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**STATUS OF THE VULNERABILITY ASSESSMENT OF THE ARAB
WATER SECTOR TO CLIMATE CHANGE****Summary**

Climate change represents one of the main challenges facing the Arab region. Concerns regarding these challenges have led to a series of high-level political statements and commitments that call for improved understanding of the impact of climate change on the region. The Arab Ministerial Declaration on Climate Change (2007) urged Arab and United Nations organizations to carry out assessments of the impacts of climate change on water resources aimed at supporting the development of adaptation strategies in the Arab region. This was echoed in the ESCWA resolution on climate change, at the Commission's twenty-fifth session (2008), which called on ESCWA to prepare an assessment of the impact of climate change on freshwater resources and its implications for socio-economic vulnerability in the region. To that end, coordinated regional action has resulted from a number of high-level meetings, namely, the sector meeting on climate change, which was organized by the United Nations and the League of Arab States (2009); the Arab Ministerial Water Council during the preparation of the Arab Water Security Strategy (2010); and a series of regional expert group meetings, which were organized by ESCWA and various partners.

This report reviews the resolutions, decisions and coordination mechanisms that have led to the launching of a regional initiative to assess the impact of climate change on water resources and socio-economic vulnerability in the Arab region. The regional initiative consists of four pillars focused on the following: (a) collection and review of information; (b) climate change impact analysis and vulnerability assessment; (c) awareness raising and information dissemination; and (d) capacity-building and institutional strengthening. ESCWA has been tasked to lead the implementation of this regional initiative through the Regional Coordination Mechanism (RCM). Additionally, ESCWA is implementing a project within the framework of the regional initiative that seeks to identify vulnerability hotspots based on the findings of a regional climate model and regional hydrological modelling tools for assessing the impact of climate change on water resources at the Arab regional level. Complementary projects and activities coordinated within the framework of the regional initiative are also under preparation by partner organizations.

This initiative is being undertaken in response to requests by Arab countries, including ESCWA member States, and is expected to support more informed priority-setting, policy formulation and decision-making on climate change adaptation as it relates to the water sector.

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Introduction

1. Climate change and climate variability are expected to have serious impacts on water resources and socio-economic vulnerability in the Arab region. Flood and drought cycles, heat waves, cyclones, wind storms and dust storms witnessed in the region over the past few years are expected to increase in frequency and intensity. It is estimated that the impacts of climate change on the Arab region will include changes in temperature, precipitation, and surface runoff and river flow rates. These changes are expected to impact water resources in large and small river basins, including shared river basins from which ESCWA member countries derive most of their freshwater. Water quality in rivers and coastal zones is also expected to be affected owing to sea-level rise and saltwater intrusion into coastal aquifers. Changes in precipitation rates and drought frequency are likely to reduce groundwater recharge rates for renewable and non-renewable fossil groundwater resources, as well as reduce surface water availability.
2. Moreover, the socio-economic and environmental impacts associated with changing ecosystems and human environments could result in serious consequences for migration, agriculture, water supply and sanitation, food security, gender, eco-systems and human health. However, determining the extent to which these sectors could be affected by climate change impacts on water resources requires conducting vulnerability assessments that are specific to the region as well as analyses on other sectors.
3. The impact of climate change on water resources is usually estimated by defining scenarios for changes in climate conditions, simulated by general circulation models (GCMs) and linking them to a hydrological model in order to predict changes in river runoff and other hydrological parameters. Reliable data and information on climate and hydrologic variables are essential to be able to construct climate change projections and hydrological scenarios for impact assessment. This also requires the development and application of realistic hydrological models and a strong understanding of the linkages between climate and water modelling methods.
4. Other challenges include limited technological capacity and skills for engaging in climate modelling, including data management and the technical capacity for reviewing the large quantities of data that become available when downscaling global GCMs to the regional level. Climate projections are also premised on a high degree of uncertainty and have difficulty in modelling extreme climate events. Moreover, coordination and coherence among the various stakeholders and actors that deal with climate change poses a challenge that needs to be overcome in view of the importance of pursuing climate change assessment and adaptation in a multidisciplinary manner. The cross-sector of disciplines involved include, among others, meteorology, ecology, hydrogeology, economics, public health, gender analysis, disaster risk management, governance, community development and biodiversity.
5. In view of these challenges, ESCWA is collaborating with the League of Arab States (LAS) and its specialized agencies as well as other United Nations organizations serving the Arab region in view of responding to the requests by governments to assess the impact of climate change on the water sector and its associated implications for socio-economic and environmental vulnerability in the region.
6. This report reviews the resolutions, decisions and coordination mechanisms that have led to the launching of a regional initiative aimed at assessing the impact of climate change on water resources and socio-economic vulnerability in the Arab region. It describes how ESCWA was tasked to lead the implementation of this regional initiative through the Regional Coordination Mechanism (RCM) and what activities have been undertaken to coordinate with partners in order to reach this assessment. The report also introduces the project that ESCWA is implementing with partners within the framework of the regional initiative and how the project is set to identify vulnerability hotspots based on the findings of a regional climate model and regional hydrological modelling tools for assessing the impact of climate change on water resources at the Arab regional level. Complementary projects and activities coordinated within the framework of the regional initiative and follow-up activities proposed on climate change adaptation are also presented.

I. REGIONAL CLIMATE CHANGE MANDATES AND INITIATIVES

7. Given that climate change represents one of the main challenges facing the ESCWA region, there have been many efforts to tackle this global phenomenon at the highest political level. Despite the fact that the Arab region represents the smallest emitter of greenhouse gases (GHGs), with a share of less than 5 per cent of global GHGs, the LAS has taken the lead in the process of building the Arab commitment for common, but differentiated responsibilities towards adaptation to and mitigation of climate change impacts. ESCWA and other regional organizations provide substantive support to the LAS and Arab member states with a view to developing regional approaches and presenting a common Arab position in global talks and negotiations on climate change. Set forth below is an overview of the mandates, resolutions and coordination mechanisms in relation to climate change in the Arab region, particularly those in which ESCWA is playing a key role.

A. ARAB MINISTERIAL DECLARATION ON CLIMATE CHANGE

8. Commitments by Arab countries to climate change were reflected in the Arab Ministerial Declaration on Climate Change, which was adopted by the Council of Arab Ministers Responsible for the Environment (CAMRE) in December 2007. This Declaration identifies the principles for dealing with climate change issues on both the national and Arab regional levels with respect to mainstreaming climate change adaptation and mitigation measures within national and regional policies for sustainable development, and in line with efforts to achieve sustained economic growth and poverty eradication. The Declaration also calls for the preparation of methodologies aimed at assessing the impacts of climate change on water resources in view of supporting the development of adaptation strategies and measures in the Arab region. Governments are assigned the onus of implementing these policies in coordination and cooperation with all parties concerned, including regional organizations, scientific research centres, universities and institutions of civil society as well as the private sector.

B. ESCWA RESOLUTION ON CLIMATE CHANGE

9. In order to address climate change issues in the Arab region, ESCWA adopted, at its twenty-fifth Ministerial session in May 2008, a resolution in which the Commission requests the secretariat to prepare an assessment of the vulnerability to climate change of socio-economic development in the region, with particular emphasis on freshwater resources; and to take the necessary measures in order to increase awareness of climate change in terms of adjusting to and alleviating its impact, and to work with member countries and initiate dialogue over the relevant recommendations. The Commission also requested the secretariat to develop an Arab Framework Action Plan on Climate Change in partnership with the LAS, United Nations Environment Programme/Regional Office for West Asia (UNEP/ROWA) and other relevant regional organizations.

C. REGIONAL COORDINATION BETWEEN LAS AND THE UNITED NATIONS

10. The Arab Summit for Economic and Social Development, which was organized by the LAS in January 2009, accepted the preparation of a project to assess the impacts of climate change on water resources in the Arab region. Subsequently, and pursuant to the resolutions of the United Nations General Assembly and the Council of the League of Arab States, the Ninth Sectoral Meeting on Climate Change between the United Nations and LAS and their specialized organizations was held in June 2009. Major activities in relation to climate change adaptation and mitigation and potential areas of collaboration were addressed in the meeting. The meeting recommended that specialized entities within the United Nations and LAS were encouraged to collaborate on the preparation of vulnerability and impact assessments of climate change on land and water resources management, which additionally need to consider socio-economic impacts. Moreover, the meeting called for agencies to assist countries integrate climate change adaptation measures into development planning and natural resources management as well as promote networking and the exchange of best practices and lessons learned on climate change adaptation in the Arab region.

11. The draft Arab Framework Action Plan on Climate Change (AFAPCC) is solidly founded in the Arab Ministerial Declaration of December 2007. AFAPCC highlights key issues and challenges facing the Arab region with regard to coping with climate change, and elaborates priority programmes and joint actions at the regional level in various sectors as well as cross-cutting themes. Moreover, the AFAPCC emphasizes that adaptation to climate change needs to be made through a series of actions, including developing and disseminating methodologies and tools aimed at assessing the impacts of climate change and vulnerability; improving adaptation planning as well as its measures and procedures; integrating with sustainable development; and understanding, developing and disseminating measures, methodologies and tools that achieve economic diversification. Priority is given to the adaptation process as an effective way of addressing the potential effects of climate change over the next decade. Special attention is given to providing the necessary infrastructure in order to reduce potential risks, including the mechanisms for addressing the risks and improving the efficiency of the management of natural resources by monitoring and surveillance, early warning systems and appropriate technologies; readiness to confront disasters caused by climate change; capacity-building; improving access to and exchange of information, including weather information; raising the level of public awareness; and establishing partnerships.

12. In order to facilitate the implementation of the AFAPCC and ensure a coherent regional action, the Framework recommends the establishment of an Arab high-level coordination council on climate change (HL-CC-CC), comprising the heads of the national climate change committees and representatives of regional organizations, private sector and civil societies. Additionally, it recommended the establishment of a technical advisory committee to guide and advise the council on research, programmes and projects, and to report regularly on progress. The draft plan was completed and is set to be endorsed by Arab countries.

D. REGIONAL COORDINATION BETWEEN ESCWA AND THE UNITED NATIONS

13. In order to strengthen cooperation on climate change issues, the RCM established the Thematic Working Group on Climate Change (TWG-CC) in 2008. The RCM is led by ESCWA and is guided by the United Nations Chief Executives Board (CEB), while the TWG-CC is chaired by UNEP/ROWA. The main objective of the Thematic Working Group is to enhance collaboration among United Nations agencies on programme planning and implementation related to climate change as well as assist Arab countries in addressing their technical and capacity-building needs with more focus on regional activities. The first meeting of the Thematic Working Group was hosted by LAS in November 2008. While initially an observer, the LAS became a member of the RCM and of the working group in 2009, thereby indicating the commitment of the United Nations to work with its regional partners and within existing regional institutional frameworks and mechanisms to deliver more coherent and region-relevant support. This first meeting addressed areas of joint collaboration that are relevant to regional priorities, as indicated in the Arab Ministerial Declaration and AFAPCC. One focus area was adaptation to climate change and developing methodologies for a vulnerability assessment on water resources in the Arab region, and conducting regional training programmes on methodologies for vulnerability assessment. The agencies expressing interest in conducting a joint vulnerability assessment were identified, namely, ESCWA, United Nations Development Programme (UNDP), UNEP/ROWA and United Nations Educational Scientific and Cultural Organization (UNESCO). An action plan with a timeline for conducting the vulnerability assessment as well as other activities on climate change was adopted by the working group.

14. In response to these calls to prepare a joint vulnerability assessment related to the water resources sector, ESCWA organised in cooperation with the LAS and UNEP/ROWA, an "Expert Group Meeting Towards "Assessing the Vulnerability of Water Resources to Climate Change in the Arab Region" (Beirut, 26-28 October 2009). The aim of the meeting was to reach a consensus on the purpose, scope and methods to be adopted for the preparation of an Arab regional vulnerability assessment of the impact of climate change on water resources. The meeting was attended by Arab countries and representatives from the United Nations and LAS organizations, which have been mandated to support this collaborative initiative through various inter-governmental forums.

15. A project framework was developed as a main outcome of the meeting. The framework is based on four pillars consisting of the following: (a) collection and review of baseline information, including the development of an associated knowledge management system for regional climate and hydrological data; (b) impact analysis and vulnerability assessment, which includes model identification and downscaling to the regional level, based on regional specificities; (c) awareness raising and information dissemination to produce policy-relevant materials, such as a brief on vulnerability hotspots; and (d) capacity-building and institutional strengthening on a variety of topics, including climate change modelling and vulnerability assessment. The meeting was followed by the preparation of a project concept note on the regional initiative that was used as the basis for forging partnerships and that was reviewed by all partners. A core group was established for further follow up, comprising ESCWA, UNEP/ROWA the International Strategy for Disaster Reduction/Regional Office for Arab States (UNISDR/ROAS), Arab Centre for the Study of Arid Zones and Dry Lands (ACSAD) and representatives from member countries. ESCWA subsequently drafted a project concept note that included these four components and was circulated to partners for comment. A series of project proposals were subsequently developed based on this concept note, including a project brief on water and climate that was submitted by ACSAD, under the auspices of the LAS secretariat, to the Arab Ministerial Water Council (AMWC), which approved the project for implementation in July 2010.

E. ESCWA ACTIVITIES AT THE GLOBAL LEVEL

16. At the global level, the United Nations coordinates its work under the Chief Executives Board (CEB) whose decisions are supported through the High Level Committee on Programmes (HLCP) and its Working Group on Climate Change. The CEB report, entitled “Acting on climate change: The United Nations system delivering as one”, which was published in November 2008, mandates United Nations regional commissions, including ESCWA, to serve as “the Designated Convener for cross-cutting areas of United Nations activities supporting global, regional and national actions”. The United Nations coordination on climate change focuses on a number of major issues in response to the negotiation process and the broader mandates of the United Nations system, namely, adaptation, mitigation and finance, technology transfer, capacity-building, and reducing emissions from deforestation and forest degradation in developing countries (REDD).

17. ESCWA contributed to the United Nations Framework Convention on Climate Change (UNFCCC) fifteenth Conference of the Parties (COP-15), which was held in Copenhagen (December 2009). The five United Nations regional commissions organized a side event during the conference during which a joint document was presented on the impact of climate change on member countries and how to develop strategies and implement programmes to ensure sustainable management of natural resources in their respective regions. Activities implemented by ESCWA in support of climate change adaptation and mitigation were also presented as well as planned programmes.

18. ESCWA has also been contributing substantively to the UN-Water Thematic Priority Area on Water and Climate Change. It provided input to the policy note on “Climate change adaptation: The pivotal role of water”;¹ and participated in the task force meetings that focused on mapping exercises and gap analyses, and on formulating and sharing climate change databases. ESCWA is currently assisting the working group to finalize a mapping exercise of UN-Water members and partners on mandates and capacities related to water and climate issues; conduct a literature review of existing climate change adaptation guidelines related to the water sector; and pursue opportunities to increase understanding regarding the vital importance of water in climate change adaptation.

II. CONCEPTUAL FRAMEWORK FOR IMPACT ASSESSMENT AND VULNERABILITY ASSESSMENT OF WATER RESOURCES AND RELATED SECTORS

19. The impacts of climate change on water resources are usually assessed by developing scenarios for changes in climate conditions over a defined time period, generating climate change projections through

¹ UN-Water, “Climate change adaptation: The pivotal role of water” (2009).

general circulation models (GCMs), and then linking these projections to hydrological models. The hydrological models then serve to predict changes in river runoff, groundwater recharge and extraction rates. Downscaling techniques are often employed to achieve the desired level of detail for regional and national assessments in terms of both time and space. While based on scenarios and projections, impact assessment outcomes tend to be measurable and quantitative in nature.

20. An impact assessment, however, is distinct from a vulnerability assessment. A vulnerability assessment traditionally seeks to identify the potential areas of social, economic and environmental weakness that can be experienced due to climate change. The existing state of social and political institutions, financial solvency, as well as emergency preparedness plans thus has much to do with the extent to which a country may be vulnerable to climate change pressures. Since impact assessments and vulnerability assessments tend to be undertaken separately from one another, there are many challenges that must be overcome in preparing a socio-economic vulnerability assessment for the Arab region that is based on a climate change impact assessment focused on freshwater resources.

21. Set forth below is an overview of the development of the conceptual framework for the impact assessment of water resources and the associated socio-economic vulnerability assessment requested by ESCWA member States. This framework was discussed with the concerned stakeholders during the Expert Group Meeting on the Development of a Vulnerability Assessment for the Arab region to Assess Climate Change Impacts on the Water Resources Sector convened by ESCWA and the LAS (Beirut, 8-10 November 2010).

A. MODEL-BASED APPROACH

22. In order to assess the impact of climate change on water resources and conduct a vulnerability assessment on its implications for socio-economic development across various sectors, a conceptual framework and plan of action for project implementation is needed. The logical flow in the process of developing this framework is represented by three, interrelated components, namely: climate modelling, hydrological modelling and the assessment of socio-economic and environmental vulnerability (see figure below). All three components are dependent upon access to and availability of reliable data.

23. The climate modelling phase is usually realized through a number of simulations based on general circulation models (GCMs) to define the appropriate boundary conditions. Given that these models cannot provide information at scales that are finer than their computational grid cell (usually of the order of 200 km), the development of downscaling methodologies remains an important process to provide information at finer scales. This can be achieved by using high-resolution dynamical models or empirical statistical downscaling.² GCMs are then used to derive a regional climate model (RCM) for downscaling at a reasonable resolution using a number of climate projections.

24. Reliable regional climate models are now available for many regions thanks to advances in the modelling and understanding of the physical processes of the climate system. The temporal scales can vary from a very short time interval of five minutes for urban water cycle to a yearly time scale for annual water balance computation; and spatial resolutions can range from a few square kilometres (for urban and rural watersheds) to several thousand square kilometres, such as large river basins. While GCMs have been recognized as being able to represent reasonably well the main features of the global distribution of basic climate parameters, these models cannot so far reproduce hydrological variables for regional climate conditions at the desired temporal and spatial scales of relevance to hydrological studies. The outputs from GCMs are usually at resolutions that are too coarse for national and local analysis; and may even prove difficult for identifying regional impacts when conducted at a low resolution (for example, at 200 km). As a result, there downscaling GCM predictions of climate change to regional and national scales can improve

² Intergovernmental Panel on Climate Change Secretariat (IPCC), "Impacts, adaptation and vulnerability", in *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007*, M.L. Parry et al. (eds.), which is available at: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html.

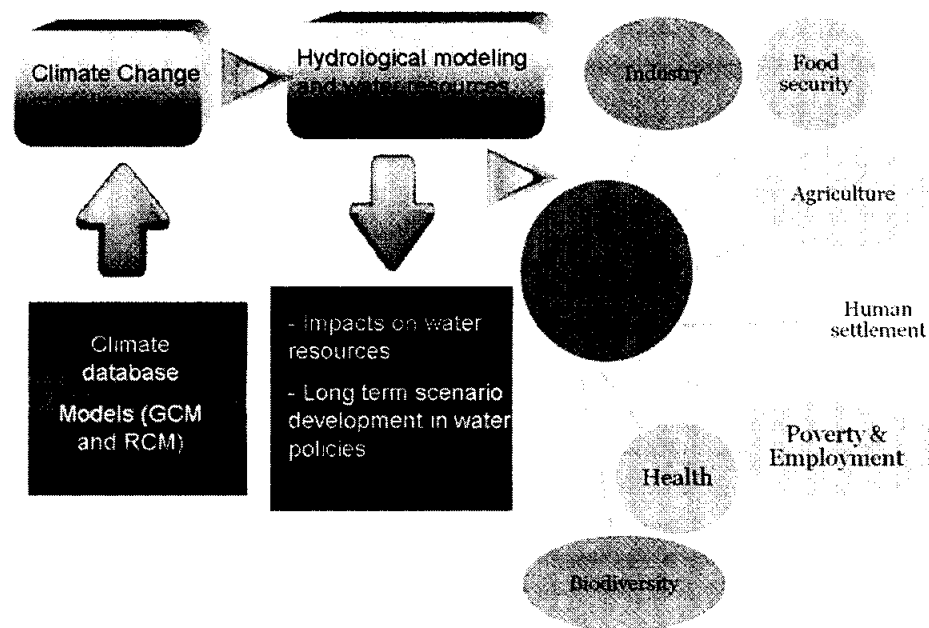
projections regarding precipitation and temperature over time. This usually necessitates an RCM with a resolution in the order of 25 or 50 km depending on the geographic area being examined, the availability of meteorological records for the targeted area.

25. The key outputs of RCM, such as precipitation, temperature and evapotranspiration, are derived for various climate projections and are fed into a hydrological model to predict changes in river runoff, groundwater recharge, extraction rates, water quality and other key hydrological variables. Various hydrologic models can be used that are physically based and whose structures are compatible with RCMs (for example, raster-based models).

26. Water resource management modules and decision-support systems can also be used by water planners and decision makers to develop future water supply and demand scenarios per sector and for different periods, such as 25 and 50 years, based on the RCM projections or hydrological models. This can assist planners and decision makers to develop long-term water policy scenarios using methodologies and approaches that are more scientifically sound. Reliable data and information on climate and hydrologic parameters are vital for the development of these scenarios that are appropriate for vulnerability and impact assessments. Moreover, it is essential to use realistic hydrological models and to understand the linkages between these models and climate models.

27. Furthermore, the socio-economic vulnerability and environmental impacts associated with climate change need to be identified in order to measure the effects of climate change within a sustainable development context. This can be done by analysing impacts and mapping hotspots of affected sub-regions based on key issues of regional concern. For instance, crop yields and sensitivities to climate changes in the agricultural sector are key parameters that can be analysed and mapped using various scenarios and agro-economic models based on the outputs generated by hydrological models. These findings could eventually be incorporated into future agricultural strategies and socio-economic policies deliberated at the regional and national levels. Health and environmental impacts could also be analysed using such models as well as related issues such as access to freshwater, impacts on wastewater treatment, changes in temperature ranges, shifts in poverty ratios, and threats to endangered species. These modelling tools could contribute to estimating impacts and vulnerability associated with the potential spread of vector-borne diseases or the loss of natural habitats based on the direct effect of climate change impacts on water resources.

Figure. Schematic for the proposed conceptual framework of methodologies for impact assessment and vulnerability assessment of water resources and related sectors



B. INDICATOR-BASED APPROACH

28. A vulnerability assessment can alternatively be conducted based on one or more hypothetical scenarios and a set of social, economic and environmental indicators. Analysis in this case is based on an examination of historical trends, a solid understanding of existing institutions affecting the current state of socio-economic development, and insight into local community responsiveness and resilience to external pressures. An indicator-based study might then be undertaken in which climate change, water-related hazards (such as floods, rainfall events, droughts, and water-borne epidemics) are represented by variables measuring their intensity, duration and frequency. The positive or negative effects of these hazards on these indicators then enable the identification of regions, communities, groups and ecosystems that are more or less vulnerable to water-related hazards arising from climate change.

29. This approach is similar to the one developed by Adger et al. in which vulnerability can be seen as a function of exposure to hazard, sensitivity to hazard and adaptive capacity.³ The latter represents a system's capability to reduce its vulnerability through adaptation to future hazards, or those that occur over a long period of time. For example, the percentage of population living in flood-prone areas is an indicator of exposure to flooding hazards, while the percentage of those with inadequate shelter and/or drainage facilities is a measure of sensitivity to flooding. It should be noted that this vulnerability assessment approach is not aimed at conducting quantitative climate change risk assessment. Vulnerability indicators in this case are intended as tools to assess and monitor adverse conditions; and to flag up vulnerability pockets in order to inform decision-making on adaptation policies to climate change and pursue further action to investigate areas of concerns. The table below shows some examples of the vulnerability indicators that can be used to support indicator-based vulnerability assessments.

SAMPLE INDICATORS USED TO SUPPORT VULNERABILITY ASSESSMENT

Category	Factor	Measure
Water resource planning and management	Application of IWRM	Level of application
	Efficiency of water demand management	Cost recovered from water fees (%)
	Water network losses	Water network losses (%)
	Water storage capacity	Water storage to total water resources (%)
	Status of strategic water reserves	Abstraction to total strategic water resources (%)
Economy	General state of the economy	Gross national income (GNI)
		Gross domestic product (GDP)
		Gross savings (% of GNI)
		Total reserves (% of total external debt)
		Total debt services (% of GNI)
		Lending interest rate (%)
	Population relative wealth	GNI per capita
		GDP per capita
		Unemployment (% of total workforce)
	Poverty	Population earning less than \$1.25 per day (%)
	Economic diversification	Value added – industry (% of GDP)
		Value added – services (% of GDP)
	Energy consumption	Electric power consumption (kWh per capita)
Energy cost	Diesel fuel price	

³ W.N. Adger et al., "New indicators of vulnerability and adaptive capacity", Technical Report No. 7 (Tyndall Centre for Climate Change Research, (2004).

Category	Factor	Measure	
Demography and income	Size of population	Total population	
	Population growth	Population growth	
	Population-female	Number of women to total population (%)	
	Population density	Population per km ²	
	High concentration of people in urban areas		Population in the largest city (% of total population)
			Population in urban agglomerations of more than 1 million (% of total population)
Economically dependent population	Number of young and old to working-age population (%)		
Agriculture	Dependency on agriculture	Agricultural land to total (%)	
		Workforce in agriculture (%)	
		Rural population (% of total population)	
	Dependency on rain-fed agriculture	Rain-fed land (% of total)	
	Level of land degradation	Degraded land (% of total)	
Food security	Reliance on single or few crops	Top three strategic crops (% of total products)	
	Reliance on locally produced food	Food produced locally (%)	
	Food productivity	Cereal yield per hectare (kg)	

III. PREPARATION OF THE VULNERABILITY ASSESSMENT FOR THE ARAB REGION AND THE ROLE OF ESCWA IN DEVELOPING ADAPTATION MEASURES AND STRATEGIES

30. The Regional Initiative on the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region is the framework program under which the joint vulnerability assessment will be prepared. The initiative draws upon impact assessment and vulnerability assessment methodologies that depend upon modelling tools and indicator-based approaches that will result in the preparation of an integrated assessment. As coordinator of the regional initiative, ESCWA is working with regional organizations and project partners to ensure coherence and complementarity among organization on the preparation of the regional assessment based on the four pillars that structure the regional initiative. The following parameters have hereto been agreed to:

- (a) The geographic scope of the regional assessment will be based on the delineation of an Arab Domain that will serve as the basis for running one or more regional climate models (RCMs);
- (b) The RCMs will be based in large part on downscaling from global circulation models;
- (c) The climate change projections and outputs from one or more RCMs will serve as the basis for generating hydrological scenarios;
- (d) Socio-economic vulnerability to the impacts identified through the climate modelling and hydrological modelling components will be cross-sectoral in nature;
- (e) Vulnerability hotspots will be identified through geo-spatial referenced maps of the Arab region; overlays may be used to conduct spatial analysis across different vulnerability parameters;
- (f) Regional stakeholders, policy advisors, governmental decision-makers partner organizations will be involved in capacity building activities through different project components; and
- (g) Consultations will be regularly organized with regional stakeholders to discuss methods and preliminary findings at each stage of the assessment process.

31. Efforts to secure financial and technical support for the regional initiative are underway. Funding for a significant project component has been secured from the Swedish International Development Cooperation Agency (SIDA) through a project signed between SIDA and ESCWA in December 2010. The project is led by ESCWA and implemented in partnership with the LAS, ACSAD, WMO and the Swedish Meteorological and Hydrological Institute, which is one of the unique institutions in the world that merges the management and development of information on weather, water and climate into a single public agency. The International Development and Research Council (IDRC) Middle East and North Africa Regional Office in Cairo has expressed interest in supporting the initiative through a regional project led by ACSAD. The Government of Egypt, UNEP/ROWA, UNESCO and other regional organizations have also expressed interest in contributing technically and financially to the regional initiative in view of preparing the joint assessment.

32. Within the framework of the ESCWA work program for 2010-2011, a study is under preparation that elaborates upon the methodology to be applied in conducting the integrated assessment that links impact assessment and vulnerability assessment tools and approaches. It is expected that this study will contribute to the implementation of the regional initiative and the preparation of the vulnerability assessment.

33. In anticipation of the outcomes and findings of the regional initiative, ESCWA submitted a project proposal to the United Nations Development Account in October 2010 aimed at developing national capacities to adapt to climate change by applying IWRM tools in the key sectors that will be affected by climate change impacts on the water sector. ESCWA would lead this multidisciplinary regional project on climate change adaptation in the water sector given its mandate to assist member countries in terms of assessing and responding to climate change challenges in the region. Three United Nations partners would also contribute to this project, namely, the United Nations Economic Commission for Africa (ECA), UNEP/ROWA and the regional offices of World Health Organization (WHO), in addition to two Arab organization, namely ACSAD and the Arab Countries Water Utilities Association (ACWUA). The project proposal has passed the preliminary stages of review and will be considered for funding in early 2011.

34. For the biennium 2012-2013, ESCWA is planning to organize an expert group meeting on regional cooperation for climate change adaptation, which is set to strengthen linkages between all national and regional entities in the Arab region, thereby ensuring synergy in developing adaptation strategies; and to develop guidelines for formulating region-specific strategies that can cope with the specificities of the Arab region. Moreover, a study will be conducted on the mechanisms and measures for incorporating regional priorities into sector strategies and plans within the context of strengthening the regional coordination for climate change adaptation.

35. Additionally, within its Technical Cooperation programme, ESCWA will continue to provide support to its member countries in terms of priority-setting, developing national adaptation strategies and building the capacity of national experts for negotiations and project financing. .
