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Economic and Social Commission for Western Asia (ESCWA)

Expert Group Meeting on the Development of a Vulnerability Assessment
for the Arab Region to Assess Climate Change Impacts on the Water Resources Sector
Beirut, 8-10 November 2010

Summary

The expert group meeting aimed to update the state of knowledge in climate change and water resources modelling, impact analysis and vulnerability assessment and to build consensus on the way forward for implementing the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region. This included identifying appropriate approaches for reviewing baseline information, conducting climate change impact analysis and preparing the vulnerability assessment. The meeting was attended by Arab member States and representatives from United Nations and League of Arab States organizations, which have been mandated to support this collaborative initiative through various inter-governmental forums.

This second meeting in support of the regional initiative follows the expert group meeting “Towards Assessing the Vulnerability of Water Resources to Climate Change in the Arab Region” (Beirut, October 2009). The first meeting resulted in the preparation of the four pillar framework that structures regional initiative into: (a) baseline review; (b) impact assessment and vulnerability assessment; (c) awareness raising and information dissemination; and (d) capacity building and institutional strengthening.

This meeting consisted of three days of interactive discussions at the plenary and working group levels. On the first day, experts reviewed the conceptual framework of the regional initiative and the components of conducting climate change impact assessment on water resources and socio-economic vulnerability. This included a review of current work being undertaken in the region as well as a discussion of regional climate models for generating climate change projections for the Arab region. One technical working group discussed preferred approaches for pursuing climate change modelling for the Arab region, while another working group reviewed the work of regional climate change networks to identify appropriate ways for generating benefits from existing mechanisms in the Arab region.

The second day examined forging linkages between climate change projections and hydrological modelling and their application in informing vulnerability assessment and mapping. Two working groups complemented the plenary sessions for more detailed discussions on developing hydrological models and a communication and knowledge management strategy for supporting the regional initiative.

On the third day, the recommendations of the technical working groups were presented and plenary discussions took place to define the way forward for implementing the regional initiative. The discussion concluded with a set of recommendations based on the four pillars of the regional initiative, modalities for cooperation, and expressions of commitment by Arab Governments, United Nations organizations, League of Arab States specialized agencies and regional partners to support the regional initiative.

CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
INTRODUCTION	1-3	3
I. CONCLUSIONS AND RECOMMENDATIONS	4-8	3
A. Baseline review		
B. Impact analysis and vulnerability assessment		
C. Awareness raising and information dissemination		
D. Capacity building and institutional development		
II. MAIN TOPICS OF DISCUSSION	9-46	5
A. Conceptual framework and stocktaking	9-11	5
B. Regional climate modelling	12-16	6
C. Technical Working Groups 1.....	17-21	7
D. Linking climate change projections to hydrological models.....	22-25	7
E. Technical Working Groups 2.....	26-28	8
F. Forging linkages between climate change analysis and vulnerability assessment and mapping.....	29-33	9
G. Roundtable Discussion: Options for integrated climate change assessment.....	34-37	9
H. Consolidation of a Draft Implementation Plan.....	38-43	10
I. Discussion of next steps.....	44-46	13
III. ORGANIZATION OF WORK	47-54	13
A. Venue and date.....		13
B. Opening.....		13
C. Participants.....		13
D. Agenda.....		14
E. Evaluation.....		14
F. Documentation.....		14
ANNEX		
List of Participants.....		15

INTRODUCTION

1. The Economic and Social Commission for Western Asia (ESCWA) in partnership with the League of Arab States (LAS) organized 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 from 8 to 10 November 2010 in Beirut, Lebanon. Representatives from most Arab Governments and regional and international organizations participated in the expert group meeting (EGM), which was the second meeting convened in support of the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region.

2. The main objectives of the meeting were as follows:

- (a) Stocktaking and exchange of lessons learned on the experiences in the region on climate change impact analysis and vulnerability assessment related to the water sector.
- (b) Reviewing methodologies and tools for climate modelling, hydrological modelling and vulnerability assessment taking into consideration knowledge gaps and data availability.
- (c) Building consensus on approaches for reviewing baseline information, conducting impact analysis and preparing the assessment of the impact of climate change on socio-economic and environmental vulnerability in the Arab region.
- (d) Discussing proposed activities for the regional project in view of formalizing a work plan based on a mapping of partner pledges and contributions to the regional initiative.

3. The meeting was comprised of plenary sessions and technical working group discussions. Chapter I of this report highlights the main conclusions and recommendations of the meeting, while chapter II provides a summary of the presentations and discussions held within each session including the recommendations of the technical working groups. Chapter III summarizes the outcomes of the round table discussion and present the consolidated draft implementation plan for the regional initiative. Full documentation of the meeting is available at the following address:

<http://www.escwa.un.org/information/meetingdetails.asp?referenceNum=1338E>

I. CONCLUSIONS AND RECOMMENDATIONS

4. Through a consultative process involving Arab member states, international experts, and United Nations and League of Arab States specialized and regional organizations serving the Arab region, the expert group meeting provided a forum for discussion and consensus building for moving forward with the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region. The following recommendations were proposed by the participants.

A. BASELINE REVIEW

5. Compilation and review of historic and current data on climate and water resources in the Arab region is essential to support the preparation of the vulnerability assessment. To this end, it was agreed to:

- (a) Develop a standardized mechanism to collect and management climate data and information, possibly based on variables identified by the “COordinated Regional climate Downscaling EXperiment” (CORDEX);
- (b) Solicit information and data sharing from Arab and non-Arab countries that are part of the shared water basins to support the hydrological modelling component of the assessment;

- (c) Include data on the impacts of extreme events at the regional and local level;
- (d) Collect data from indigenous and traditional sources of knowledge at the local level;
- (e) Explore new sources of data, such as data collected through remote sensing;
- (f) Include information on mitigation and adaptation measures being undertaken by some countries in the region.

B. IMPACT ANALYSIS AND VULNERABILITY ASSESSMENT

6. To determine the impacts of climate change on water resources and its associated implications for socio-economic vulnerability, participants discussed the integrated climate change assessment methodology which links climate change impact assessment to socio-economic vulnerability assessment. The resulting recommendations agreed to:

- (a) Reach consensus on a clear approach for assessing vulnerability in the regional initiative, given differences that exist in the definitions and methodologies for assessing biophysical vulnerability and socio-economic vulnerability;
- (b) Limit the scope of the regional initiative to climate change impact assessment, vulnerability assessment and the associated enabling pillars so as to provide a common regional basis for supporting negotiations, priority-setting and adaptation policy formulation at the regional level;
- (c) Establish a clear timeline for implementing the integrated assessment;
- (d) Avoid systematic biases that may originate from assumptions and inter-relationships embedded in regional climate models and hydrological models by using national and local level data to verify model outcomes;
- (e) Provide adequate tools to assess climate change impact on water resources in a comprehensive manner, so that water quantity is assessed as well as water quality and its impact on health;
- (f) Ensure that climate change projections on water resources examine a range of water-related parameters, including rainfall, temperature variations, wind, etc.;
- (g) Delineate an Arab domain for regional climate modelling to cover the entire Arab region and include the headwaters of shared rivers that flow into the Arab Region;
- (h) Seek to introduce the Arab domain developed as part of the regional initiative as a CORDEX domain to support the application of other regional climate models at the Arab regional level; and draw lessons from downscaling efforts being conducted in other regions;
- (i) Ensure that the vulnerability assessment reflects regional specificities that are unique to the Arab region;
- (j) Issue outcome documents to inform the development of Arab position for negotiation in global forums, including the United Nations Conference on Sustainable Development (Rio+20) and facilitate better access to climate adaptation funds.

C. AWARENESS BUILDING AND INFORMATION DISSEMINATION

7. During the course of the expert group meeting communication and knowledge management tools were discussed as means of raising awareness and disseminating information about the project process and expected outcomes. To this end, it was recommended to:

- (a) Improve coordination among climate change initiatives being implemented in the Arab region;
- (b) Develop a national database with accurate and accessible information on water related parameters needed to carry-out regional climate and hydrological model simulations;
- (c) Make available the outputs of the regional climate model component of the regional initiative so as to support other research initiatives at the regional, national, sub-national and basin levels.

D. CAPACITY BUILDING AND INSTITUTIONAL STRENGTHENING

8. In view of maximizing benefits from the preparation of the integrated climate change assessment, preparation of the assessment should be complemented by building the capacity of regional stakeholders and strengthening the capacity of institutions to engage in climate change modelling assessment and analysis as it relates to the water sector. Accordingly, it was recommended to:

- (a) Increase understanding and expertise in the use of methodologies and technologies applied to support climate change monitoring, forecasting and projection;
- (b) Design the regional climate modelling and hydrological model components of the initiative in a manner that can help to inform the preparation of regional and national adaption policies and strategies;
- (c) Organize forums that bring together climate change scientists with representatives of socio-economic sectors so as to exchange ideas and perspectives;
- (d) Encourage the participation of national meteorological offices in the preparation of the integrated assessment;
- (e) Upgrade climate and water monitoring systems and encourage the development of national information systems;
- (f) Define technology transfer requirements for the preparation of climate change assessments and their use to develop adaptation policies and measures.

II. MAIN TOPICS OF DISCUSSION

A. CONCEPTUAL FRAMEWORK AND STOCKTAKING

9. ESCWA provided an overview of the regional initiative as an outcome of a collaborative effort between the United Nations, the League of Arab States and their respective specialized organizations that was first formalized at the joint expert group meeting “Towards Assessing the Vulnerability of Water Resources to Climate Change in the Arab region,” in October 2009. The presentation underlined the scope and geographical coverage of this initiative, as well as its objective to provide a common information platform for assessing and addressing climate change impacts on freshwater resources in the Arab region, and its associated effects on socio-economic vulnerability.

10. ESCWA further proposed a conceptual framework for assessing the vulnerability of Arab States to climate change impact on freshwater resources, and proposed the preparation of an integrated assessment that links climate change impact assessment to vulnerability assessment. Different assessment approaches were suggested for examining different types of vulnerability, including an indicators based approach.

11. During the discussions, attention was drawn to the frequency and intensity of extreme weather events occurring in the Arab region. It was noted that a few countries, like Oman and Morocco, had already adopted adaptation measures to face climate change impacts, such as new water resources

management policies and dam construction. There was thus a pressing need for reliable information and analysis to identify vulnerabilities and support decision-making processes. Participants emphasized the importance of developing regional and national databases on water resources to yield accurate results.

B. REGIONAL CLIMATE MODELLING

12. The World Meteorological Organization (WMO) exposed the main findings of the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) as they related to the Arab region. It was explained that three working groups carried out the assessment completed in 2007 on future climate change projections and likely impacts. The scope, content and process adopted for the preparation of the Fifth Assessment Report (AR5) was also presented, along with highlights of the main topics to be covered by each of the three working groups, with Working Group II assigned the task of looking at regional aspects. The Coupled Model Inter-comparison Project Phase 5 (CMIP5) framework for climate change modelling over the next five years was also described as a research program aimed at informing the preparation of AR5 and beyond. CORDEX was also discussed and the opportunities presented by considering other regional domains being examined under CORDEX.

13. The Swedish Meteorological and Hydrological Institute (SMHI) presented a proposed approach for applying regional climate modelling to the Arab region. The presentation discussed regional downscaling from global circulation models and how to overcome uncertainty by using data collected from each country to support the verification of RCM outputs. The presentation elaborated on the new emission scenarios that will be used by the IPCC during the preparation of AR5, and suggested that these representative concentration pathways (RCPs) be used to guide the assessment to be undertaken by the regional initiative. In discussing the delineation of a proposed Arab Domain, it was recommended to set up a domain for the entire region and to perform RCM downscaling from a number of GCMs.

14. Climate change risk management was presented by the UNESCO-Cairo Office Hydrology Program. The presentation reviewed UNESCO's strategic objectives and work in four interdisciplinary key areas to combat climate change, including several activities being undertaken to mitigate and adapt to climate change. The MDG-Spanish Fund project on climate change risk management in Egypt was introduced, including its objectives, components and activities under implementation with other regional organizations. This included the elaboration of the ensemble methodology followed to apply an RCM to the Nile Basin and parts of the Arab region, which was undertaken in partnership with the Ministry of Water Resources and Irrigation of Egypt and other partners. The presentation concluded with an overview of the impacts projected of climate change impacts on groundwater in the Arab region and recommended response measures.

15. A proposal for establishing a regional climate information network for the Arab region was presented by the WMO. The importance of information and data availability for conducting climate change assessments and developing adaptation strategies was highlighted, along with the WMO's strategy for supporting societal response to climate change. Regional Climate Centres (RCCs) and Regional Climate Outlooks Forums (RCOFs) were identified as key mechanisms for generating and managing climate change information at the regional level, including their capacity to engage in climate prediction and projection. A review of the RCOF concept, process and successful application in other regions was described, and the role that such networks can play in developing the knowledge base needed to address challenges to food security, public health and climate change. A vision for establishing these forums in the region was offered, as well as recommendations for the development of regional climate information network for the Arab region.

16. In the ensuing discussions, the need for better coordination among several organizations was raised given the fact that a number of climate change initiatives are being implemented in the Arab region. For

modelling purposes, experts stressed out that each member country should contribute in providing the required data for validating the projections of the computer models.

C. TECHNICAL WORKING GROUPS 1

17. At the end of the second day, experts convened in two parallel technical working groups to build consensus on the way forward for implementing the regional initiative. The first working group on regional climate modelling was intended to formulate proposals for the preferred approaches for pursuing climate change modelling applications for the Arab region, while the second working group on climate change networking reviewed the work of regional climate change networks to identify appropriate ways for generating benefits from new and existing mechanisms in the Arab region.

18. The first working group on regional climate modelling discussed the delineation of an Arab domain that would include shared water resources and their sources. It was suggested to consider the boundary conditions set up for the Africa domain by CORDEX, a coordinated international effort to produce improved multi-model regional climate downscaling efforts for input to the IPCC Fifth Assessment Report and beyond. Parameters associated with the application of an RCM were also preliminarily identified, as well as potential sources of data.

19. The second working group on climate change networking reviewed the work of various climate change networks in the region, including the Regional Coordination Mechanism Thematic Working Group on Climate Change, the UNEP/ROWA Climate Change Adaptation Network, and the Working Group on Climate Change established under the Arab Integrated Water Resources Management Network (AWARENET). Discussion focused on ways to generate increased benefits from these mechanisms. It was agreed that efforts should be undertaken to strengthening cooperation and the exchange of experiences between these networks. A clear work program and adequate support were defined as prerequisites to maintaining a sustainable and successful network.

20. The outcomes of the two technical working groups were presented to the plenary. Participants recognized the need for national data to validate the outcomes of an RCM. It was pointed out that the permanent Committee for Meteorology of the Council for Arab Ministers Responsible for the Environment (CAMRE) had initiated discussions with the WMO on possible avenues of cooperation related to the establishment of regional climate centres. Participants emphasized that a proper institutional set-up and political commitment were prerequisites to establishing mechanisms aimed at data sharing and information exchange among national stakeholders.

21. Based on a review of the outcomes from the climate change networking working group, participants emphasized the importance of establishing a team of professionals for managing regional networks and having sufficient financial resources to successfully manage a network.

D. LINKING CLIMATE CHANGE PROJECTIONS TO HYDROLOGICAL MODELS

22. The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) presented examples of applying water resources management and hydrological models in the Arab region, including case studies based on the use of the Water Evaluation and Planning System (WEAP) in Morocco and the Syrian Arab Republic. Case studies on flood risk management in Lebanon, the Syrian Arab Republic and Saudi Arabia using different hydrological modelling were offered, as well as examples on groundwater modelling around Damascus. An assessment of the vulnerability of freshwater to environmental change in the Eastern Mediterranean region was also presented based on methodological guidelines prepared by UNEP and Peking University.

23. SMHI presented the criteria for identifying regional hydrological models for elaborating climate change impact analysis on water resources for the Arab Region. The proposed approach includes carrying out RCM downscaling for a number of GCMs, setting up a regional hydrological model that covers the Arab region, applying a regional hydrological modelling using RCM outputs for the present and future climate and providing RCM outputs for use in local hydrological models. The presentation elaborated on the criteria needed for choosing the best regional hydrological models for the Arab Region. This included the ability of the model to appropriately represent arid climates, require a limited number of parameters to be calibrated, be suitable for large scale application so as to make it possible to estimate groundwater recharge, and be easy for use to facilitate compatibility with different input datasets and computing efficiency.

24. The United Nations Regional Centre for Disaster Risk Reduction (UNISDR) delivered a presentation on disaster risk reduction and climate change adaptation. It covered the disaster risks associated with climate change while giving examples of sea level rise and storm surges experienced in the Arab region. The presentation also discussed global and regional strategies for disaster risk reduction.

25. During the discussion, attention was drawn to the fact that rainfall and geomorphology should be taken into account during flood risk analysis. On the issue of regional versus national hydrological models, it was highlighted that hydrological models should be based on the basin-centered approach and depending on inputs from RCM. SMHI suggested that a common approach be applied for the entire region to ensure consistency. Participants expressed concern regarding the calibration of regional hydrological models given data availability and data access constraints.

E. TECHNICAL WORKING GROUPS 2

26. Two technical working groups were formed to discuss hydrological modelling and the development of communication and knowledge management strategy respectively. The first working group examined the comparative benefits of conducting hydrological modelling at the regional, national and basin levels. The outputs of climate projections were considered important inputs for the application of hydrological models at the regional and basin scale.

27. The second working group discussed the requirements to develop an effective climate change communication strategy and knowledge management platform for the Arab region. Special focus was placed on the purpose of the regional communication strategy and knowledge management system for the regional initiative. Available on-line tools for communicating information, consolidating information sources and fostering collaboration between regional partners were discussed, including the possible components of a common knowledge management platform for the Arab region.

28. The outcomes of the working groups were presented to the plenary session. The participants suggested establishing a task force for identifying suitable RCMs and regional hydrological models for application in the Arab region. Participants also noted the need for sustainable financial resources to develop and maintain an effective climate change communication strategy and knowledge management platform. Attention was drawn to the importance of avoiding overlap with existing communication platforms and the need to effectively inform decision-makers and the public about outcomes of the regional initiative. The United Nations University (UNU) and UNISDR proposed to host a knowledge platform for regional initiative through their already established on-line platforms, indicating that they would explore this opportunity and revert back with further information.

F. FORGING LINKAGES BETWEEN CLIMATE CHANGE ANALYSIS AND VULNERABILITY ASSESSMENT AND MAPPING

29. Vulnerability assessment and mapping of climate change hotspots based on impact analysis outcomes was presented by the AWARENET Climate Change Working Group chair. An overview of the integrated assessment approach was discussed showing the how climate change impact assessment can be used to inform the preparation of a socio-economic vulnerability assessment. The severe drought event experienced in the Syrian Arab Republic during 2008 and the flash floods that occurred in Jeddah in 2009 were offered as case examples. The presentation offered a hazard/vulnerability/adaptive/capacity/risk (HVAR) mathematical methodology for identifying climate change hotspots in the Arab region. The methodology is based on estimating indices of risk as a function of weighted indicators of hazard, vulnerability and adaptive capacity. The presentation also suggested that a geographical information system (GIS) could support the mapping component of the vulnerability assessment.

30. A study on mapping climate change vulnerability in Southeast Asia was delivered by the International Development Research Center (IDRC) Cairo Office. The study identifies areas in Southeast Asia that are considered to be the most vulnerable to climate change based on an index of the climate change vulnerability. The index is informed through a quantitative and qualitative process involving consultation with regional stakeholders and covers 590 sub-national administrative areas in seven countries in Southeast Asia. It was suggested that the approach offers the potential for transfer and adaptation to the Arab region.

31. The main findings of the UNEP-sponsored study on the Vulnerability of Shared Freshwater Resources to Climate Change in West Asia were presented by the Arabian Gulf University. The study assesses current and future freshwater resources vulnerability for national and shared sources in Western Asia under the prevailing water development and management practices. In doing so, the study seeks to provide decision-makers with options to evaluate and modify existing policies and implement adaptation measures to improve water resources management in face of climate change. The presentation elaborated on the methodology used for constructing the vulnerability index that was applied during the assessment, and presented the findings of a series of case studies showing the vulnerability index generated for selected shared water resources in the region.

32. Health vulnerability and adaptation assessment were the key issues discussed in the presentation delivered by the World Health Organization Regional Office for the Eastern Mediterranean (WHO/EMRO). The WHO framework for vulnerability, impact and adaptation assessment was elaborated covering the linkages between public health, water and climate change, as well as current WHO activities in the region.

33. In the ensuing discussions resulted in agreement on the need for a clear definition of vulnerability as it is used within the framework of the regional initiative, given the different perspective and methodologies that are in use for assessing vulnerability. Emphasis was placed on the need to keep in mind that the regional initiative seeks to assess socio-economic vulnerability and not the vulnerability of water resources per se. The importance of using national and local level data parameters was also highlighted when assessing vulnerability. During the discussion it was noted that more water does not necessarily lead to better health.

G. ROUNDTABLE DISCUSSION: OPTIONS FOR INTEGRATED CLIMATE CHANGE ASSESSMENT

34. Experts convened in a roundtable to formulate proposals regarding possible approaches for developing an integrated climate change assessment that draws upon climate change impact assessment methodologies and vulnerability assessment approaches. The identification of the major socio-economic

and environmental sectors and phenomena at the Arab regional level were examined to ensure that the regional specificities that are characteristic of the Arab region are considered in the integrated assessment.

35. The concept of vulnerability was debated and resulted in agreement that the definition of vulnerability should respond to the scope of the regional initiative and thus focus on socio-economic aspects. It was also agreed that vulnerability assessment is an important tool for informing climate change negotiations related to adaptation, mitigation, technological transfer and finance.

36. Participants agreed that different regional climate models should be applied to the Arab region to provide a broader range of information and a means to cross-check findings and reduce uncertainties that emerge during modelling processes, resources permitting. The impact assessment should be based on the implementation of a regional hydrological model that will draw upon the outputs of a regional climate model to produce regional hydrological impact simulation for surface and groundwater systems for different climate projections in the Arab region. It was indicated that since 67 per cent of water resources in the region originate from outside the Arab region, these basins should be taken into consideration and included in the proposed Arab domain. Consideration should also be given to the use of water resources management models for shared water resources so as to consider the potential effects of dam construction by upstream countries or desalination when considering adaptation measures or changes in human responses to climate change over time.

37. Political conflicts were also brought up by country representatives as an aspect to consider in the vulnerability assessment, particularly in countries like Iraq and Palestine. The importance of seasonal forecasts for agriculture was emphasized given the importance of the agricultural sector for many economies in the Arab region.

H. CONSOLIDATION OF A DRAFT IMPLEMENTATION PLAN

38. This session was dedicated to elaborating a draft action plan for implementing the regional initiative. Discussion focused on how to organize a coordinated process involving Arab Member States, the League of Arab States and its specialized organizations and United Nations regional and specialized organizations. Proposed modalities for joint implementation were considered based on the substantive discussions undertaken during the meeting. Proposals were discussed within the context of the four pillars that constitute the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region, namely the: (a) baseline review; (b) impact analysis and vulnerability assessment; (c) awareness raising and information dissemination; and (d) capacity building and institutional strengthening.

1. Baseline review

39. The baseline review component of the regional initiative seeks to develop a clear picture of the current state of freshwater resources and climate in the Arab Region based on a common set of indicators and methods. To this end, the experts proposed the following:

- (a) Consolidation and collection of observed climate data at national level in cooperation with national meteorological services to verify RCM outputs: The WMO indicated that it could support the establishment of a Regional Climate Outlook Forum in the region that would involve national meteorological services. The RCMs could be run using globally available climate data sets that can be verified against observed climate data by national meteorological services through a regional verification strategy. The engagement of meteorological services could be facilitated through the LAS Permanent Committee for Meteorology/Sub-Committee on Climate and Climate Change that reports to CAMRE.

- (b) Consolidation and collection of observed water data at the national level to verify the outputs of the regional hydrological model: UNU suggested that a database for shared water resources in the Arab region be developed as a knowledge management platform for informing the project, and stated that they are currently working with the LAS to secure funding to support the development of such a platform.

2. Impact analysis and vulnerability assessment

40. This component of the regional initiative aims to review existing global climate models and select one to two regional climate models for application at the level of the Arab Region that can be suitably downscaled and incorporate hydrological modelling and scenario development to serve as the analytical basis for conducting the vulnerability assessment. The expert group meeting suggested an integrated assessment approach to guide this work. To this end, the experts proposed the following:

- (a) Regional climate modelling: SMHI suggested that it could conduct a sensitivity analysis to determine the boundaries of the Arab Domain, and could inform CORDEX and its 21 member institutions of this domain so as to encourage them to run RCMs for Arab Domain as a contribution to the regional initiative. SMHI and the Government of Egypt expressed interest in running an RCM for the Arab region based on the delineated Arab Domain. It was recommended that Representative Concentration Pathways (RCPs) be used as the emission scenarios for running the climate models as they will be used as the basis for analysis in AR5.
- (b) Regional Hydrological Modelling: SMHI suggested to link their RCM to a regional hydrological model to assess climate change impacts on water resources across the Arab region based on a common and consistent set of assumptions and inputs. These impacts would be projected based on the outputs of the RCM and thus offer an assessment of regional hydrological impacts associated with specific global emission scenarios. It was suggested that water resource management models and basin-level models be used to elaborate on the outcomes of the regional hydrological model.
- (c) Regional vulnerability assessment: The experts identified several key indicators that should be considered when developing the vulnerability assessment, namely water availability, water quality, agriculture (rainfed, irrigated), water supply and sanitation, health (disease, nutrition), and population dynamics.

3. Awareness raising and information dissemination

41. Awareness raising activities and tools aim to present simplified key messages to targeted stakeholders on the findings of the regional initiative. To this end, the experts proposed the following:

- (a) Preparation of a communication strategy: The strategy should target the policy-makers and decision-makers; practitioners and technical advisors; the research community and professional networks; civil society and the general public.
- (b) Establishment of a knowledge management platform: The platform could be in the form of a portal that would aim to: consolidate information available from regional networks working on water and climate change; facilitate access to information on regional research and studies on climate change; foster collaboration; facilitate networking and exchange between regional networks of practitioners; maintain a listing of regional experts in the field; and communicate information about the regional initiative.

- (c) Hosting of the knowledge management platform: Criteria and a terms of reference would need to be developed for characterizing the role of the platform. UNISDR indicated that they would provide further clarification on the possibility of using PreventionWeb as an e-platform for the regional initiative, with dedicated information base on climate change that could be hosted by UNISDR. UNISDR suggested it might be possible to develop a dedicated page on climate and water on PreventionWeb, noting that the platform is based in Geneva and also supports e-communication among UNISDR networks.

4. Capacity building and institutional strengthening

42. The fourth and final pillar of the regional initiative focuses on institutional strengthening and capacity building in knowledge management, modelling, impact analysis, and vulnerability assessment, with focus given to working through existing networks on climate change to enhance capacity in these areas. To this end, the experts suggested the following:

- (a) Benefit from existing water and climate change networks in the region: The LAS might be invited to facilitate networking among the regional networks, possibly through the Arab Ministerial Water Council. Climate change networks could address a range of climate change issues, and not only be limited to climate change impacts on water resources network. UNEP indicated that it is seeking to attract funding to support such a regional climate change network.
- (b) Networking for Climate Data, Prediction and Projection: The WMO indicated that it would support initiation of a Regional Climate Outlook Forum for seasonal forecasts and climate prediction and projection in the region.
- (c) Institutional strengthening for climate data collection, management, prediction and projection: The WMO indicated that they would be interested in supporting the establishment of one or more regional climate centre (RCC) in the region and building the capacity of national meteorological services so as to extend their capacity to provide climate services to other countries. WMO elaborated that a designated RCC could provide “mandatory functions’ or ‘highly recommended functions’ depending on its designation.
- (d) Capacity building and training: participants expressed interest in providing training in the following areas: climate data management, seasonal forecasting and prediction, RCM downscaling, diagnosis of RCM outputs, diagnosis of regional hydrological modelling outputs, and vulnerability assessment methodologies

5. Coordination and management modalities

43. It was suggested that a task force for regional climate modelling and regional hydrological modelling be created to support the implementation of the regional initiative so that same Arab Domain, standards and protocols are used when downscaling regional climate models to the Arab region. It was also suggested that the regional initiative seek to securing commitments and contributions; generate resources through technical, financial and in-kind assistance; and establish a monitoring and reporting systems that would allow for regular reporting to the Arab Ministerial Water Council through its Technical Scientific and Advisory Committee. It was recommended that reporting on the regional initiative also be submitted to CAMRE.

I. DISCUSSION OF NEXT STEPS

44. Attention was drawn to the fact that the implementation of the regional initiative is supported by several political mandates, and that this official support would facilitate the preparation of the assessment in the Arab region. Furthermore, participants stress the need to establish a core group of multi-sectoral professionals, including communication experts, who can support the regional initiative and disseminate its findings, such as the Council of Arab Ministers for Communication.

45. The IDRC expressed its interest in building upon the outcomes of the impact assessment and supporting the preparation of the vulnerability assessment component through a collaborative regional project that would be implemented in consultation with ESCWA and regional researchers under the leadership of ACSAD.

46. Acknowledging the fact that information dissemination is very essential, UNISDR organization suggested to share the information related to this initiative on PreventionWeb in view of exchanging information and lessons learned from related activities and raising awareness about the initiative. UNU suggested cooperating with the LAS Center for Water Studies and Arab Water Security in Damascus to coordinate efforts related to data sharing and regional databases on shared water resources.

III. ORGANIZATION OF WORK

A. VENUE AND DATE

47. 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 was held from 8 to 10 November 2010 at the United Nations House in Beirut, Lebanon.

B. OPENING

48. The meeting was formally opened by Ms. Roula Majdalani, Director of Sustainable Development and Productivity Division at ESCWA, who delivered the opening statement on behalf of Ms. Rima Khalaf, Executive Secretary of ESCWA. Ms. Inas Abdel-Azim Mostafa delivered the statement of the League of Arab States on behalf of Mr. Djameleddine Djaballah, Director of the Sustainable Development, Environment and Housing Division. Mr. Abdul-Majeid Haddad, representative of the United Nations Environment Programme, Regional Office for West Asia (UNEP/ROWA), delivered a statement during the opening session as coordinator of the Regional Coordination Mechanism Thematic Working Group on Climate Change.

C. PARTICIPANTS

49. The meeting was attended by 38 participants, including government representatives from ministries working in climate change and water resources from eleven ESCWA member countries and two non-ESCWA Arab countries. In addition, experts in the fields of water resources and climate science from regional and international organizations, as well as representatives from United Nations and League of Arab States organizations participated in deliberations. The list of participants is included in the annex of this report.

D. AGENDA

50. Presentations and discussions were made over seven sessions. The agenda of the meeting is summarized below:

1. Opening session.
2. Presentation on the conceptual framework and stocktaking of developments in climate change impact assessment and vulnerability assessment in the Arab region.
3. Presentation and discussion on regional climate modelling for generating climate change Projections for the Arab region.
4. Technical working group sessions on regional climate modelling and climate change networking.
5. Presentation and discussion on linking climate change projections to hydrological models.
6. Technical working group sessions on hydrological modelling and devising a communication and knowledge management strategy.
7. Presentation and discussion on forging linkages between climate change impact analysis and vulnerability assessment and mapping.
8. Roundtable Discussion: Options for integrated climate change assessment.
9. Working Groups: Plenary discussion on work planning and identifying roles and responsibilities.
10. Consolidation of a draft implementation plan.
11. Discussion of next steps and closing session.

E. EVALUATION

51. An evaluation questionnaire was distributed to assess the relevance, effectiveness and impact of the meeting. The majority of the participants found that the workshop met its objectives and their expectations. Nearly all the participants found that their expertise was very well suited for the meeting, in addition to providing them with an excellent opportunity to establish contact and exchange information with other experts from the region.

52. Several participants also indicated that they would like follow-up activities, namely, follow-up activities within the context of the initiative and to provide more information on regional climate model projections and impacts identified through hydrological models. Further capacity-building workshops on climate change and its impact on the water sector and on climate modelling were also requested.

53. Some participants did make recommendations for improving the upcoming meetings. These include: define a road map for future activities, involve climate change experts from the region, follow-up on the recommendations emanating from this meeting and encourage exchange of lessons learned and information dissemination of the vulnerability assessment outcomes.

F. DOCUMENTATION

54. The list of documents submitted to the meeting is available on the ESCWA website at: <http://www.escwa.un.org/information/meetingdetails.asp?referenceNum=1338E>

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