

CHAPTER 8. RECOMMENDED POLICY DIRECTIONS AND ADAPTATION ACTIONS

This draft chapter serves as a starting point to be discussed with, and built upon by stakeholders in the Arab countries. It will be supplemented with inputs from consultations with key stakeholders in the governments of Arab countries as well as civil society organizations in the region. This will ensure that the suggestions and recommendations provide a useful direction for governments to pursue. Likewise, a matrix with policy options and guidance for governments will be prepared with Arab region government officials and regional and global experts during the consultation process. For discussion, a first draft is presented in Table 8.1.

For a summary of recommendations presented in the core chapters 2-7 of this report, see Appendix H.1. At this time, they are somewhat repetitive and generic. The consultation process over the next few months will seek feedback from stakeholders in the Arab Region make them more Arab Region specific and to prioritize them.

8.1 Climate change affects all people in all Arab countries. But the least developed countries—and the poorest people and communities within these countries—will be the most vulnerable, because they depend on natural resources, and they don't have the assets to cope with the impacts of climate change on their livelihoods and well-being. Governments, with assistance from the private sector and civil society, can ensure that their countries' development policies, strategies and action plans are resilient to a changing climate. Ideally, climate change adaptation would be mainstreamed into government processes and procedures for development. As this report shows, an integrated approach to climate change adaptation at the country level calls for leadership, action, and collaboration and involves a number of processes including identification, integration and implementation.

8.2 The social and economic impacts of climate change are already being felt in Arab countries. Responses are slowly being prepared, but more are urgently needed. Even if national and global efforts to address climate change improve, current and future climate trends have considerable momentum, and they will dramatically affect economic, human, and social development for years to come. Poverty, inequality, water stress, crop yields, migration, health, and livelihoods, particularly in poor arid areas, are and will be measurably affected by changes in the climate. The impacts of climate change depend as much on socioeconomic resilience as on biophysical exposure. Biophysical impacts are superimposed on existing vulnerabilities determined by factors such as an individual's age, gender, or health status; a household's asset base and degree of integration with the market economy; and a community's capacity to take part in developing and implementing local and national adaptation actions that will help build resilient livelihoods in Arab countries.

8.3 Even with ongoing actions to combat climate change, global warming from past emissions is already locked in, posing challenges to social and economic development in all Arab countries. It is imperative that actions are taken now to adapt to the already changing climate. This chapter aims at providing guidance to policymakers on how to address climate change adaptation.

8.4 Adaptation policies must be diverse and far-reaching: they need to reach many sectors including agriculture, water, energy, transportation, and health, and they must address the

location of communities in cities, rural areas, coasts, deserts, or mountains. In addition, they will use a broad set of instruments to achieve their goals including standards, tax measures, transfers, and investment choices (IPCC 2007 and Hallegatten et al. 2011). A diverse set of policy actions aimed at different time horizons and at different levels of government will be required; a national climate change strategy, a National Adaptation Programme of Action (NAPA) or national communication is not enough. To be effective, strategies need to be supported by legislation and action plans, including the necessary frameworks and strong domestic policy.

8.5 This chapter picks up the themes introduced in Chapter 1. The adaptation pyramid presented in that chapter (Figure 1.4) is expanded in a structured discussion that centers on policy options for tackling the issues identified in the body of this report.

8.6 Incorporating short-, medium- and long-term responses to global climate change and variability into national development targets and policies is the key to successful adaptation and mitigation. Reform of the global and local food systems should become a priority to make food prices more resilient to climate shocks and volatility on global commodity markets. With the inevitability of increased climate variability and change, trade is a crucial channel for adaptation which would allow regions of the world with fewer negative effects to supply those with more.

8.7 The heterogeneity with which climate change will impact countries, and regions within countries, will make it necessary for Arab countries to rely increasingly on healthy and open trade relationships in order to fulfill the increasing demand for food. Most countries already acknowledge these crucial ties. This may provide the additional channels necessary to face climate variability and change.

8.8 The underinvestment in social safety nets, public services such as water supply and wastewater treatment, and housing and infrastructure in vulnerable areas make poor people more vulnerable to a changing climate. This “adaptation deficit” is likely to increase. Adaptation needs to be at the forefront of countries’ development agenda, as climate projections show that the impacts of climate change on livelihoods is likely to get worse over time.

8.9 Adaptation is a process that takes place over years and decades. Hence, it will be subject to revisions as new information becomes available. The uncertainty about how society and climate will change in the future makes many standard decision-making methodologies unsuitable, and alternative, robust ways of setting priorities are required.

8.10 The following sections aim to assist in building good adaptation governance, which is key to building climate resilience in Arab countries. As Chapters 2–7 point out, this calls for improved water management, increased resilience in agriculture, expanded social protection and public services, participation of both men and women, and enhanced disaster-risk management. Introducing a temporal perspective to each of the recommended policy actions is important to help policymakers focus and prioritize current and future adaptation needs.

8.11 As part of a seven-pronged approach for improving development in a changing climate, short- to medium- term adaptation measures are presented as actions to be considered within the current and next national five-year development plans, while long-term adaptation measures are presented as strategic policy options and investments with a

potentially profound impact on the overall development path (see Table 8.1 for a summary of policy options).

Box 8.1 Using a Climate Lens to Focus on Adaptation Policies

A climate lens is a valuable tool for examining potential actions and interventions in a government or sector strategy, policy, plan, project, or regulation (OECD 2009). It can be used in the preparation of a large program such as the Yemen Pilot Program for Climate Resilience (PPCR) and it was in Stage I when the task was defined. Three key questions to ask when initiating a process or when revising a previous launched initiative are:

- To what extent do climate risks affect the project or program?
- Has climate variability and change been taken into account?
- How might they affect vulnerability and of whom?

Answers to these questions can inform decisions on climate adaptation actions to move the country toward a more sustainable and resilient development path. Reliable and thorough information about climate, impacts and vulnerability will help guide policymaking (see checklist in Chapter 2). After actions and investments have been implemented, a timely and systematic monitoring and evaluation system will assess performance and can indicate if revisions or changes are called for (OECD 2009). In sum, adaptation is a process.

STRENGTHEN TECHNICAL AND POLICY EXPERTISE ON DEVELOPMENT-CLIMATE LINKAGES AND DECISION-MAKING CAPACITY

8.12 Adaptation is a long-term dynamic process that will take place over decades and be subject to regular revisions as new information becomes available; an adaptation framework needs to balance short and long-term needs. Long-term adaptation will capture benefits from today's better management of current climate variability and risks. The large uncertainty about how society and climate will change in the future makes many standard decision-making methodologies inappropriate, and alternative, robust ways of setting priorities are required. Adaptation actions will have many side-effects that need to be taken into account in the decision-making processes, and adaptation actions need to be mainstreamed into regular planning (Hallegatte et al. 2011).

8.13 This section presents elements that can be used in the framework presented in Figure 1.1 to help stakeholders develop effective adaptation strategies. It draws on experience from Arab countries and other international experience (OECD 2009; Hallegatte et al. 2011). It is suggested that policymakers take into account the role of uncertainty and inertia and consider structural changes in addition to marginal adjustments. There are several domains of action: production and dissemination of information on climate change and its impacts; adoption of standards, regulations, and fiscal policies; changes in institutions; and support for public infrastructure and buildings.

8.14 A framework can be adopted with the objectives to:⁵⁷

- (i) disseminate knowledge and develop capacity on climate change impacts and adaptation options;
- (ii) organize and coordinate adaptation planning and actions;
- (iii) provide guidance for regional or sectoral assessments of adaptation actions;
- (iv) assess adaptation actions and select desirable ones, taking into account costs, benefits, and resilience to uncertainty; and
- (v) prioritize adaptation actions, taking into account financial and capacity constraints, current climate variability, and uncertainty about the future climate.

8.15 The framework presented here is based on three elements and can be expanded where need be in the individual Arab countries:

- (i) an institutional mechanism to ensure knowledge and capacity building, prioritization of adaptation actions, and regular revisions of implemented actions;
- (ii) a decision-making framework, including a set of decision criteria; and
- (iii) a set of climate scenarios, used to assess and rank adaptation options. Development and approval of a policy action will require expertise, using information from international experience.

8.16 As discussed in Chapter 1, success calls for strong leadership and a well-defined process with appropriate milestones. International experience shows that the lead needs to be taken by a prominent ministry or government champion, such as the Prime Minister, Minister of Planning or Economy, or State Planning Commission. A strong team needs to be built with participation from such groups as relevant ministries, representatives from governorates, local authorities and institutions, representatives from the private sector, civil society organizations, and ideally from opposition parties in order to ensure continuity as a democratic elected government may change. Clearly, this should be adapted to the context of individual Arab countries and its circumstances.

8.17 We propose a three-component building-block approach:

1: Gather knowledge about climate change impacts and past adaptation actions through:

- sectoral and multi-sectoral meetings in key areas such as water, agriculture, health, and disaster risk;
- a plenary meeting to summarize findings and results and identify areas with knowledge gaps or where additional information is called for.

2: Develop proposals for adaptation actions through meetings that address questions including:

- What additional/different public investments are required because of climate change?
- What are the obstacles to adaptation for households and business?

⁵⁷ Adapted from Hallegatte et al. 2011.

- What are the negative effects that the adaptation action of one actor can have on other actors, and what can be done to mitigate these effects?
- What are the financial options for public investments, for supporting private adaptation, and for knowledge development and dissemination?

3: Assess proposals and select actions through, for example:

- technical work based on a decision-making framework;
- a definition of possible categories of action such as (i) production and diffusion of information; (ii) changes in norms and regulations; (iii) changes in institutions and in the objectives and mandates of existing institutions; (iv) direct investments; and (v) guidance for future impact and adaptation analyses carried out at the sector or local scale;
- the establishment of a monitoring plan for actions, which should include indicators and criteria for success and provisions to ensure that the efficiency of actions is evaluated.

8.18 Particular attention should be paid to the people living in regions that are particularly vulnerable to natural disasters such as drought and flooding. A high committee could be established with the goal of improving development in these regions from an intersectoral perspective by tackling the issues of rising food, feed, fuel prices; diversifying the economy; providing social safety nets; and building resilience in local communities.

Improve access to climate data and apply them in planning and policymaking

8.19 Access to quality weather and climate data is essential for policymakers. Without reliable data on temperature and precipitation levels, it is difficult to assess the current climate and make reliable weather forecasts and climate predictions that will allow for the design of effective policies, the implementation of early warning systems, and the adaptation of key sectors upon which the local and national economy depend.

8.20 In the short and medium term, the collection and monitoring of climate data could be improved by expanding the number of weather stations and by collaborating with other countries in the region to improve comparability of data. This effort should be combined with a push to link climate data to impact analysis by making climate data available to policymakers and researchers. It is also important to link climate data with other socioeconomic data and typological data sets. The goal is to enhance local, regional, and national resilience to climate variability and change.

Promote integrated water resources management

8.21 The effects of climate change will be felt primarily in people's access to water. An integrated, cross-cutting approach is needed to address the complicated and critical issues of both surface and groundwater management, in the short-, medium-, and long-term perspective.

8.22 Irrigation efficiency at both the system and end-user level should be improved to increase productivity, save water, and ensure sustainability. This would include the rehabilitation of existing irrigation in selected basins, the acceleration of new irrigation projects, upgrading on-farm management to use water more efficiently, and improving

overall irrigation efficiency in partnership with local users. It should also address the institutional incentives necessary to create conditions for improving water-use efficiency. A review of the water legislation could be a central part of preparation for any demand-side management project.

8.23 Better groundwater and surface water management is critical. This should combine initiatives to address overexploitation and increased salinization for the groundwater and surface water pollution as well as international cooperation on watersheds, etc. Pilot projects for testing different technologies and integrated management practices are recommended. The reuse of effluent from new municipal wastewater treatment plants or agricultural drainage water is one promising option that should be investigated in the long term.

8.24 There is a need to integrate basin management to improve the quality and increase the efficiency of water supply and sanitation services through rehabilitation of existing infrastructure, expansion of networks, modernization of operation and management systems, and provision of satisfactory wastewater collection and treatment.

8.25 Finally, strengthening institutions in their technical skills to collect and monitor data as well as their capacity to carry out research, involve local stakeholders such as water user associations and farmers' unions, and apply advanced information systems in decision-making processes is needed to achieve integrated water resources management.

Improve sustainability of agriculture

8.26 Achieving sustainability in the rural sector will require improving sustainability in the agricultural sector both in the short and long term. Building climate resilience in irrigated, rainfed, and livestock agriculture, combined with rangeland management, is the foundation for developing sustainable adaptation in rural areas.

8.27 In the near and medium term, it is critical to build a rich and functioning network of social and extension services that links farmers to agricultural research and markets as well as vulnerable populations to policymakers and to guarantee that national policies reach every farmer. Such a network also provides a strong link back from the farmer to scientists and policymakers for the collection of information relevant to technological advances and policymaking.

8.28 Yields of rainfed crops are hit particularly hard by droughts and the long-term impacts of climate change. Scientific advances in breeding drought-resistant crop varieties will be key to the future of rainfed agriculture in a longer time horizon. Farmers should be encouraged to adopt more appropriate on-farm management techniques to offset the impacts of climate change including: choosing optimum sowing dates and planting densities, switching crops and crop varieties such as faster maturing plants, expanding zero or minimum tillage techniques, introducing irrigation to some rainfed fields, and promoting rainwater harvesting.

8.29 Irrigated crops are less affected by droughts, but expanding irrigation is severely constrained by the availability of water resources; the efficiency of irrigated agriculture should be improved to get "more crop per drop." It is recommended that a system that conserves rainfall and efficiently distributes water among agro-ecological zones should be a part of a national plan to further invest in water as an increasingly scarce resource. However, it is important to note that increasing irrigation efficiency often increases yields, but only partly translates into water savings. Therefore, any initiative to improve the efficiency of

irrigated agriculture should be complemented by: promoting less water-intensive and higher value crops, removing subsidies on diesel and electricity for irrigation, introducing water tariffs and quotas, licensing and registration of legal wells, closing of illegal wells, and regulating the use of contaminated water for irrigation purposes. In the longer term, it will be important to introduce metering of all wells.

8.30 The livestock sector is particularly vulnerable to the impacts of climate change. With the expected continuation of climate variability and increased drought, this sector requires extensive adaptation measures to continue to contribute significantly to rural livelihoods. Adaptation methods for building a resilient livestock sector include enforcing sustainable grazing management, improving veterinary services through extension service networks, promoting the introduction of adapted breeds, and improving market access. Building institutional capacity to regulate access to protected rangeland and water sources, and controlling the movement of livestock will be pivotal to achieving sustainability in the livestock sector. Grazing management techniques and practices need to have the conservation of ecosystems as a prime objective; legislation to organize and regulate access to pastureland will increase a sense of ownership and encourage sustainable pastureland management.

8.31 All these adaptation actions will require significant up-front increases to investment in research and development in the agricultural sector. Improvements to the productivity of crops and livestock, including the development of possible modified crop and livestock varieties, will be critical to success. Within the current and subsequent national plans, Arab countries should support research and development nationally and push for better international cooperation and funding of agriculture research and development goals worldwide.

Strengthen urban and rural livelihoods and well-being

8.32 To adapt urban and rural space to a changing climate, both urban and rural livelihoods should be strengthened through targeting and expansion of social services, reducing vulnerability through effective risk management, scaling-up nutrition and health programs, and supporting new livelihood opportunities. Public services such as water supply and drainage are called for in vulnerable urban areas.

8.33 The poorest are hardest hit by climate change; improving the targeting of existing social safety nets, expanding service coverage to more communities, and introducing new mechanisms to better structure and deliver social services are critical for protecting the poor. It is essential to have in place social safety nets that provide the necessary channels of outreach and mitigation to the poor and vulnerable, such as direct transfers and cash-for-work programs. The introduction of rural pension schemes, which have been shown in Brazil to have the capacity to transform rural livelihoods and communities with a strong regional income redistribution function, should be considered now for effectiveness in the long term (World Bank 2003).

8.34 Flood and drought management should become part of the overall economic development planning framework by recognizing the role of social transfers for building economic resilience among communities vulnerable to disasters, in both urban and rural areas. Such initiatives include activities such as community-asset building through public works and assistance with micro-enterprises and other productive activities. These initiatives would work at the field level and would play a key role in providing immediate relief after disasters as well as assisting in recovery and rehabilitation activities. The effectiveness of

their role in past climate disasters should be evaluated in order to estimate present and future needs for capacity building, funding, and the possible expansion of their role in disaster management.

8.35 Long-term opportunities for people, including farmers and herders to develop alternative income sources could be achieved by promoting education for people living in rural and poor urban areas, increasing non-farm income activities, and improving markets. By nurturing these channels of interaction, it will be possible to better disseminate information, technology, services, and technical support to vulnerable groups in rural areas.

Box 8.2 Adaptation at the Local Level is Important to Improve Livelihoods and Wellbeing

The effects of climate change in Arab countries are felt most strongly at the local level (OECD 2009 and Verner 2011). Climate change affects the livelihoods and assets of households and communities, increasing their vulnerability and further decreasing their capacity to adapt. Local institutions and networks are critical for providing assistance to affected households and communities and for the implementation of adaptation measures.

OECD (2009) suggests that successful integration of climate change adaptation into local development processes depends on five enabling conditions:

- a broad and sustained engagement with and participation of local stakeholders, such as local governments and institutions, communities, civil society and private sector
- a participatory approach with legitimate decision-making agents
- an awareness-raising campaign on climate change among households, local organizations, opinion leaders, and educators
- information gathering to inform local-level adaptation decisions
- response development to short- and long-term climatic shocks

OECD identifies four entry points to facilitate the integration of climate change adaptation into local development planning processes:

- consideration of the implications of climate change in development planning processes of local governments such as village action plans, rural or district development plans, and city development plans or strategies (could be similar to the national level approach)
- adjustment of local regulatory and service provision frameworks, to include provision of information based on likely local impacts of climate change
- adjustment of local government accountability mechanisms
- engagement of private-sector and civil society organizations and processes, which can support adaptation at the local level by internalizing and institutionalizing climate risk management into their own decision-making processes and operations

To facilitate the integration of adaptation at the local level, OECD suggests four actions at higher levels of government:

- collect information on climate change adaptation and make it available
- provide human, financial and technical resources and services to support local adaptation
- provide social protection for the poorest and most vulnerable
- ensure a supportive policy and institutional framework for risk management and strengthening the institutions needed to manage communication and decision-making processes

Support for decentralization can be coupled with efforts to enhance local government capacity.

Source: OECD 2009.

Strengthen women's participation in the adaptation decision-making process

8.36 The exact impacts of climate change in Arab countries are uncertain. What is certain, however, is that adaptation to the new realities will demand the full energy and potential of entire societies. This means that adaptation efforts must include and empower those who face the most barriers to developing their potential, and ensure equality of opportunity in the options for adapting to the changing climate in the coming years. At the same time, the current and future impacts of climate change add to the urgency of addressing the underlying causes of poverty and gender-based inequality and vulnerability, which represent significant challenges in Arab countries. Both gender-responsive adaptation actions designed to adjust and protect livelihood systems from specific climate change impacts and actions that focus on reducing the underlying drivers of gender-based vulnerability to climate change are needed to meet the gender-related challenges in adaptation in Arab countries.

8.37 It is recommended that adaptation strategies be based on the following premises:

- The impacts of, and responses to, climate change in most sectors are not gender-neutral.
- Women are important agents of change as managers of natural resources and as the household's primary caretakers; they are key stakeholders and leaders in adaptation.
- Gender difference and inequality in Arab countries, including in terms of access to assets, opportunities for alternative livelihoods, participation in decision-making, and mobility and autonomy, mean that women's sensitivity to climate change is often higher and their adaptive capacity lower than men's.

8.38 One of the most important policy options for reducing gender inequality and improving gender responsiveness in adaptation is the institutionalized, accurate, and sustained collection of data on key indicators and its consistent use in all areas of research and policy making on adaptation. Such data collection serves to make visible what is otherwise invisible, enable comparisons between communities, regions and countries, assess change over time, and measure the effectiveness of policies and projects (Aguilar 2002) and is invaluable to improving adaptation strategies in both national and community level interventions. Quantitative and qualitative data, such as on rural women and men's use of time, can enable researchers to understand the impacts of climate change better and provide policymakers with the tools necessary for informed and gender-responsive decision making. Research methods need to include: time use surveys, focus groups, direct observation, and informant interviews. Adaptation programs and activities should include local data collection for the establishment of a gender baseline, development of targeted and effective indicators, and transparent and participatory monitoring and evaluation systems. Collectively, this will help ensure awareness of underlying gender patterns, accurate assessment of women's and men's different needs for assistance and capacity building, and strengthening the voice of the most vulnerable groups, including women.

8.39 Tackling the specific drivers of gender-based vulnerability to climate change is critically important for building resilience. Holistic development is vital for reducing vulnerability, and cannot be achieved without tackling gender inequalities. Investment in broader development goals will build communities' capacity to adapt and reduce sensitivity to climate change. If harmonized with the adaptation needs of the region, this is a "no-regrets" approach to climate change adaptation. It is recommended that Arab countries continue to address gender inequalities in all aspects of life by tackling the socio-cultural, political, and economic mechanisms that maintain them. Priorities for the region are to

improve gender equality in: access to assets, economic and alternative livelihood opportunities, and participation in political and decision-making processes. Overall, it is essential to continue the broader progress achieved in gender equality, including in health, education, economic participation, agency and political participation at all levels, as well as to reform any discriminatory laws and customary practices that affect women's civil rights, autonomy, and capacity to adapt, in order to build resilience. Progress in these areas will increase and strengthen women's capacity to participate in adaptation decision-making processes.

8.40 Continued progress on development for both women and men is needed both to facilitate these aims in terms of increasing gender equality and to build resilience. In particular, it is essential to address the drivers of vulnerability to climate change among communities in general, including for men; solutions for poor men must be a part of policy to promote women's rights, knowledge, power and assets (da Corta and Magongo 2011).

8.41 New frameworks, principles and capacity-building efforts are needed for developing and implementing gender-responsive adaptation: Adaptation projects must identify women's and men's specific roles, vulnerabilities, and needs through a framework of gender mainstreaming. Gender mainstreaming should ensure that men and women take part in adaptation processes in an equal capacity, and incorporate the study and integration of gender-specific knowledge on the environment and natural resource management. It is important that regional and national institutions study the methodological tools for gender mainstreaming in adaptation developed by international institutions, and in other regions, and adapt them for the local context.

7. Strengthen healthcare and education systems

8.42 Assessment of vulnerable populations and specific illnesses is vital to recognize direct and indirect impacts of climate change with respect to countries in the Arab region in the short, medium, and long term. This process would benefit from the development of regional hazard maps that record extreme weather and environmental events. These maps would allow governments to develop strategies to target specific areas that are, for instance, prone to floods, have high concentrations of air pollution, are low-lying or coastal, are in or near malarial zones, or have other ecological/health risks related to climate change. Developing these tools will facilitate efficient management of available health resources. Communities living in poverty are the most vulnerable to climate-sensitive diseases. Sound adaptation strategies should aim to reduce their socioeconomic vulnerability to climate change (Chan 2009; McMichael et al. 2009).

8.43 To properly cope with the burden of climate change on health, weak healthcare systems need to be strengthened through advanced stewardship, effective and efficient resource management, and planning (Costello et al. 2009). This entails the development of a strong and comprehensive public-health infrastructure that provides primary-care services, including vaccination programs and preventative measures for priority diseases such as water- and vector-borne diseases, food-borne disease, malnutrition associated with food insecurity, heat related illnesses, and respiratory and allergenic diseases associated with air pollution. It is extremely important to build the capacity of primary healthcare centers in remote and vulnerable areas to deal with emergent health crises related to climate change.

8.44 The current health surveillance systems should be improved through the development of a specific set of indicators that include region-specific projections of health-related exposures, estimates of the vulnerability of human settlements, meteorological monitoring, environmental determinants, water and food security indicators, and vector profile distributions. The national information systems need to be made more reliable by ensuring timely update and validation of data. These systems should be integrated into national health-advisory mechanisms that alert people of oncoming heat waves, flooding, or high concentrations of air pollution.

8.45 National and regional early-warning systems and emergency preparedness plans should be developed. On a national level, governments should devise strategies to manage prospective health disasters and hazards. This should include coping with potentially endemic infectious diseases, including malaria and other vector-borne diseases, water- and food-borne diseases. This system should include weather and seasonal forecasting to prepare populations for potential weather-related disasters. Governments in Arab countries might pool their efforts and resources to establish coordinated early warning and response systems to alert neighboring countries of environmental hazards. Population responsiveness to these warning systems depends on the level of public awareness; regular training workshops and public advocacy campaigns would help educate the public about new disaster adaptation mechanisms.

8.46 Interdisciplinary applied research and demonstration projects on people's vulnerability to the health impacts of climate change are the cornerstones for building effective health protection measures. This entails qualitative and quantitative research on community and national populations to establish and synthesize evidence for the formulation of adaptation policies, practices, and programs. To realize this broad research agenda, regional scientists and professionals might pool their resources and expertise to establish strong regional research coordinating bodies with ties to national, regional and international funding organizations, stakeholders, and scientific communities. Moreover, information generated from such processes may influence national governments and stakeholders to allocate budgets for mitigation and adaptation practices, as well as additional research in the field.

8.47 It is important to sustain and improve existing environmental health functions and services in order to fight the threats to water and food security faced by vulnerable people from climate change. This can be achieved through better monitoring and evaluation and includes securing minimum household water requirements, safeguarding drinking water quality, and ensuring the treatment of wastewater and sewage systems.

8.48 Finally, it is essential to involve and integrate all national, regional, and international parties working in the field in all stages of design and implementation of adaptation strategies to respond better to the health threats from climate change. This entails collaboration among different governmental agencies and institutions, civil societies, academia, local communities as well as international cooperation.

Table 8.1 Draft Matrix To Be Filled During Consultations; Summary Of Prioritized Adaptation Actions

Institutional Arrangements		
	Assess the current, national institutional arrangements in relation to national circumstances and experience elsewhere	<p>Is the treatment of climate change within national government</p> <ul style="list-style-type: none"> • Coordinated • Comprehensive • With sufficient authority to be effective?
Information management		
	Ensure that available information is readily accessible (e.g. meteorological data is available on line and without restrictions)	
	Enhance collection of climate related data	Balance what is needed and what is feasible remembering that new data collection efforts may take some years to deliver useful data
	Consider climate related additions to national and sub-national statistical reporting; including biophysical, social and economic data. Consider where gender disaggregation might be needed.	
	Create open-access and data sharing arrangements	
Knowledge Management		
	Coordinate across the Arab Region – knowledge/research/training networks – Consider whether the Region should hosts Centers of Excellence as being discussed in the UNFCCC negotiations.	

	National coordination (should there be a lead organization?)	
	Consider mechanisms for delivery at local level	
	Consider the opportunities for inclusion in primary and secondary school curricula.	
Priority Research Topics for the Arab Region		
	Regional Centre(s) for local climate projections	
	Focus on regional hazards (e.g. sandstorms, extreme temperatures, flash flooding)	
	Practical delivery of early warning systems	
	Climate resilient agricultural systems	
	Efficient water allocation and efficient use	
Sector Specific Recommendations		
Water		
Rural and Agriculture		
Urban		
Gender		

Health		
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APPENDIX H.1 SUMMARY OF ADAPTATION OPTIONS AND RECOMMENDATIONS

These recommendations were presented in chapters 2-7 of this report. Over the next few months, the team will seek feedback from stakeholders in the Arab Region through a consultation process in order to prioritize the recommendations make them more specific to the Arab region.

Objective	Adaptation option	Implementation level
Climate and disaster risk management		
Improve climate data collection and analysis	<ul style="list-style-type: none"> • Improve access to quality weather and climate data • Expand the number of weather stations and collaborate with other countries in the region to improve comparability of data (short and medium term) • Link climate data to impact analyses by making climate data available to policymakers and researchers • Link climate data with other socioeconomic data and typological data sets 	National International
Reduce vulnerability to climate disasters	<ul style="list-style-type: none"> • Strengthen commitment at the national level for comprehensive DRM/DRR across all sectors by financing risk reduction and including DRR in national development plans and legal frameworks • Develop national, local, and community capacities to identify, assess, monitor, and disseminate information on disaster risks • Identify institutional and administrative roles at all levels of government in the various stages of a climatic impact (before, during, and after) for timely information exchange, better coordination, and reduced overlapping of resources 	National Local
Improve protection of ecosystems	<ul style="list-style-type: none"> • Use climate finance to support sustainable management practices of both land and marine environments • Regulate environments such as soils, water bodies, and marine areas to ensure the natural resource base is not degraded through human actions 	National
Water		
Improve the management of water across sectors	<ul style="list-style-type: none"> • Balance the three pillars of Integrated Water Resources Management: economic efficiency, social equity, and environmental protection • Integrate water-resources management across water and non-water sectors (agriculture, tourism, urban development) • Implement and enforce water-related laws and regulations to protect water resources from pollution and overexploitation 	National

Improve access to water supply	<ul style="list-style-type: none"> • Develop better storage and conveyance capacity • Expand wastewater reuse and desalination (in some regions) 	National
Reduce water demand by increasing efficiency	<ul style="list-style-type: none"> • Develop and use more water-efficient farming practices including micro-irrigation and drought-resistant crop varieties • Use market-based instruments to increase water-use efficiency and abate pressure on existing water resources 	National Local
Enhance regional cooperation in the water sector	<ul style="list-style-type: none"> • Facilitate trade in water-intensive products from more water-endowed countries • Increase regional and inter-regional cooperation on managing shared water resources 	International National Regional
Agriculture, rural livelihoods, and food security		
Increase productivity in agriculture	<ul style="list-style-type: none"> • Use targeted subsidies to support investment in new irrigation equipment, land improvement, seeds and other adaptation needs • Grow higher value crops to increase income from agriculture (but not at expense of food security) • Increase local and Arab-region knowledge about agricultural management through increased coordination between agricultural research centers and better extension services • Develop access to markets and improve marketing to maximize income from food production 	National NGOs Regional Household
Reduce vulnerability of rural livelihoods	<ul style="list-style-type: none"> • Increase social support and safety nets for the most vulnerable to protect their asset bases during extreme events • Increase support to migrating households by helping them to establish quickly in new areas to limit the impacts of loss of social capital • Access various payment schemes such as payments for ecosystems services and climate mitigation/adaptation funds to improve living standards and environment • Reduce risk of climate extreme impacts on income from agriculture through climate insurance • Develop land tenure to ensure access to subsidies and credit 	International National NGOs Households

Build resilience in rural livelihoods	<ul style="list-style-type: none"> • Develop household industries to increase additional income sources • Support economic diversification by increasing investment incentives to private sector to establish businesses in rural areas • Support attendance in schools and other learning opportunities to increase ability to engage in diverse employment 	National Private sector Local
Improve food security	<ul style="list-style-type: none"> • Target food-price controls and subsidies to vulnerable groups to reduce impacts of price rises and ensure access to food supplies • Improve food transport and strategic storage systems from production to consumption • Improve bi- and multi-lateral food supply chains by establishing contractual agreements for food supply with producing areas 	International National Local
Urban livelihoods, living conditions, and transport		
Reduce exposure and sensitivity of urban infrastructure and housing to climatic hazards	<ul style="list-style-type: none"> • Assess vulnerability to indicate the required upgrading and protection measures • Incorporate climate change impact information when deciding how and where to develop and invest, particularly in coastal and environmentally sensitive areas • Enforce building and zoning codes to reduce development in environmentally sensitive or hazardous zones 	Local
Increase adaptive capacity of urban residents	<ul style="list-style-type: none"> • Improve the quality and supply of basic services such as water supply and wastewater management, particularly in informal settlements • Improve social safety nets and access to insurance for the most vulnerable • Increase public education about climate change threats 	National Local
Empower local level decision makers to act on	<ul style="list-style-type: none"> • Decentralize urban planning and development decisions • Educate local authorities on the potential climate impacts in their city and the tools that can be used to mitigate risk and encourage information sharing among Arab cities • Make international climate funds available for municipal level activities 	National Local

climate threats		
Minimize the likelihood and consequences of a failure in the transport system	<ul style="list-style-type: none"> • Alter the design of infrastructure elements (e.g. roads, bridges, port facilities) to make them resilient to climate change, including both ongoing change and sudden events • Strengthen construction standards to ensure higher quality of execution and reinforce maintenance capacity to ensure that infrastructure remains in a state of good repair • Ensure redundancy exists both between and within modes so that disrupted traffic can quickly move from road to rail, for example, or from a damaged port to an undamaged one • Design infrastructure for high reparability so that service may be rapidly restored in case of disruption. 	National Local
Gender		
Collect and use sex-disaggregated data on the impacts of climate change	<ul style="list-style-type: none"> • Promote in-depth research on all aspects of gender and adaptation in local contexts • Support innovative, non-conventional data collection, including qualitative data • Integrate sex-disaggregated research/data in program- and policy- level adaptation interventions 	National NGOs
Implement gender mainstreaming in national climate policy and projects	<ul style="list-style-type: none"> • Establish cross-sectoral network of experts to build capacity of national and local institutions to implement gender mainstreaming • Incorporate gender criteria in national climate change strategy by establishing gender-sensitive reporting, monitoring and evaluation systems in all areas of policy and intervention • Improve women's access to climate change information by implementing targeted campaigns and training female community leaders 	National
Increase women's resilience to the impacts of climate change	<ul style="list-style-type: none"> • Invest in strengthening gains in overall development and gender equality in literacy, education, skills-development, health, employment, political participation, and rights • Improve women's access to and ownership of land and access to credit by reforming discriminatory laws and practices • Improve women's ability to enhance existing rural livelihoods by ensuring extension services transfer relevant knowledge and skills to women and providing business-related training for women • Improve opportunities for women to diversify livelihoods by investing in innovative new areas of business in rural economies with an emphasis on improving opportunities for women 	National NGOs Local Households

Health		
Enhance climate-related health monitoring and surveillance systems	<ul style="list-style-type: none"> • Assess public health vulnerabilities thoroughly through the development of a specific set of indicators • Promote and fund interdisciplinary research on climate related health outcomes • Develop national health advisory mechanisms that alert the population of oncoming heat waves, flooding, or high concentrations of air pollution 	National NGOs
Upgrade healthcare systems	<ul style="list-style-type: none"> • Involve all key stakeholders (ministries, researchers in government and academic institutions, local communities, NGOs, development partners and donor agencies, the private sector) with strong regional cooperation to deal with cross-boundary health issues • Strengthen environmental health services related to water and air quality • Build the capacity of primary healthcare centers in remote and vulnerable areas to deal with emergent health crises 	International National NGOs

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