adaptive capacity and mitigate the risks of climate change on vulnerable communities and critical ecosystem services; Development and joint management of EbA plans, NRM strategies and Integrated Water Management options for critical watersheds, rangelands, agricultural lands and forested areas by local governments and vulnerable communities at each location; Establishment of District Climate and Disaster Management Committees and DRR plans to address community vulnerabilities to climate change and facilitate response and preparedness plans to reduce identified risks; Development and piloting of physical techniques and adaptation measures including investment in medium and small-scale water infrastructure, reforestation, flood-control infrastructure, and watershed management to improve ecosystem resilience of critical watersheds, rangelands and forested areas; Strengthening of women's livelihood diversification with the introduction of adaptation technologies aimed to reduce dependence on dwindling natural resources.

Main risks: Little cooperation between executing institutions due to political divisions and the existence of regional states; Security risks, particularly clan-based conflicts over competing uses of natural resources; Poor forecasting capabilities due to limited climate monitoring; Lack of nationally-available expertise and human resources; Increase in the frequency of flood events and continued drought.

Main assumptions: Local communities sufficiently incentivized to implement climate resilience-building measures by increasing their awareness about climate change impacts; Protected reforestation and re-vegetation areas respected by local populations, including nomadic pastoralists, through increased awareness of their purpose; Sufficient political support and capacity within the agencies dealing with adaptation to successfully execute and implement the project; Sufficient incentive on the part of the Government of Somalia to earmark funds to support the environment and climate change.

Alignment with national initiatives: National Development Plan (2017 – 2019), Provisional Constitution, Article 25 on Environment (2012); Somali New Deal Compact,[8] Priority 3 for the Peace and State Building Goal 4 (PSG4) of the New Deal for Puntland and South Central as well as Priority 5 for Somaliland (2013); Somalia's Six Pillar Policy (2012); Somalia's Economic Recovery Plan (2014-2015); Somaliland's Vision 2030; Somaliland National Development Plan (2012-2016); Somaliland's Policy of Disaster Risk Management (2008); Somaliland Environment Strategic Plan and National Environment Policy (2011-2015); Somaliland Constitution: Article 18: The Environment and the Relief of Disaster; 5 Year Strategic Plan of Puntland State (2014 – 2018); Puntland Master plan for all Livelihood Sectors (2015 – 2030); Puntland Disaster Management Framework (2011).

Photo: UNDP Somalia

[5] Given the high vulnerability, coupled with the much larger land area of South-Central as compared to the other two zones, LDCF funds are supporting four of the eight districts in this zone
[6] Somalia Ministry of National Resources 2013. National Adaptation Programme of Action on Climate Change for Somalia (NAPA 2013)
[7] Ibid
[8] http://www.pbsbdialogue.org/The%20Somali%20Compact.pdf

Case study 12: Disaster risk reduction and recovery in Somalia

Recent years have seen a serious escalation of drought cycles, food insecurity and famine risk in Somalia and the greater Horn of Africa. The last famine in 2011 saw the loss of hundreds of thousands of lives, and since then approximately USD 4.5 billion has been spent on emergency responses. Shifting away from reactive to preventive measures is a key part of UNDP's support in recent years through DRR and recovery support to the government. The recent drought impacting Somalia left over 6 million people in need of humanitarian assistance, displacing close to 1 million people.

In response, UNDP supported immediate risk assessment and response measures in 2017, and in concert with sister UN agencies and IFIs provided technical assistance to develop an in-depth Drought Impact and Needs Assessment (DINA) and Resilience and Recovery Framework (RRF). Aligned to the National Disaster Management Policy, the DINA and RRF together now identify the root causes of the crisis affecting the country and set a new strategy for medium-term recovery and long-term resilience. The DINA elaborates the cumulative $3 billion of losses and damages expected as a result of the climatic disaster, while the RRF serves as a strategic basis for financing recovery with $1.75 billion of recovery needs elaborated.

UNDP is now working to develop the capacities of the new Ministry of Humanitarian Affairs and Disaster Risk Management to implement this new vision, with new UNDP initiatives set to emerge in partnership with sister UN agencies and IFIs. This will help Somalia implement the DINA findings and RRF, strengthen resilience to recurrent droughts, increase crisis response capacity, and enhance Somalia's ability to respond to climate change. The process brings together government and communities, including both Somalia's federal and state governments to work together for recovery and resilience.

Photo: UNDP Somalia

Photo: UNDP Somalia

Case study 13: Building climate resilience in the agriculture and water sectors by minimizing and reversing food insecurity in Sudan

Project Title	Building climate resilience in the agriculture and water sectors by minimizing and reversing food insecurity in Sudan
Implementing Partner	The Higher Council for Environment and Natural Resources
Project Budget	US$3.3 million (GEF-LDCF)
Period	2009-2013
Location	River Nile State, North Kardofan State, Gedarif State, and Southern Dafur State
Beneficiaries	National agencies involved in agriculture/pastoralism and rain-fed farmers and pastoralists. [9]

Project summary

Objective: To implement an urgent set of measures, in-line with the Sudan NAPA, that will minimize and reverse food insecurity and enhance adaptive capacities to climate change for small-scale farmers and pastoralists in 5 vulnerable regions.

Background: In Sudan's agriculture-based economy, food security is threatened by changes in temperature and rainfall patterns that could cause shifts in the precarious distribution of ecological zones in the productive capacity of rain-fed agriculture. Approximately 80% of Sudan's population is directly dependent on the natural environment for survival. Agriculture provides 90% of the raw material for local industries, and employment and income for more than 80% of the population. Roughly 90% of cultivated areas depend exclusively on rainfall, making quantity and distribution of rain a central determinant of crop success in Sudan, with fluctuations in crop yield attributed almost solely to fluctuations in rainfall. Likely impacts of climate change include desertification, decreasing annual rainfall, increasing rainfall variability, and increasing average annual temperatures, contributing to drought conditions in many areas, and threatening cultivation on approximately 6.6 million hectares of traditional rain-fed lands. Additionally, floods are causing increased erosion within the ecologically sensitive areas within farmland areas.

According to the Agriculture and Forestry Vulnerability Assessment, the humid agro-climatic zones that support agriculture will shift southward, rendering areas of the North increasingly unsuitable for agriculture. In 2030 and 2060, crop production is predicted to decline by between 15% and 62% for millet and between 29 and 71% for sorghum.

Strategy: This project targeted four states to reduce food insecurity through the implementation of locally driven adaptation strategies. New technologies, practices and approaches were introduced and generally adopted in all the project's target villages. In most villages, this included a complex package of forestry, traditional agricultural crops, new horticultural crops, water management and harvesting, livestock management, sustainable energy and training.

Specifically, the project aimed to address the following key issues:
- Decrease in available forest area and area under cultivation;
- Decline in crop and gum yield due to inappropriate farming and herding technologies/practices;
- Limited knowledge and experience in rainwater harvesting;
- Limited resilience of food production systems to extreme weather shocks.

Implementation: The strategy was implemented through the following three project components:
1. Implementation of pilot adaptation measures and small-scale water harvesting techniques
2. Capacity building for climate risk management in the agriculture sector.
3. Leveraging outputs and scaling them up nationally

Innovative approaches of this project design include:
- Reintroduction of a traditional financing method is the form of a revolving fund, a Sanduq, to increase the acceptance of adaptation interventions.
- Organization of Village Development Committees to engage local communities in decision-making, facilitating stakeholder project ownership.

Project outcomes:
- Under Component 3, the project produced the "NAPA Best Practices in Sudan Documentation Study," providing a good overview of many of the practices introduced by the Project and some of the impacts.
- In Gedaref and South Darfur government agencies demonstrated policy change;
- In South Darfur, 30 government extension workers worked full time and developed a strong understanding of adapting to climate change and extending this knowledge to communities. They supported successful initiative proliferation into other rural communities. Likewise, the many sub-contractors, involved in, for example tree planting or terracing, benefitted from on-the-job training provided under the project, and are now more capable. The government has also extended practices to new areas, and it has provided tractors and vehicles and other tools to upscale activities;
- In North Kordofan and Gadarif, the government developed an Action Plan for management of drylands during a

changing climate, and they established local laws restricting land-use to respect climate change;

- In North Kordofan and South Darfur, women became involved as village level decision-makers;
- In River Nile:
  - o 4000 men and 500 women benefitted from the introduction of cash crops on irrigated land thanks to the support of a revolving fund that provided cash support to purchase for diesel irrigation pumps. The pumps multiplied beneficiary incomes by several factors;
  - o 1220 feddan were converted to multi-cropping systems;
  - o The government provided 200 pumps, in addition to the 60 provided by the project;
  - o 705 women obtained gas stoves, thereby reducing time spent collecting wood, and conserving forest and improving health;
  - o 26 kms of shelterbelt were established to protect several villages from sand dune encroachment;
  - o Many families have benefitted from solar powered drinking water.
- In Gadarif State:
  - o The government expanded certain project approaches over 200,000 feddans;
  - o 200 women and 500 men benefited from improved water harvesting over 1,800 feddan;
  - o 90 women benefited from solar stoves;
  - o 1,000 men and 10,000 women benefitted from training;
  - o Many benefitted from improved rangelands (due to seed broadcasting), more resilient harvesting (due to use of early maturing seeds) and improved revenue (due to improve animal health and husbandry measures).

Key results expected: Greater food security and autonomy for rain-fed farmers. Over 21,000 local beneficiaries with some improvement in CCA, livelihood and/or food/security. Introduction of physical measures including borehole irrigation, rainfall and water catchment basins to enhance communal water storage systems and reduce vulnerability to water scarcity; Establishment of village level micro-finance institutions (e.g., revolving, risk absorption, livestock fund) in target communities to build adaptive capacity and livelihood resilience in Northern Kordofan State; Establishment of local leadership councils and/or Resource Users Association to facilitate stakeholder engagement and ownership of pilot adaptation interventions; Re-introduction of stress resistant rangeland seedling varieties, introduction of drought resistant varieties and integrated pest management techniques; National menu of best practices disseminated and mainstreamed into national development planning.

Main risks: The project did not result in a long-term commitment and strategy to address CCA for the vulnerable sectors in an integrated and effective manner; Local farmers and pastoralists did not see the benefit in engaging into the project or in uptaking innovative adaptation measures as established practices in their productive systems; There was poor institutional capacity and limited funding to sustain EWS.

Main assumptions: Local communities were willing to undertake adaptation measures and to modify their current farming and pastoralist practices; Local governments were supportive and engaged in the implementation process; Key target Ministries, extension services and other target organizations were willing to participate in project activities and to modify their policies and programmes in response to identified climate change risks.

Alignment with national initiatives: National food security policy, NAPA, 25-year Comprehensive National Strategies, Poverty Reduction Strategy, builds on the 2004 Comprehensive Peace Agreement, the Country Programme Docment 2009-2012, the 2008-2011 Agriculture Revival Plan (ARP), CPAP, and the Initial and Second National Communications to the UNFCCC.

Special note: The Village Development Committees and Revolving Funds continue to function after project termination. Due to the success of the technical committees (TCs) in helping to remove barriers and to create linkages between research, extension and farmers, they are being implicated in future projects in Sudan including the Climate Risk Finance project (described below). Technologies/practices most likely to be sustained include livestock feed improvement, gas cylinder adoption and use of improved crop varieties.

Type of input or support	Number of beneficiaries whose life - over the short term - has been significantly improved through the input/support	Number of beneficiaries whose life - over the short term - has been significantly improved through the input/support
	Male	Female
Agriculture and crop related (including horticulture)	5,041	3,349
Veterinary and livestock	4,311	2,999
Energy and alternative energy	7,244	11,574
Water and irrigation	3,528	2,736
Training	1,124	933

Table 2: Number of Beneficiaries by Gender and by Type of Input or Support

[9] One feddan equals 0.42 hectares.

Case study 13b: Implementing Priority Adaptation Measures to Build Resilience of rainfed farmer and pastoral communities of Sudan, especially women headed households to the adverse impacts of Climate Change

Project Title	Implementing Priority Adaptation Measures to Build Resilience of rainfed farmer and pastoral communities of Sudan, especially women headed households to the adverse impacts of Climate Change
Implementing Partner	The Higher Council for Environment and Natural Resources
Project Budget	US$ 2,800,000 (Foreign Affairs, Trade and Development Canada/GEF) US$ 130,454 (French Embassy, Khartoum)
Period	2013-2016
Location	River Nile, North Kordofan, Gedarif and South Darfur states
Beneficiaries	National agencies involved in agriculture/pastoralism and rain-fed farmers and pastoralists.

Project summary

The project is a follow up of the LDCF/NAPA Implementation Project (2010-14); to upscale best practices demonstrated by the first GEF/LDCF NAPA project. It was funded by the Foreign Affairs, Trade and Development of Canada (FATDC). The Sudan project is one of six projects that scale up or extend projects previously supported by the Global Environment Facility's Least Developed Countries Fund (GEF/LDCF) (the others are in Cambodia, Cabo Verde, Haiti, Mali and Niger). A Global Facility, known as the Canadian Climate Change Adaptation Facility (CCAF), was established by the UNDP to coordinate between these projects and to enhance knowledge production and sharing. The CCAF aims to strengthen climate-resilient approaches to agriculture and water management, with an emphasis on gender-sensitive approaches. In addition, a global component of the CCAF promotes south-south cooperation and enhances understanding about initiatives that address adaptation, especially gender dimensions. The facility therefore collects and analyses information, experiences, and lessons learned emanating from the six national projects to produce and disseminate knowledge that can be shared between the countries and usefully applied in other contexts. The CCAF also helps to broadly inform climate and sustainable development policies at the local, national and global levels, while promoting global exchange of information, experiences, and lessons learned.

The project targeted four critical agro-ecological zones to address the complexity of productive systems within Sudan. It also defined coping strategies that are being undermined by increasing climate variability and reoccurring hazards such as droughts.

The project introduced innovative adaptation measures to increase robustness and resilience of highly vulnerable rain fed farming and pastoralist systems to climate change risks, especially women headed households that are most resource deficient.

The project has aimed to achieve the following climate adaptation goals:

1. Improved yield and livelihoods of farmers and pastoralists using tested watershed-based water harvesting models and ground-water based small scale seasonal irrigation;

2. Adoption of improved and drought resilient crop varieties and animal breeds by communities through in-situ reintroduction of stress resistant breeds and crop varieties;

3. Improved rangeland and forest cover through reseeding, re-planting and use of sand stabilization measures;

4. Improved community-based ecosystem conservation practices through awareness campaigns, introduction of alternative household energy options and other land management & agronomic techniques;

5. Improved capacities of women groups in the face of climate change hazards;

6. Improved Government of Sudan food security policies that address critical social vulnerabilities which underpin resource-based conflicts being aggravated by human security conditions.

Project Outputs:
The project has maintained good progress in attaining the intended results by meeting the set targets. The target number of beneficiaries was reached by the project's various activities (4960 Households (HH), of which 2920 of them were women headed HH) In some states, the increase in the income of some farmers has increased by 400% by using tested water harvesting techniques and improved agricultural practices. Activities included the following:
- Improving access to reliable water sources;
- Introducing drought resistant varieties of animals and crops;

- Community mobilization and organization for the introduction of local drought resistant vegetable and fodder varieties;
- Community-based ecosystem conservation practices to strengthen food security measures;
- Community mobilization and organization for establishing shelterbelt plantations to protect the target farm plots form sand encroachment;
- Training of extension service personnel in the target states in designing new extension products and services on farming methods and drought resistant varieties;
- Organized farm demonstrations for successful agronomic measures and yield results from drought resistant crops;
- Building the capacities of the targeted communities to ensure the sustainability of the project activities;
- Training on measuring the impact of project results; (The International Institute for Environment and Development (IIED) presented their methodology of Tracking Adaptation for Measuring Development (TAMD) during the Global Exchange Workshop that was held in Sudan. Project teams had an opportunity to do a short hands-on exercise to see how TAMD can help measure the impact of their project.)
- Training on the Monitoring and Evaluation of concepts "Result Based Monitoring and Reporting" during which staff acquired skills in result-based reporting and capturing and documenting of good practices;
- Increasing the awareness of women groups in the area of increasing forest cover for combating desertification in the River Nile state villages; (Four training workshops were held in the four targeted villages to build the capacities of the women groups in CBOs organization and management.)
- Capturing, documenting and disseminating lessons learned and emerging best practices.

Emerging Lessons

• Building on indigenous knowledge and local skills guarantees community participation and responsiveness while ensuring sustainability: For example, the use of indigenous methods of boreholes construction or the distribution of climate resilient local breeds of goat /sheep helped ensure community buy-in of project interventions;

• Partnerships with local institutions can expedite implementation processes: For example, labour-demanding activities, such as micro-fencing and seedlings planting were facilitated in partnership with local institutions that were more experienced in mobilizing target communities.

Photo: UNDP Sudan

Case study 14: Increasing the climate resilience of rain-fed farming and pastoral communities with complementary micro-finance and weather-based index insurance services

Project Title	Increasing the climate resilience of rain-fed farming and pastoral communities with complementary micro-finance and weather-based index insurance services
Implementing Partner	The Higher Council for Environment and Natural Resources
Project Budget	US$5.7 million (GEF LDCF)
Period	2014-2018
Location	The 6 states of Kassala, White Nile, Nile State, Northern Kordofan, Gedarif, and Southern Darfur.
Beneficiaries	Rain-fed farmers and pastoralists and national agencies involved in agriculture/pastoralism, microfinance, and insurance.

Project summary

Objective: To increase the climate resilience of rain-fed farmer and pastoral communities in the regions of high rainfall variability in Sudan through climate risk financing.

Background: Approximately 80% of Sudan's population is directly dependent on smallholder rain-fed farmers and pastoralists, who are particularly vulnerable to climate change and are in desperate need of risk reduction measures. However, limited financial services are available to this high-risk population to provide them capital for resilient-building activities. Additionally, insurance companies have failed to provide coverage during extreme weather events.

Due to their vulnerability to extreme weather and climate risks, the productivity of rain-fed farmers and pastoralists is decreasing dramatically in Sudan. Extreme weather provoking floods and droughts has caused negative impacts on key socio-economic sectors including the loss of life, damage to property and infrastructure, and has limited food, energy (hydroelectric power) and potable water supplies. The drought in 2000 reduced food stocks and caused prices to rise three-fold (Zakieldeen, 2007).

All such climate-related risks are exacerbated by inappropriate agricultural practices, weak support services and an inefficient credit system.[10] The high-risk status of climate sensitive rain-fed farmers and pastoralists currently hinders their ability to access microfinance providers, which, lacking any incentive to serve this high-risk customer segment, do not cater to their specific needs. When they have access to financial services, smallholder rain-fed farmers and pastoralists (SRFP) borrow high interest rate loans with inflexible payment schedules. Furthermore, the insurance industry is currently incapable of covering the risks faced by SRFP.

Strategy: This project aims to improve national and decentralized capacities to provide a timely forecasting and EWS, as well to provide complementary microfinance and weather-based index insurance services for rain-fed farmers and pastoralists to improve their ability to manage and adapt to climate risks. Funds are being used to support the development of financial mechanisms to incentivize investments in CCA and risk reduction measures in six vulnerable agro-ecological regions of Sudan. They also support the development of efficient and robust collection and interpretation of weather/climate information for risk mapping, rainfall forecasting and drought early warning. Funds are being used to support the development of Sudan's first Weather Index Insurance products, which will be strategically combined with microfinance services supporting adaptation-oriented agricultural and livestock practices. By implicating the private insurance sector that is inherently incentivized to support extensive and reliable climate and weather monitoring to ensure low basis risk, targeted early warnings and seasonal forecasts will be improved in the long-term and SRFPs will have the support of basic insurance to cover the costs of damage when floods and droughts occur.

To ensure sustainability with these tasks, it is necessary to build the capacity of the national hydro-meteorological services to have the technical and operational capacity to maintain equipment and models over the long-term. Similarly, regulatory frameworks for financial services must be updated and capacities within the financial/insurance institutions must be built to target smallholder rain-fed farmers and pastoralists. Insurance products must be designed to address residual climate risk, while microfinance products must consider seasonal payment schedules and pastoral mobility.

Specifically, the project aims to address the following key issues:

- Limited monitoring makes it impossible to validate claims during or after floods and droughts;
- Poor forewarning capacities keep farmers and agro-pastoralists from adopting practices;
- The weak, inefficient credit system is not tailored to the needs of the SRFP;
- High risk status of SRFP limits their ability to access insurance and MF products;
- Existing insurance products are incapable of covering the climate-induced risks faced by SRFP.
- SRFP do not have the means to invest in climate-resilient production practices (e.g., rainwater harvesting) and have had trouble entering markets, have poor access to inputs and lack critical agricultural/livestock advisory- and ex-

tension services, keeping many families (especially single female headed households) in continuous cycles of poverty and food insecurity. [11]

Implementation: The strategy is being implemented through the following three project components:
1. Increasing infrastructure and capacity for climate observation and early warning
2. Developing weather-based Index Insurance
3. Disseminating MF services to facilitate the transfer of adaptation technologies

Special note: The role of MF in delivering index insurance is significant, either through the banks and their MF facilities or community funds – sanduqs. Without bundling insurance with credit, many farmers will lack the capital to pay the insurance premiums and the incentive to use scarce resources to buy risk coverage.

Innovative approaches of this project design include:
- Mandating the adoption of adaptation technologies with financial services;
- Facilitating the involvement of the private sector, e.g., insurance companies to fund the expansion of weather/climate monitoring networks to ensure lower basis risk;
- Designing and applying MF products geared towards rain-fed farmers and pastoralists that include flexible payment schedules and collateral requirements;
- Designing and piloting weather-index based insurance products that are suitable to the climate zones and farmer/pastoralist's economic and social livelihood characteristics;
- Leveraging revenue-generating weather/climate/agricultural advisories to ensure cost-recovery;
- Ensuring sustainability for weather-based index insurance (WII) by eliminating administrator fees to perform individual loss assessments through index insurance, and decreasing insurance and lending costs as adaptation-oriented inputs are adopted, increasing yields and the ability of SRFP to repay loans.
- Facilitating scaling-up of the MF-WII products, which will become cheaper as efficient value chains are established and insurance agencies gain experience in piloting and testing them.

Key results expected: Development of Sudan's first Weather Index-based Insurance Scheme; Institutional and technical capacity for climate observation, forecasting and early warning strengthened at national and local levels; At least 6 Weather Index-based Insurance products designed and introduced, covering at least 45,000 farmers and pastoralists who depend on rain-fed farming systems, including the creation of a nationally-based WII marketing and development team; At least 1 adaptation option/package developed in each state to inform and enable the provision of microfinance institution (MFI) credit packages; At least three micro-credit, flexible loan products designed and tested to account for pastoral mobility and income cycles of smallholder rain-fed farmers and pastoralists.

Main risks: Data sharing hindered by lack of coordination/willingness of agencies to share data or by technical constraints (e.g., bandwidth issues or local mobile telecommunication networks); Brain drain as trained, qualified engineers/technicians leave for more lucrative positions. Unavailability and limited sustainability of requisite human resources and technical/operational capacities; Damage to infrastructure by natural disasters; Scepticism of targeted farmers and pastoralists making them unwilling to engage in the index-insurance scheme and inability to pay for the product.

Main assumptions: Capacity for long-term planning and costing will be built in all information production agencies; Sufficient political support and will within relevant institutions to reinforce existing capacities for successful execution and implementation of the project; Durability of procured infrastructure, including training for repair and maintenance and provision of spare parts in each technical, information production agency; Experience and knowledge on the part of insurance companies to adopt and adapt the WII products to new crops and data due to their implication in the design; No delays for insurance compensation which could hinder following year's harvests; Willingness of reinsurance companies to back high-risk smallholder rain-fed farmers and pastoralists as experience from other projects has shown.

Alignment with national initiatives: Agricultural Revival Programme, Strategy for the Development and Expansion of the Microfinance Sector in Sudan, Sudan's Country Program Action Plan (CPAP, 2013-2016), Sudan's Five-Year National Development Plan (2012-2016), Sudan's Medium-Term Strategy, Comprehensive Peace Agreement (CPA), Darfur Peace Agreement (DPA), Twenty-Five Years National Strategy 2007-2031, Environment Protection Act 2001, Environment and Natural Resource Article 11, Decentralized System of Governance (Levels of Government, Article 24), the Organizational and Regulatory Framework for Microfinance Institutions (2008), Insurance Supervisory Act (2001), and the Initial and Second National Communications to the UNFCCC.

[10] Sudan Vision, An Independent Daily, 19 Sep 2013, article by Kidani, Alula Berhe

[11] http://www.cgap.org/blog/innovations-islamic-microfinance-small-farmers-sudan

Case study 15: National disaster risk management in Sudan

The disaster risk profile of Sudan is predominantly influenced by climatic factors, with exposure to hydro-meteorological hazards including floods, droughts, sand storms, pest attacks and desertification amongst others. Supported with UNDP resources, the National Disaster Risk Management Programme was launched in Sudan in 2013 to improve national capacities in disaster preparedness and loss and damage database management. The project worked at two levels to jointly address the climate and disaster risk management issues. At the higher level the project helped to draft a National Disaster Risk Management Strategy which focuses on both aspects of the risk spectrum. The project counterpart was the Ministry of Interior, however given the close synergies between CCA and DRR, the project worked very closely with the Ministry of Environment as well.

The project has delivered strategic results at the national level in Sudan which include strengthening the national EWS for natural hazards; and provision of significant support to the Sudan Meteorology Authority (SMA) in upgrading its hazard and climate monitoring infrastructure and technical capacities. The project helped to strengthen national multi-sectoral coordination for early warning through establishment of national level coordination system between the SMA and other disaster response stakeholders. At the city level, the project also supported the State Government of Khartoum to develop a State Disaster Risk Management Strategy to address the disaster risks that threaten the capital city of Khartoum. Given the predominantly climatic nature of the hazards that threaten Khartoum city, the strategy provided strategic framework to manage disaster and climate risks through an integrated manner. The project is expected to contribute to sustainable development in Sudan through addressing the vulnerability of poor people, while also reinforcing national and local capacities to manage development to become resilient climate and disaster risks.

Photo: UNDP Sudan

Photo: UNDP Sudan

Case study 16: Supporting Tunisia's most vulnerable coastal areas with innovative adaptation strategies, technologies and financing options

Project Title	Supporting Tunisia's most vulnerable coastal areas with innovative adaptation strategies, technologies and financing options
Implementing Partner	Ministry of Equipment, Land Planning and Sustainable Development, Coastal Protection and Planning Agency (APAL)
Project Budget	US$5.5 million (GEF SCCF)
Period	2014-2020
Location	Island of Djerba and the northeast coast of the Gulf of Tunis
Beneficiaries	Coastal populations, NGOs/CSOs, private tourism sector and national agencies involved with the environment.

Project summary

Objective: To promote innovative adaptation strategies, technologies and financing options to address the additional risks posed by climate change on populations and key socio-economic sectors in Tunisia's most vulnerable coastal areas.

Background: A recent global study by the World Bank identified Tunisia among seven of the most vulnerable coastal countries worldwide in terms of percentage of population exposed to SLR impacts. The country's coast is the backbone of its economy and the confluence of competing resource uses including tourism, fishing and agriculture. The combined effects of 10% intensification of storm surges and a 1m SLR are expected to highly impact Tunisia in terms of GDP, proportion of land area, urban land area, agricultural area, and exposed wetland. [12] Combined with climate change, pressure on water resources is projected to place catchment areas of Tunisia at very high levels of water stress, with the ratio of annual water withdrawals to annual renewable water resources estimated to exceed 80% by 2050. [13] The Coastal Protection and Planning Agency (APAL), which has been entrusted with responsibility to protect the coastal zone and the Maritime Public Domain, lacks the technical and operational capacities to implement activities in-line with the internationally accepted approach of ICZM (See Section 3.4).

Strategy: This project proposes a risk-based approach to CCA by enabling flexible adaptation pathways,[14] which will build resilience to climate change and provide maximum co-benefits. As tourism is a dominate source of revenue for the region, a set of economic instruments will be devised to identify existing risks and drive future hotel and private residence investment and development away from areas vulnerable to coastal erosion. Such an approach will make local development plans more risk-based and climate compatible. Both the public and private sectors will serve as important catalysts for adaptation interventions and in supporting coastal monitoring.

Specifically, the project aims to address the following key issues:
- Predominance of 'hard' techniques to protect adjacent infrastructure and land from erosion, leading to landscape degradation, accumulation of algae, eutrophication of waters within breakwaters, uneven redistribution of sediment, and aggressive erosion adjacent to longshore protection works;
- Exacerbated erosion impacts through ill-conceived human interventions along the coast, such as the reduction of protective dunes due to seaside development.

Implementation: The strategy will be implemented through the following three project components:
1. Leveraging ICZM and updating coastal development policies
2. Implementing replicable adaptation measures on the ground
3. Promoting upscaling of proven coastal adaptation measures

Innovative approaches of this project design include:
- Creation of a national ICZM platform;
- Application of soft, ecosystems-based measures such as coastal protection measures (e.g. dune and wetland restoration) and best water management practices (e.g. controlled extraction of groundwater reserves and wastewater re-use for irrigation);
- Development of M&E schemes for the soft coastal protection interventions;
- Development of a guidance package for ICZM for national/local authorities, tourism sector representatives and the Federation of Insurers on coastal risk mitigation options;
- Providing joint grants to hotels and NGOs/CSOs to implement soft coastal protection measures and incentivize shared management of the coast by public-private partnerships;
- Supporting women-run nurseries to provide local plant species for dune fixation;
- Pooling together existing nationally-based environmental funds into a consolidated National Environment Fund Management System (NEFMS) to have more collective bargaining power and attract continued capitalization;
- Developing a plan to attract international financing mechanisms to finance coastal adaptation projects on nation-

al and local levels;

- Providing training to relevant agencies on the Economics of Adaptation to be able to justify the costs and benefits of coastal adaptation measures;
- Development of a formalized partnership with the Green Economy Initiative to promote palmivelle production, which will create green jobs and potentially a green industry;[15]
- Introduction of a property insurance to incentivize development in low risk areas (i.e., development in areas not at high risk to storm surges, erosion, etc. will have lower premiums).

Key results expected: Strengthening of regulations and enforcement mechanisms governing coastal land use and environmental impact assessment (EIA) to include climate risks management requirements, with a particular focus on siting and construction of infrastructure and tourist facilities; Introduction of advanced coastal risk assessment and adaptation economics tools for planning to national and regional planning authorities and delivered to 200 key technical staff and decision makers; Introduction of shore protection practices and technologies to mitigate long-term risks from SLR in the region northwest of the Gulf of Tunis and on Djerba island, covering 22 km of coast and 670 hectares of wetland and benefiting 150,000 inhabitants; Implementation of improved water management and savings practices for coastal fresh aquifer resources in both project zones to prevent saltwater intrusion resulting from SLR; Design and introduction of coastal risk monitoring and early warning mechanisms focusing on SLR-induced erosion and urban flooding; Design and introduction of insurance and property development credits that provide effective risk sharing and risk reduction incentives in coastal built amongst 500 highly exposed businesses and households.

Main risks: Water and coastal management strategies may be made ineffective by an unanticipated increase in the frequency of flood events and drought, jeopardizing coastal protection and water conservation measures; Insufficient institutional engagement and coordination may prevent successful project delivery in the current transitional context in Tunisia; Insufficient financial literacy of NGOs/CSOs to manage small revolving funds or micro-grants for small-scale coastal adaptation projects.

Main assumptions: Sufficient incentive on the part of the Government of Tunisia to mobilize funds which can be effectively targeted towards coastal adaptation activities in a transparent manner with appropriate financial management; Sufficient technical capacity within APAL for successful execution and implementation of the project; Institutions have the will and ability to engage in long-term planning to mitigate potential coastal risks; Accuracy of initial coastal vulnerability studies and technical assessments in their predictions of coastal impacts.

Alignment with national initiatives: Tunisia's Initial and Second National Communications (INC, SNC) to the UNFCCC, 12th National Development Plan (2012-2014) and National Development Strategy (2012 –2016), Tunisia's priority on ICZM Protocol, 2010 National Climate Change Adaptation Strategy for the Tourism Sector, Regulation on the Maritime Public Domain (Law 95-72 of 24/07/1995) (Domaine Public Maritime, DPM), Law 2009-49: Coastal and marine protected areas, the Code for the Management of Land and Urban Areas (Law 94-1223; Law 2003-78), CATU and the Law (28/ 11/ 1994) on land-use and town planning, Urban Development Plan (Plan d'Aménagement Urbain, PAU), Regulations on Environmental Impact Assessment (Law 115 of 30/11/1992 and Law 2001-14 of 30/01/2001 and Decree No:91-362); RAMSAR, National Strategy on Climate Change (2011), National CC Adaptation Strategy for the Tourism Sector (2010), Strategy of Coastal Adaptation to Climate Change induced SLR (2008) and the National Coastal Adaptation Strategy (2011).

[12] Dasgupta, S. et al. 2007. The impact of Sea Level Rise on Developing Countries: A comparative analysis. World Bank Policy Research Paper 4136. Washington

[13] Milano et al., (2013) Current state of Mediterranean water resources and future trends under climatic and anthropogenic changes. Hydrological Sciences Journal, 58:3, 498-518, DOI: 10.1080/02626667.2013.774458

[14] Scotland's Centre of Expertise Connecting Climate Change Research and Policy, Flexible Adaptation Pathways 2012. www.climatexchange.org.uk

'Flexible adaptation pathways' is an approach to adaptation based on recognizing and addressing the long-term and uncertain nature of climate change by systematically adjusting adaptation strategies in response to new information and changing circumstances, in ways that are as efficient and transparent as possible. The approach is founded on a risk-based decision framework for acceptable and unacceptable levels of risk for different issues. Limits and decision criteria (triggers) for risks are defined. Alternative adaptation pathways for risks are also established should thresholds be approached. Flexible adaptation pathways incorporate low and no regrets actions, usually with the implication that these can be implemented now, whilst further research is conducted to enable informed flexible pathways to be established for longer-term aims.

[15] The Green Economy Initiative (GEI) aims to streamline the efficient use of natural resources, to contribute to the promotion of green employment and renewable energies, to promote low-carbon development and to support the development of eco-technologies to the National Strategy for the Green Economy (2016-2036)

Case study 17: Support to disaster risk reduction in Tunisia

UNDP partnerships for DRR in Tunisia began in 2013, through initial institutional and legal framework assessments and convening a national dialogue on DRR challenges and solutions. UNDP thereafter supported Tunisia to initiate a project on 'Support to Disaster Risk Reduction in Tunisia' to strengthen national capacities. This was coupled with support from UNDP's Arab Cities Disaster Resilience Project to help the municipality of Ain-Draham develop municipal systems and capacities for DRR. The initiative included provision of critical DRR support such as 1) conduct risk analysis and develop institutional systems; 2) carry out physical mitigation across critical public buildings; and 3) establish disaster response team.

To replicate the good practices of DRR implemented at the municipality of Ain-Draham, UNDP in collaboration with the UNISDR have launched a new phase of cooperation. The project 'Enhancing community resilience and human security of vulnerable communities in urban settings' focuses on urban risk assessment, urban planning for DRR and technical capacity development and community preparedness. The overall goal is to strengthen urban resilience against disaster risks across other vulnerable cities in Tunisia. The project is funded by the United Nations Trust Fund for Human Security (UNTFHS).

Photo: UNDP Tunisia

Photo: UNDP Tunisia

Case study 18: Integrating Water Harvesting Technologies to Enable Rural Yemeni Populations to Adapt to Climate Induced Water Shortage

Project Title	Integrating Water Harvesting Technologies to Enable Rural Yemeni Populations to Adapt to Climate Induced Water Shortage
Implementing Partner	National Water Resources Authority (Ministry of Water and Environment); Social Fund for Development, Ministry of Agriculture and Irrigation.
Project Budget	US$4.92 million (GEF LDCF)
Period	2014-2019
Location	Tihama,[16] Sana'a and Ibb (improved rainwater harvesting techniques on at least 5,000 hectares)
Beneficiaries	Rain-dependent farmers and pastoralists; rural and urban poor households in the Yemeni governorates of Ibb, Taiz, Sana'a, Dhamar, Raymah and Al Mahweet

Project summary

Objective: To enable vulnerable rural populations in Yemen to adapt to climate induced water shortages by re-introducing traditional and introducing innovative water harvesting techniques to improve water availability and by developing and supporting the enactment of a water management policy.

Background: Yemen may be the first Arab country to run out of water. Currently, research has shown that 70 - 80% of communal conflicts in Yemen result from water insecurity,[17] prompting Yemen to be described as the world's first "ecologically failed state".[18] Agriculture is the main source of employment for 55% of the country's inhabitants, contributing 20% to the country's GDP and consuming 93% of its surface and groundwater resources. The lucrative diversification from traditional crops to water-intensive qat, a narcotic, has enhanced groundwater depletion. With temperatures increasing 1.5 times faster than the global average[19] and rainfall predicted to become increasingly erratic, proper management of water resources is integral to the agricultural economy and the livelihoods of many Yemeni.

Because of water scarcity and inefficient water management practices, at least 10 million people, about 46% of total population, are now considered to be food insecure.[20] Insecurity has negatively affected trade and aid distribution, making access to food one of the most pressing concerns that many Yemenis face. Conflict also complicates an already dire degree of water scarcity.

Previous water management practices have supported sustainable development. For instance, spate irrigation systems – also known as 'large catchment water harvesting' – were developed by farmers adjacent to wadi channels to divert flood waters to agricultural areas.[21] However, since the 1980s, rain-fed agriculture and low-value crops such as wheat and sorghum could only offer relatively low wages compared to work opportunities in urban centres. Similarly, mechanized pumping, introduced to Yemen in the 1970s to facilitate the extraction of groundwater from wadi valleys and plains, contributed to the neglect of traditional spate irrigation systems. The constant availability of groundwater created a perception that it was limitless.

Strategy: The project will focus on developing the scientific knowledge base to support policy proposals and water basin management plans. It will support on-the-ground efforts to rehabilitate traditional water harvesting methods and introduce innovative ones, training local communities in their maintenance and construction, and promote awareness of the socio-economic benefits of water harvesting. In addition, it will promote efforts to increase agricultural water efficiency. If will further support the decentralization of water management by strengthening water user associations, and increase the capacity of the Social Fund for Development Engineering Unit.

Implementation: The strategy will be implemented through the following three project components:

1. Improving water security through capacity building;
2. Increasing water availability by financing on-the-ground water management measures; and
3. Supporting decentralized management of water harvesting systems.

Innovative approaches of this project design include:

- Stimulating community and private investment in water harvesting infrastructure through the introduction of a set of incentives to facilitate scaling-up, such as concessional micro-loans, community grants and employment guarantees for construction and maintenance of water harvesting infrastructure;
- Establishment of a knowledge management (KM) system for rainwater harvesting best practices for domestic and agricultural uses based on socio-economic baseline and monitoring surveys. The KM system will promote sustainability by addressing the risk of local communities being skeptical about the reliability of water harvesting to satisfy their water needs;
- Supporting water user associations (WUAs) to provide customer-oriented water distribution and seasonal rationing services for communal harvested water; and

- Reintroducing successful, traditional water harvesting techniques to ensure sustainability and buy-in from communities.

Key results expected: Development of technical capacities to integrate cost-effective water harvesting techniques at national and local institutions and in local WUAs; Increase of water availability in the intervention areas through introduction of on-the-ground rainwater harvesting measures; Development of decentralized and community-led water management systems to cope with long-term impacts of climate change on water availability; Positive effects on health[22] and income[23] due to greater water availability.

Main risks: Lack of maintenance of water harvesting interventions in agricultural lands due to limited funds or labour; Failure of financing schemes for rainwater harvesting technologies to be sustainable; Deterioration of rooftop and fog harvesting systems due to limited funds.

Main assumptions: Sustained maintenance of rainwater harvesting systems beyond project implementation thanks to increased awareness and capacity of local communities; Continual provision of extension services and training due to increased capacities of government technical staff; Mainstreaming of recommendations for updates to policies and strategies into development planning; Acceptance of integrated water resources management (IWRM) plans by decisions-makers and local communities; Sufficient allocated funds to rehabilitate targeted area of terraces.

Alignment with national initiatives: Yemen's Initial and Second National Communications to the UNFCCC, National Water Sector Strategy and Investment Programme, Social Fund for Development, Transitional Programme for Stabilization and Development (TPSD 2011–2015), Fourth Five-Year Developmental Plan (4th DPPR 2011–2015), Yemen's Water Law.

Photo: UNDP Yemen

[16] The Tihama is the coastal plain of Yemen
[17] Sipkin, S. 2010. Water conflict in Yemen: inventory of conflict and environment. Case Study 235. Available at: http://www1.american.edu/ted/ice/Yemen-Water.htm. Accessed on 11 December 2013
[18] Moore, S. 2011. Parchedness, politics and power: the state hydraulic in Yemen. Journal of Political Ecology 18: 38–50
[19] Zubrycki, K., Crawford, A., Hove, H., Parry, J-E. 2011. Review of current and planned adaptation action: North Africa. International Institute for Sustainable Development, Adaptation Partnership. Available at: http://www.adaptationpartnership.org/sites/default/files/North%20Africa%20Country%20Profiles%20(Yemen).pdf. Accessed on 2013-11-04.
[20] United Nations and League of Arab States 2013. The Arab Millennium Development Goals Report Facing Challenges and Looking Beyond 2015 League
[21] This technique consists of a stone barrier that is constructed partially or entirely across a wadi channel that redirects floodwaters and fertile sediment towards agricultural fields
[22] Al-Derwish, A., Dottrigde, J. 2013. Evaluation of user satisfaction or rural water supply in Yemen. Journal of Water, Sanitation and Hygiene for Development 03.3. p. 322–331
[23] Wiebelt, M., Breisinger, C., Ecker, O., Al-Riffai, P., Robertson R., Thiele, R., 2011 Climate Change and Floods in Yemen: Impacts on Food Security and Options for Adaptation. IFPRI Discussion Paper 01139. IFPRI Development Strategy and Governance Division

Photo: UNDP Somalia

5

Observations and lessons learned

The following section outlines and discusses successful interventions, innovative ideas, and lessons learned while implementing the interventions highlighted in this publication.

5.1 Policy enabling environments for adaptation

UNDP has been the leader in supporting countries to develop National Climate Change (NCC) Policies. Both Djibouti and Somalia have established NCC Policies under the LDCF. The policies streamline the coordination of climate change and disaster risk management-related programmes and projects and reinforce coherent on-the-ground programming. The NCC Policies act as over-arching, prominent policies that guide the current patchwork of sectoral policies related to the environment and have the capacity to identify and resolve transversal climate change issues. Similarly, within coastal regions, UNDP has shown that updates to coastal management policies to mandate more social and economic instruments such as property insurance and development credits can enable integration of sustainable adaptation measures such as deterring development on sensitive beaches.

5.2 Capacity building for locals on all levels

The first LDCF-financed project in Sudan demonstrated that capacity building of local professionals is crucial. In the case of this project, international experts did not effectively transfer knowledge from outside Sudan to the Sudanese experts at either national or state levels. This was viewed to be a large missed opportunity. Project implementation has demonstrated that capacity building from national down to local levels and allotment of sufficient funds for capacity building are essential elements to ensuring project sustainability.

5.3 Interlinking CCA and DRR

The Arab region is highly exposed to more frequent and severe droughts, with greater integration of climate adaptation and disaster risk reduction efforts a top priority for achieving resilience at national and community level. As seen in the projects above, UNDP has been successful in linking DRR and CCA in the Arab region. Integrating the nexus of DRR and CCA into development planning and risk management systems has been found to reinforce synergies and bring together capacities and resources across line ministries. This integrated approach will be key to achieving SDG 13, the Paris Agreement and Sendai Framework in integrated manner. Simultaneously, the projects have also focused on strengthening the capacities of governments to plan and implement recovery and adaptation processes and integrate climate information into disaster recovery efforts.

Resilient recovery from crisis is an important issue moving forward in the region. In many countries, infrastructure is being weakened by extensive damage resulting from both conflict and climatic disasters, while more frequent droughts have generated loss of livelihoods and mass displacement. Governments have typically not accounted for the costs and benefits of integrated approaches to CCA and DRR in major development investments or crisis recovery strategies. Infrastructure fragility is accentuated in crisis contexts in particular, where infrastructure standards are poor and social vulnerabilities are highest. The crisis recovery and reconstruction planning underway across the region is thus an important opportunity to mainstream integrated CCA-DRR approaches into new structures and systems. This can help achieve the goal of Building Back Better (BBB),[1] including better building standards during crisis recovery, and upgrading infrastructure with disaster resilient construction. A number of lessons learned include:

- Integrated, multi-dimensional risk assessments are instrumental tools to achieve the goal of integrating CCA and DRR into development and crisis recovery planning;
- An enhanced capacity of EWS for monitoring, and forecasting of hydro-meteorological hazards are important tools to improve national preparedness and response systems, and reduces climate induced disaster risks;
- Building community level capacities for early warning including EW volunteers (such as in the case of Somalia) is a recommended approach to obtain weather/climate data in remote areas;
- End-to-End EWS is the most effective approach for risk-informed decision-making processes and is composed of four inter-related components including: i) observation/forecasting, ii) impact analysis, iii) dissemination, iv) and action by local communities and other partners;
- Localized and community-based efforts that take an integrated CCA-DRR approach have been effective in reducing risks and impacts in rural and urban settings.

5.4 Project design

Due to the nature of the Arab region in being water scarce, numerous physical infrastructures to mobilize store and divert water resources are in the process of being constructed. In such cases, it has proven to be essential to include significant time and financing for initial, comprehensive, hydrogeological studies to determine the location and quantities of water and groundwater resources.[2] In Djibouti, these studies were demonstrated to provide the required data to drill in favorable zones for boreholes. However, it must be noted that shade gardens in Djibouti were most effectively implemented when shallow wells were used due to their rapid construction and water provision. Locating and drilling boreholes with sufficient capacities took in some cases up to several years before water could be exploited.

Furthermore, effective implementation of concrete adaptation infrastructure typically relied on local materials, traditional rainwater harvesting methodologies (due to low operation and maintenance costs) as well as local employment generation opportunities such as Cash for Work. In Somalia, it was found that engaging communities during all phases of project design helped in mitigating the risk of conflicts amongst clans and sub-clans.

In Sudan it was noted that the construction of living shelter belts to combat desertification must be on a large scale. Also, project development must emphasize the provision of sufficient funds for technical support. As shown in Sudan and in the case of water (such as the use of solar-powered pumps), forest, agriculture and land use management, each village required regular technical support to be able to master and fully adopt adaptation measures and technologies.

In all cases of water provision, project implementation has indicated that mobilization and diversion projects must consider the wider catchment using an Integrated Water Resources Management (IWRM) approach. Also, land acquisition/tenure issues must be addressed during design using a Social and Environment Management Plan to provide appropriate grievance mechanisms such as for resettlement. In the case of UNDP's portfolio of adaptation projects, Vulnerability and Adaptation (V&A) assessments were often conducted as a prerequisite to project design. The assessments indicated what enabling activities and adaptation measures were required as well as what areas should be targeted.[3]

5.5 Operation and maintenance (O&M)

To ensure sustainability with Operation and Maintenance (O&M) of water infrastructures, catchment-based Watershed Management Organizations and Water Point Management Committees are being successfully established and trained in Djibouti, Somalia and Sudan. As shown in Somalia, appropriate centralized and decentralized water management organizations are critical to ensure infrastructure is managed sustainably (e.g., ensuring maintenance of river banks and sufficient dredging of sediment). In Somalia, the central management organization coordinates with existing canal committees by establishing abstraction rules, coordinating canal operation and releases, and informing farmers on irrigation plans.

For effective O&M, the long-term target must be obtaining

1 GFDRR World Construction Conference 3, June 2017

2 As evidenced in Djibouti

3 UNDP Sudan, Building climate resilience in the agriculture and water sectors project. See Case Study 13


Photo: UNDP

sufficient maintenance revenues (via cost-recovery mechanisms) from water beneficiaries. This is particularly important in water scarce countries across the Arab region that requires water volume consumption to be regulated to promote the conservation of dwindling water resources.

5.6 Decentralization and implications of community-based organizations

Decentralization should be a key government policy across government administration.[4] In Sudan, state-level Technical Committees (TCs), consisting of representatives of the concerned technical government departments, local experts and community representatives were demonstrated to be effective in discussing technical issues, setting priorities, preparing work plans, resolving conflicts and supervising activities. Similarly, districts in Somalia are considered the main focal level because they have access to vast populations and their village development committees (VDCs). In Sudan, VDCs have been effective in initiating and managing forestry activities and in accessing gas stoves. In Somalia, as part of the first LDCF-financed project, local government authorities are creating District Development Frameworks (DDFs) that align district development with sustainable land, natural resource and water management.

Preliminary findings based on project evaluations also indicate that local Water User Associations (WUAs) work well in various Arab countries such as Somalia and Djibouti. Such committees are essential in distributing water according to traditional decision-making processes. They can also oversee collection of minimal tariff based-fees that provide incentives to ration water during periods of drought. Similarly, managing forestry by Village Development Committees (VDCs) has so far proven to be a promising approach to ensure that initiatives are backed by the local stakeholders.

5.7 Conducting cost-benefit analyses using economics of adaptation principles

In Djibouti, it has been shown that cost benefit analyses and analyses of internal rates of return are required to validate the sustainability of adaptation technologies/practices. Other Arab countries such as Tunisia are adopting this quantified approach to gain more support for adaptation across sectors such as land use planning, agriculture, livestock, water and energy.

5.8 Innovative best practices

UNDP has been supporting the application of innovative best water management practices such as sand dam and infiltration gallery construction in Somalia and Djibouti respectively. In Somalia, sand dams, or dykes that permit runoff to infiltrate through sandy river beds, have been demonstrated to be preferable over the traditional approach of storing water in small reservoirs. Such reservoirs are subject to evaporation and contamination. Sand dam implementation has shown to be an effective approach for sub-surface water collection. They are now being used by the communities during the dry seasons by digging wells. The sand dam has been awarded as a best practice by the government of Puntland and is being replicated by other development organizations, including projects funded by the World Bank. Similarly, rehabilitated berkads (water reservoir) in water scarce ASALs in Somalia have positively impacted the beneficiaries by restoring the spring water and giving them a sufficient water storage to survive during dry seasons.

In Djibouti, fog harvesting has also been proven to be an innovative technique to capture water moisture in humid, forest regions (e.g., Day forest). Developing best practice menus on sustainable agricultural/pastoral/NRM and coast-

4 UNDP Somalia, 15 April 2018, Project Implementation Review of the PIMS 5268 GEF-financed project: Enhancing Climate Resilience of the Vulnerable Communities and Ecosystems in Somalia


Photo: UNDP

al management approaches has facilitated the expansion of lessons learned.

For coastal adaptation, a combination of hard and soft approaches has been shown to protect coasts from SLR. In line with Integrated Coastal Zone Management (ICZM) principles, using hard and soft solutions while promoting a whole of systems approach to benefit entire ecosystems, has proven to be the preferred choice to protect coastlines based on quantitative cost-benefit analyses and monitoring of interventions. In Tunisia and Egypt, hard infrastructure designed outside the context of an ICZM Plan and without looking at minimizing physical impacts on the whole coastal zone led to the failure of accounting for natural sedimentation and flow processes. This led to significant problems with erosion, salinization and coastal flooding. In response, various 'soft' approaches are being implemented such as living shorelines, beach nourishment, vegetative buffers and dune rebuilding measures with native palm and posidonia grasses, with promising results. It should be noted that often in practicality, soft approaches alone were deemed infeasible because of severe erosion impacts.

5.9 Community revolving funds and microfinance

A LDCF-financed project in Sudan has indicated that a community-based revolving fund is functioning well. The revolving fund enables local farmers to purchase solar-powered irrigation pumps and gas cooking stoves. The cooking stoves have demonstrated significantly reduced pressure on biomass-based fuel and thereby reduce deforestation.

In Djibouti, a three-tiered system of microfinance enables adoption of adaptation technologies and improved seedlings for even the poorest. The poorest populations use a safety net type of financing, then nanofinance and ultimately micro-finance (MF) products. Through the support of a strong, existing MF institution, the progressive, adaptation-focused microfinance strategy is performing well.

5.10 Ensuring access to financial services in remote locations

The project in Sudan revealed the benefit of increasing access of rural populations to financial service providers (banks, MF institutions, and insurance companies). As part of the project, progressive microfinance structures (e.g., initially offering nanofinance) are being tested to provide loans targeted towards adaptation and tailored to the needs of small holder rain-fed farmers and pastoralists, such as Weather Index-based Insurance (WII) linked with MF products targeted to farmers and pastoralists to support compensation and the reduction of damages due to climate change.

In general terms, the risks associated with a changing climate and unstable markets discourage financial service


Photo: UNDP

providers from lending to farmers and livestock owners. Challenges are also geographic: rain-fed farmers/pastoralists often live in remote locations that are not serviced regularly by financial outlets, increasing both the cost of lending for MF institutions, and the cost of borrowing for farmers. For example, during the severe drought of 2000, the insurance industry experienced a 103 percent loss ratio in their livestock insurance scheme due to exorbitant rates of claims.

The UNDP-supported GEF project in Sudan has demonstrated that WII products combined with local MF services are key to ensuring that farmers are less financially at risk to climate change impacts. Insurance products are being designed to address residual climate risk, while existing microfinance products are being adapted to take seasonal payment schedules and pastoral mobility into account.

5.11 Promoting resilience through livelihood diversification

To build the resilience of rural populations to climate change impacts, projects support livelihood diversification and job creation schemes for women and youth. In Djibouti and Somalia, such schemes include gabion construction, nursery development, reforestation and artisanal production. The projects focus on empowering women, e.g. by training them on the value chain of adaptation technologies that are useful for household chores such as subsistence farming. In the case of Somalia, women have been very keen to participate in women-focused training events on integrative farming techniques, water management and the creation of small scale businesses on adaptive technologies. Similarly, youth are being empowered by updating university curricula to produce more technical graduates. In countries such as Somalia where the youth employment rate is close to 70 percent, it is expected that there will be increased employment opportunities for youth and subsequently less likelihood that educated graduates will succumb to precarious trades such as illegal charcoal sales and enlisting in terrorist groups such as Al-Shabaab.

5.12 Project Monitoring and Evaluation

An effective Monitoring and Evaluation (M&E) system is required to enhance the collection and dissemination of lessons learned, thereby improving knowledge management. In the case of Djibouti and Tunisia, CBOs were effective agents of collecting data and then re-transmitting this information to neighbouring communities to enhance scaling–up of activities. In Tunisia, coastal-based NGOs/CSOs are monitoring the progress of soft interventions to combat SLR. Similarly, farmers and fisherman who have a direct stake in protecting agricultural lands and lagoon ecosystems are being implicated. Furthermore, in Somalia, joint monitoring missions with locals and government officials were effective in forming partnerships and in transferring practical knowledge. These actions are aimed to support knowledge management and the proliferation of lessons learned.

Photo: Tobin Jones/UN

6

Way forward

This publication provides a pathway forward for the Arab region to support its farmers, fisherman and pastoralists, living in dry land, riverine and coastal regions and ecosystems in becoming more resilient to climate change. The convergence of climate risk and situations of conflict and displacement is rising to the top of the agenda globally and in many countries in the Arab region. As UNDP projects are being carried out to support rural populations, lessons learned are being documented. Unless action is taken (guided by this publication), such populations will greatly suffer from climate change, including through water scarcity, desertification, reduced agricultural productivity, food insecurity, seawater rise, inundation of fertile lands, erosion of coastal infrastructure and the loss of biodiversity. With scarcer natural resources in conjunction with young people's high unemployment rates in the Arab region, illegal armed groups having access to precious resources can gain positions of power.[1] This publication thus provides a key framework for future projects and programmes to be successful by building off the lessons learned, and best practices accrued by UNDP's extensive experiences in the Arab region.

1 Igarapé Institute: Somalia: the Role of Climate Change in Recurring Violence Nov 2017

Findings from this publication indicate that achieving the Millennium Development Goals (MDGs) was only a partial success with particularly limited results in the LDCs and crisis contexts. To expedite progress with the new SDGs in accordance with the successful interventions aforementioned, the following actions are recommended:

- Facilitating governance reforms for risk informed, climate resilient development such as by integrating principles of CCA, DRR, IWRM, NRM and ICZM with preferably integrated national strategies on climate change and disaster risk reduction;

- Reigniting growth in agriculture and pastoralism[2] by supporting extension services to guide sustainable practices and the adoption of adaptation technologies (e.g. rainwater harvesting);

- Promoting water use efficiency practices to improve agricultural and pastoral production;

- Strengthening national capacities to produce data (e.g., climate, weather, coastal);

- Monitoring progress of achievements by involving NGOs and CSOs;

- Promoting diversification of livelihoods for farmers and pastoralists (e.g., by enabling them to exploit natural resource-based value chains or to use adaptation technologies) to make them less susceptible to climate shocks;

- Increasing public and private investment to boost productivity and to reduce the impact of risks associated with climate change;

- Improving climate information data collection and analysis and the implementation of Early Warning Systems: and

- Identifying and incorporating the management of climate and disaster risks into all governance structures, policies, planning, and monitoring efforts.

Furthermore, more work is needed to ensure that gender disaggregated vulnerability is mainstreamed into development plans, trainings and in capacity assessments. Women must be perceived as key agents to adapt to climate change due to their dependence on natural resources. Local communities must also become empowered to participate in the incorporation of adaptation and disaster risk preparedness practices. Other multi-sectoral stakeholders including national planning and finance authorities, regional/local authorities, NGOs/CSOs and private sector representatives must be engaged in planning processes to inform efforts for the incorporation of adaption into national and sectoral plans as well as into poverty reduction and development strategies.

Lessons learned from completed and on-going projects compiled by UNDP are intended to act as guidance for future adaptation activities. Application of the successful interventions and innovative ideas highlighted in this publication are expected to increase the resilience of countries most vulnerable to climate change in the Arab region. They will also enhance the region's quest for food security if regional collaborations can be developed to share technologies that improve water use efficiency, and which can boost agricultural production.[3] The next critical step is planning and financing a coherent long-term coordinated approach for application of adaptation success stories.

UNDP is on the way to addressing a large-scale, coordinated and sustainable approach by requesting funds from the Green Climate Fund for the countries described herein. Most recently, UNDP has supported Egypt in accessing a US$31 million grant from the Green Climate Fund to protect agricultural areas near the coast, and the vulnerable communities that rely on them, and to help prevent the risk of displacement.[4] GCF and similar funds must be used efficiently and wisely in a transparent manner to gain support for the adaptation cause from outside investors, particularly the growing number of climate finance mechanisms provided by the private sector. More efforts and funds are also required to make climate change adaptation more pro-poor and rights-based.[5]

In doing so, through venues such as the regional events during the annual climate COPs and with guidance from the League of Arab States and its Council of Arab Ministers Responsible for the Environment, future CCA programming for the Arab region can exemplify how best to manage the growing problem of climate change in an all-inclusive manner that benefits those in poverty and contributes to a resilient recovery from crisis. Achieving the ambition of the SDGs, Paris Agreement and Sendai Framework will require increased efforts to ensure that climate action is implemented at an accelerated pace and scale that it is closely connected to the state of fragility and crisis.

2 Since poverty rates are higher in rural areas, and agriculture and pastoralism are still major employers

3 According to the Arab Multi-dimensional Poverty Report. E/ESCWA/EDID/2017/2 (ESCWA, UNICEF and United Nations Beirut: 2017), Environmentally-friendly technologies can improve water-use efficiency in agriculture by 15 to 30 percent, which could boost agricultural production, increase farmer's income and conserve non-renewable groundwater.

4 Cushman, J.H., 12 Jan 2018. Inside Climate News. 1.5 Degrees Warming and the Search for Climate Justice for the Poor and Khoday K and Knox J (2017) http://www.undp.org/content/undp/en/home/blog/2017/unequal-protection--climate-change-and-the-acceleration-of-globa0.html

5 The International Policy Centre for Inclusive Growth, Khoday, K. 2017. Social protection after the Arab Spring. Volume 14, Issue No. 3 December.

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7 Conclusion

The Arab region encompasses populations heavily dependent on climate sensitive, subsistence farming, fishing and pastoralism. Many of the economic activities are in flood-prone river or coastal zones or in Arid and Semi-Arid Land (ASAL) drought-prone areas. In such regions vulnerable to climate change, there is a strong link between poverty and poor management of natural resources. For instance, Yemen is close to a national water shortage due to over-pumping of groundwater resources to support the water intensive cultivation of the narcotic, qat. At the time of writing this publication over 2.7 million people across Somalia are expected to face crisis and emergency food shortages through June 2018 due to an inability to prepare for and adapt to consecutive seasons of poor rainfall.[1] It is thus undeniable that urgent, broad-scale coherent action is required to increase the resilience of the millions of livelihoods in Arab states at extreme risk to the impacts of climate change.

1 FSNAU and FEWSNET (USAID) (2017). Somalia Food Security Outlook Feb – Sep 2018 Technical Release Available at: https://www.fews.net/somalia Accessed 29 March 2018.

In response, UNDP has made great efforts to support national priorities and to attract climate financing to address expected climate change impacts. Projects financed by the GEF and the AF have been designed to address the AFAPCC and its goal to focus on the adaptation process as a priority due to the fragility of ecosystems in the Arab region. The projects also address recommendations from Climate Vulnerability Forum for Middle East and North Africa (MENA) countries held in May 2015.[2] Furthermore, the projects aim to support the Arab region in achieving the SDGs, and in adhering to the Paris Agreement and the Sendai Framework for Disaster Risk Reduction.

From extensive experience in developing and implementing these projects, this publication highlights the efforts undertaken by specific countries of the region and extracts key lessons learned to facilitate the development of future adaptation and DRR projects and programmes. Synopses of each project outline the barriers, major risks/assumptions and innovative methods to support adaptation. Three groups of projects are being supported by UNDP and have been designed to address the specific climate resilience building needs for the region. They include:

1. Assistance for agro-pastoralists/pastoralists to become more resilient to climate change including with water mobilization schemes such as rainwater harvesting and more sustainable agro-pastoral practices;

2. Support for coastal communities to become more resilient to SLR and erosion impacts; and

3. More integrated approaches to achieve CCA and DRR goals at the local level, including within crisis response and recovery processes in the Arab region.

According to analyses of the capacities of the countries discussed herein, it is first and foremost evident that it is critical to develop, update and enforce national and local policies centered on sustainable development (such as land and water use strategies) to improve the numerous livelihoods dependent on dwindling natural resources in the Arab region. In response, with the support of UNDP, many countries (such as Djibouti and Somalia) have taken the lead to develop national climate change policies or strategies and others integrated climate change/DRR strategies (Egypt, Jordan, Lebanon and Tunisia). The strategies are designed to address the current patchwork of environmental regulations and to provide an overarching framework for coherent adaptation and DRR programming.[3]

The national climate change policies and new (or updates to existing) land policies aim to improve ecosystems, combat deforestation and over-grazing while mainstreaming NRM and CC into national development plans. DRM policies, plans and updates are also being implemented to address the region's poor capacities to prepare for disasters and extreme weather events. This includes supporting countries such as Djibouti, Somalia and Sudan to establish DRM units, to procure climate and weather stations, and to establish climate monitoring and early warning centres.

Similarly, a plethora of national environmental funds have been consolidated to increase their bargaining power in Tunisia and Djibouti (e.g., in an Environmental Fund Management System). Capacities are also being built within appropriate national and regional institutions to seek climate financing from both the public and private sector to ensure activity upscaling after project termination.[4]

Extension services are also being supported to provide technical guidance on sustainable farming and herding practices, rainwater harvesting, as well as the use of drought resistant crops, improved seeds, micro-scale irrigation and multi-cropping systems. Farmer and Pastoral Field School approaches are being used to increase the uptake of adaptation technologies and to provide agricultural/livestock advisories. Similarly, to ensure project memory, NGOs/CSOs are being reactivated and supported financially and technically with small grants to implement activities (e.g., for soil bund and food storage construction).

In summary, some innovative methods being successfully tested in the projects include:

1. Developing weather index insurance linked with microfinance products targeted to farmers and pastoralists to support compensation and the reduction of damages due to climate change;

2. Conducting cost benefit analyses using economics of adaptation principles;

3. Testing new water mobilization methods such as infiltration galleries and fog harvesting;

4. Supporting community revolving funds for irrigation pumps and gas stoves;

5. Creating Village Development Committees (VDCs) to manage forestry and Water User Associations (WUAs) to manage water resources on local levels; and

6. Developing best practice menus on sustainable agricultural/pastoral/NRM and coastal management approaches to facilitate expansion of lessons learned.

Lessons learned have been collated from all the projects due to effective M&E mechanisms. The lessons address better approaches for:

1. Establishing enabling environments;

2. Promoting sustainable and participative project design;

3. Applying best operation and maintenance principles; Decentralizing management and facilitating community involvement;

4. Application of best, innovative and cost-effective adaptation and DRR approaches; and

5. Catalyzing cost-recovery and finance recycling mechanisms.

2 http://www.thecvf.org/mena-countries-agree-14-points-to-tackle-climate-change/

3 According to the Joint National Action Plan (JNAP) in the Pacific, 2013, there is increasing recognition that CCA and DRM must be aligned, particularly at the community level. Both CCA and DRM have recognized similarities in impacts and effects, and there is an overlap in measures required to address both

4 UNDP Sep 2011. Blending Climate Finance Through National Climate Funds A Guidebook for the Design and Establishment of National Funds to Achieve Climate Change Priorities

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References

Abu Dhabi Global Environment Data Initiative (AGEDI), National Centre for Atmospheric Research (NCAR) and the Climate Change Research Group (CCRG) (2015). Regional Atmospheric Modeling. Policymaker Summary for AGEDI's Local, National, and Regional Climate Change Programme.

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.. Available at: http://www.climatechange2013.org/report/full-report/. (Accessed 17 March 2018).

Al-Derwish, A., Dottridge, J. (2013). Evaluation of user satisfaction or rural water supply in Yemen. Journal of Water, Sanitation and Hygiene for Development. Available at: http://washdev.iwaponline.com/content/3/3/322 (Accessed 17 March 2018)

Arab Forum for Environment and Development (2009). 2009 Report of the Arab Forum for Environment and Development Arab Environment: Climate Change, Impact of Climate Change on Arab Countries. Edited by Tolba, M and Saab, N. Available at: http://www.afedonline.org/afedreport09/Full%20English%20Report.pdf (Accessed 17 March 2018)

Arab Forum for Environment and Development (2015). Arab Environment: Sustainable Consumption. Annual Report of Arab Forum for Environment and Development, 2015; Abdel Gelil, I. and Saab, N. (Eds.); Beirut, Lebanon. Technical Publications. Available at: http://www.afedonline.org/en/inner.aspx?contentID=1154 (Accessed 6 December 2017)

Arab Forum for Environment and Development (2016). Arab Environment: Sustainable Development In a Changing Arab Climate. Annual Report of Arab Forum for Environment and Development, 2016; Saab, N. and Sadik, A. (Eds.); Beirut, Lebanon. Technical Publications. Available at: http://www.afedonline.org/webreport/ENG/afedreport2016-eng.htm (Accessed 17 March 2018).

Arab Forum for Environment and Development (2017). Arab Environment in 10 Years. Annual Report of Arab Forum for Environment and Development, 2017; Saab, N., (Ed.); Beirut, Lebanon. Technical Publications. Available at: http://www.afedonline.org/en/ (Accessed 17 March 2018).

Christensen, J.H., K. Krishna Kumar, E. Aldrian, S.-I. An, I.F.A. Cavalcanti, M. de Castro, W. Dong, P. Goswami, A. Hall, J.K. Kanyanga, A. Kitoh, J. Kossin, N.-C. Lau, J. Renwick, D.B. Stephenson, S.-P. Xie and T. Zhou, 2013: Climate Phenomena and their Relevance for Future Regional Climate Change. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available at: https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter14_FINAL.pdf (Accessed 17 March 2018).

Colin P. Kelly, Shahrzad Mohtadib, Mark A. Canec, Richard Seagerc, and Yochanan Kushnir (2015). Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought, PNAS, March 17, 2015, vol. 112, no. 11, pp. 3241–3246. Available at: http://www.pnas.org/content/112/11/3241 (Accessed 17 March 2018).

Dasgupta, Susmita and Laplante, Benoit and Meisner, Craig M. and Wheeler, David and Jianping Yan, David. (2007) The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis. World Bank Policy Research Working Paper No. 4136. Available at SSRN: https://ssrn.com/abstract=962790 (Accessed 17 March 2018).

El Raey, M. (2011). Impact of Sea Level Rise on the Arab Region. University of Alexandria and Regional Center for Disaster Risk Reduction Arab Academy of Science, Technology and Maritime Transport. Available at: http://www.arabclimateinitiative.org/Countries/egypt/ElRaey_Impact_of_Sea_Level_Rise_on_the_Arab_Region.pdf. (Accessed 17 March 2018).

El Solh, Mahmoud (2016). Contributing to Zero Hunger in the Arab World: Sustainable in a Changing Arab Climate. Annual Report of Arab Forum for Environmental Development.

FAO (2015). Towards a Regional Collaborative Strategy on Sustainable Agricultural Water Management and Food Security in the Near East and North Africa Region.

Feinstein International Center; Tufts University, and UNEP (2013). Standing Wealth: Pastoralism Livestock Production and Local Livelihoods in Sudan. Available at: Feinstein International Center; Tufts University, and UNEP (2013), Standing Wealth: Pastoralism Livestock Production and Local Livelihoods in Sudan. (Accessed 17 March 2018).

Fernandez, A. (1997). Myrada's Organisational Values (In the Context of PAPRO). Rural Management Systems eSries Paper

29. Bangalore, India. Available at: http://myrada.org/myradas-organisational-values/. (Accessed 17 March 2018).

Fraser C. Lott, Nikolaos Christidis, and Peter A. Stott (2013). Can the 2011 East African drought be attributed to human-induced climate change? Geophysical Research Letters, Volume 40, Issue 6, 28 March 2013, pp. 1177–1181. Available at: http://onlinelibrary.wiley.com/doi/10.1002/grl.50235/abstract. (Accessed 17 March 2018).

FSNAU and FEWSNET (USAID) (2017). Somalia Food Security Outlook Feb – Sep 2018 Technical Release Available at: https://www.fews.net/somalia Accessed 29 March 2018.

IPCC, 2014: 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 and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. Available at: http://www.ipcc.ch/report/ar5/syr/ (Accessed 17 March 2018).

Jeremy S. Pal and Elfatih A. B. Eltahir. (2016). Future temperature in southwest Asia projected to exceed a threshold for human adaptability, Nature Climate Change, Vol 6, Issue 2, pp. 197-200 February 2016. Available at: http://adsabs.harvard.edu/abs/2016NatCC...6..197P. (Accessed 17 March 2018).
Kidani, Alula Berhe (2013). Sudan Vision, An Independent Daily, 19 Sep 2013. http://www.cgap.org/blog/innovations-islamic-microfinance-small-farmers-sudan

Maliva R., Missimer T. (2012) Non-Renewable Groundwater Resources. In: Arid Lands Water Evaluation and Management. Environmental Science and Engineering (Environmental Engineering). Springer, Berlin, Heidelberg. Available at: http://www.springer.com/la/book/9783642291036. (Accessed 17 March 2018).

MHUE Djibouti (2009). Fourth National Report on Biological Diversity in the Republic of Djibouti, March 2009. Available at: https://www.cbd.int/doc/world/dj/dj-nr-04-fr.pdf. (Accessed 17 March 2018).

Milano et al., (2013). Current state of Mediterranean water resources and future trends under climatic and anthropogenic changes. Hydrological Sciences Journal, 58:3, 498-518, DOI: 10.1080/02626667.2013.774458

Moore, S. (2011). Parchedness, Politics and Power: the State Hydraulic in Yemen. Journal of Political Ecology. 2011;18: 38–50. Available at: https://scholar.harvard.edu/scott_moore/publications/parchedness-politics-and-power-state-hydraulic-yemen. (Accessed 17 March 2018).

Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, 2014: Africa. In: 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 [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265. Available at : https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap22_FINAL.pdf. (Accessed 17 March 2018).

OCHA (2009). Occasional Policy Briefing Series. No. 2, Climate Change and Humanitarian Action: Key Emerging Trends and Challenges, August 2009. Available at: https://www.unocha.org/sites/unocha/files/Climate%20Change%20and%20Humanitarian%20Action%202009_0.pdf. (Accessed 17March 2008).

Scotland's Centre of Expertise Connecting Climate Change Research and Policy (2012). Flexible Adaptation Pathways. Available at: https://www.climatexchange.org.uk/media/1595/flexible_adaptation_pathways.pdf. (Accessed 17 March 2018).

Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang (2012). Changes in climate extremes and their impacts on the natural physical environment. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK and New York, USA, pp. 109-230

Sipkin, S. (2010). Water conflict in Yemen: inventory of conflict and environment. ICE Case Studies No. 235, December, 2010. Available at: https://edspace.american.edu/jlee/ice-case-studies/ . (Accessed on 17 March 2018).

Somalia Ministry of National Resources (2013). National Adaptation Programme of Action on Climate Change for Somalia. Available at: http://unfccc.int/resource/docs/napa/som01.pdf. (Accessed 17 March 2018).
Republic of Sudan, Ministry of the Environment and Physical Development, Higher Council for Environment and Natural Resources (2003). Sudan's First National Communication under the UNFCCC. Volume 1: Main Communications, submitted in February 2003. Available at: http://unfccc.int/resource/docs/natc/sudnc1.pdf. (Accessed 17 March 2018).

Banerjee, Aditi; Bhavnani, Rakhi; Burtonboy, Catherine H.; Hamad, Osama; Linares-Rivas Barandiaran, Alejandra; Safaie, Sahar; Tewari, Deepali; Zanon, Andrea. 2014. Natural disasters in the Middle East and North Africa : a regional overview (English). Global Facility for Disaster Reduction and Recovery (GFDRR). Washington DC ; World Bank Group. Available at: http://documents.worldbank.org/curated/en/211811468106752534/Natural-disasters-in-the-Middle-East-and-North-Africa-a-regional-overview. (Accessed 17 March 2018).

Department for International Development (2006). Reducing the Risk of Disasters: Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World: A DFID Policy Paper. Available at: https://www.preventionweb.net/files/2067_VL108502.pdf. (Accessed 17 March 2018).

United Nations and League of Arab States (2013). The Arab Millennium Development Goals Report: Facing Challenges and Looking Beyond 2015. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/E_ESCWA_EDGD_2013_1_E.pdf. (Accessed 17 March 2018).

UNDP-RBAS and Sida. (2013). Water Governance in the Arab Region: Managing Scarcity and Securing the Future. Available at: http://www.undp.org/content/dam/rbas/doc/Energy%20and%20Environment/Arab_Water_Gov_Report/Arab_Water_Gov_Report_Full_Final_Nov_27.pdf. (Accessed 17 March 2017).

UNDP Somalia, 15 April 2018, Project Implementation Review of the PIMS 5268 GEF-financed project: Enhancing Climate Resilience of the Vulnerable Communities and Ecosystems in Somalia

Verner, Dorte. (2012). Adaptation to a Changing Climate in the Arab Countries: A Case for Adaptation Governance and Leadership in Building Climate Resilience. MENA Development Report. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/12216. (Accessed 17 March 2018).

UN Office for the Coordination of Humanitarian Affairs. Humanitarian Bulletin Somalia 26 Sep 2017, https://reliefweb.int/report/somalia/humanitarian-bulletin-somalia-september-2017-issued-26-september-2017

UNESCWA, UNICEF and United Nations Beirut (2017). Arab Multi-dimensional Poverty Report. E/ESCWA/EDID/2017/2. Available at: http://www.ophi.org.uk/wp-content/uploads/multidimensional-arab-poverty-report-english.pdf. (Accessed: 17 March 2018).

UNDP (2011). Blending Climate Finance Through National Climate Funds: A Guidebook for the Design and Establishment of National Funds to Achieve Climate Change Priorities. Available at: http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Climate%20Change/Capacity%20Development/Blending_Climate_Finance_Through_National_Climate_Funds.pdf. (Accessed 17 March 2018).

UNDP-RBAS, Elasha, B.O (2010). Arab Human Development Report. Research Paper Series. Mapping of Climate Change Threats and Human Development Impacts in the Arab States. Available at: http://www.arabclimateinitiative.org/knowledge/background/Balgis_mapping%20CC%20threats%20and%20human%20dev%20impacts%20in%20Arab%20region.pdf. (Accessed 17 March 2018).

UNDP-RBAS (2010). Climate Change Paper Series: Elasha, B.O. 2010. Desk Review and Mapping of Climate Change Issues, Initiatives and Actors in Arab States. December 2009. Arab Human Development Report Papers.

UNDP-RBAS, Mirkin, B (2010). Arab Human Development Report. Research Paper Series, Population Levels, Trends and Policies in the Arab Region: Challenges and Opportunities. Available at: http://www.undp.org/content/dam/rbas/report/Population%20Levels,Trends.pdf. (Accessed 17 March 2018).

UNEP Regional Office for West Asia (2015) Regional Coordination Mechanism. Issues Brief for the Arab Sustainable Development Report. Climate Change in the Arab Region. Available at: http://css.escwa.org.lb/SDPD/3572/Goal13.pdf. (Accessed 17 March 2018).

UNESCWA (2015). Arab Sustainable Development Report, First Edition. Available at: https://www.unescwa.org/publications/arab-sustainable-development-report-2015. (Accessed 17 March 2018).

UNISDR (2015). Arab Sustainable Development Report. 2015. Disaster Risk Reduction for Resilience and Sustainable Development in the Arab Region. Available at: https://www.unisdr.org/we/inform/publications/45341. (Accessed 17 March 2018).

Verner, Dorte. (2012). Adaptation to a changing climate in the Arab countries: a case for adaptation governance and leadership in building climate resilience.

Wiebelt, M., Breisinger, C., Ecker, O., Al-Riffai, P., Robertson R., Thiele, R., (2011). Climate Change and Floods in Yemen: Impacts on Food Security and Options for Adaptation. IFPRI Discussion Paper 01139. IFPRI Development Strategy and Governance Division. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.227.2315&rep=rep1&type=pdf. (Accessed 17 March 2018).

World Bank (2005). Natural Hotspots Study: A Global Risks Analysis. Disaster Risk Management Series No. 5. Available at: http://documents.worldbank.org/curated/en/621711468175150317/pdf/344230PAPER0Na101official0use0only1.pdf. (Accessed 17 March 2018).

World Bank. (2014). Turn Down the Heat: Confronting the New Climate Normal. Washington, DC. Available at: http://data.worldbank.org/region/arab-world. (Accessed 17 March 2018).

World Bank (2013). Interim Strategy Note for Somalia, 2014-2016.Available at: http://documents.worldbank.org/curated/en/795741468103478907/Somalia-Interim-strategy-note-for-the-period-FY14-FY16. (Accessed 17 March 2018).

Zubrycki, K., Crawford, A., Hove, H., Parry, J-E. International Institute for Sustainable Development, Adaptation Partnership. (2011). Review of current and planned adaptation action: North Africa. Available at: https://www.iisd.org/pdf/2011/North_Africa_Adaptation_Action.pdf. Accessed 17 March 2018.

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