Developing the Capacities of Arab Countries for Climate Change Adaptation Using IWRM Tools

Tarek Sadek – Water Resources and Climate Change Officer, ESCWA (SDPD) – Beirut, 28/09/2017
ESCWA Implemented a United Nations Development Project on Developing the Capacities of the Arab Countries for Climate Change Adaptation by Applying IWRM Tools

This project built upon the climate change impact assessment (RICCAR) outputs, and will assist countries to adapt to climate change through the use of regionally-appropriate IWRM tools in five key sectors.

The key objective is to develop the capacity of 22 Arab Governments to adapt to climate change by applying IWRM tools in the key sectors that will be affected by climate change impacts on freshwater resources.

Implementing partners are UN-ESCWA (lead agency), UNEP/ROWA (coordinating agency), ACSAD, ACWUA, WHO/CEHA and GIZ.
Linking Climate Science to Policy, Adaptive Strategy and Mitigation

Science

Impact and Vulnerability Assessment

RICCAR

Policy

Climate Change Adaptation

Adaptation in Agriculture, Health, Human Settlement, Biodiversity and Economic Development (IWRM)

Negotiations (Paris Agreement)

Adaptation-Mitigation Co-benefit
Climate Change Adaptation

United Nations Development Account Project on Developing the Capacities of the Arab Countries for Climate Change Adaptation by Applying Integrated Water Resources Management Tools

Five sector modules were developed by the following leading organizations (in coordination with ESCWA):

1. Environment module by UNEP/ROWA;
2. Agriculture module by ACSAD/GIZ;
3. Health module by WHO;
4. Human settlements (water supply and sanitation) by ACWUA;
5. Economic module by ESCWA as well as an introductory chapter for the manual.

Five workshops were held with stakeholders from each sector to review respective modules.
**1. Introduction**
- Objectives
- Methodology
- UNEP vulnerability assessment approach
- Ecosystem Based Management (EBM)

**2. CC Impacts on Regional Ecosystems and Biodiversity**
- Projected impacts based on RICCAR outputs
- Examples of hot spots

**3. Linking Ecosystem Management & IWRM for CC Adaptation**
- Analysis of differences and similarities
- Indicators for ecosystem based adaptation

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**Figure 8. Linkages among principles, structures and targets**

<table>
<thead>
<tr>
<th>Economic efficiency</th>
<th>Equity</th>
<th>Environmental sustainability</th>
<th>Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management instruments</td>
<td>Enabling environment</td>
<td>Institutional framework</td>
<td></td>
</tr>
<tr>
<td>Assessment, Information, Allocation instruments</td>
<td>Policies, Legislation</td>
<td>Central-Local, River basin, Public-Private</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management of water as a resource</th>
<th>Framework for provision of water ecosystem services</th>
<th>Structures</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Refinement</td>
</tr>
<tr>
<td>Planning a Portfolio of Ecosystem Initiatives</td>
</tr>
<tr>
<td>Review and Learning</td>
</tr>
<tr>
<td>Piloting the Portfolio Initiatives</td>
</tr>
</tbody>
</table>

4. & 5. Ecosystem Adaptation Measures & their Implementation

- Functions of ecosystems
- Processes and structure for supply of services
- Ecosystem state and impact
- Cycle for strategic adaptive management
- Valuing ecosystem services

6. Areas for Action

- Implementation tools
- Monitoring and evaluation
- National and regional actions

**Figure 16.** Components of the total value of an ecosystem

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Typical cost of restoration</th>
<th>Estimated annual benefits from restoration</th>
<th>Net present value of benefits over 40 years</th>
<th>Internal rate of return</th>
<th>Benefit/cost ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshlands</td>
<td>33,000</td>
<td>14,200</td>
<td>171,300</td>
<td>12%</td>
<td>5.4</td>
</tr>
<tr>
<td>Lakes and rivers</td>
<td>4,000</td>
<td>3,800</td>
<td>69,700</td>
<td>27%</td>
<td>15.5</td>
</tr>
<tr>
<td>Coastal</td>
<td>232,700</td>
<td>73,900</td>
<td>935,400</td>
<td>11%</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 13. Average global value of annual ecosystem services

1. Introduction

- Objectives
- Methodology
- Targeted Stakeholders

2. Framing Sectoral Problems

- Natural resources
- Socio-economic aspects
- Governance
- Legislations
- Sub-sector issues

3. Impacts of CC and Vulnerability Assessment

- Impacts of CC (T, P, ET, extreme events, etc., projections till 2100)
- Vulnerability assessment (VA) approach
- VA Indicators

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**Table 1. Biophysical and socioeconomic impacts of climate change on food production**

<table>
<thead>
<tr>
<th>Second order (biophysical)</th>
<th>Third order (socioeconomic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiological effects on crops, pasture, forests and livestock (quantity and quality)</td>
<td></td>
</tr>
<tr>
<td>Change in land, soil and water resources (quantity and quality)</td>
<td></td>
</tr>
<tr>
<td>Increased weed and pest challenges</td>
<td></td>
</tr>
<tr>
<td>Shifts in spatial and temporal distribution of impacts</td>
<td></td>
</tr>
<tr>
<td>Sea level rise, changes to seawater salinity and acidity</td>
<td></td>
</tr>
<tr>
<td>Sea temperature rise causing fish to inhabit different ranges</td>
<td></td>
</tr>
<tr>
<td>Decline in yields and production</td>
<td></td>
</tr>
<tr>
<td>Reduced marginal GDP from agriculture</td>
<td></td>
</tr>
<tr>
<td>Fluctuations in world market prices</td>
<td></td>
</tr>
<tr>
<td>Changes in geographical distribution of trade patterns</td>
<td></td>
</tr>
<tr>
<td>Increased number of people at risk of hunger and food insecurity</td>
<td></td>
</tr>
<tr>
<td>Migration and civil unrest</td>
<td></td>
</tr>
<tr>
<td>High demographic fluctuations</td>
<td></td>
</tr>
<tr>
<td>Fragile socioeconomic conditions of women, children and elderly people</td>
<td></td>
</tr>
<tr>
<td>Spread of unconventional diseases affecting humans, animals and plants</td>
<td></td>
</tr>
<tr>
<td>Lower livestock production due to constant conflict between humans and animals on land use</td>
<td></td>
</tr>
</tbody>
</table>

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**Table 3. Projected relative average change (per cent) of main crops in three target areas**

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>RCP4.5</th>
<th>RCP8.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>At the mid-century (2046-2065)</td>
<td>At the end of the century (2081-2100)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RCP4.5</td>
<td>At the mid-century (2046-2065)</td>
</tr>
<tr>
<td>Irrigated crop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Orontes watershed (Lebanon)</td>
<td>eggplant</td>
<td>-9.4</td>
<td>-13.3</td>
</tr>
<tr>
<td></td>
<td>maize</td>
<td>-7.4</td>
<td>-12.3</td>
</tr>
<tr>
<td></td>
<td>potato</td>
<td>-3.9</td>
<td>-5.2</td>
</tr>
<tr>
<td>At North Delta (Egypt)</td>
<td>maize</td>
<td>0.3</td>
<td>-1.0</td>
</tr>
<tr>
<td></td>
<td>wheat</td>
<td>-4.1</td>
<td>-5.7</td>
</tr>
<tr>
<td></td>
<td>cotton</td>
<td>-3.0</td>
<td>-4.3</td>
</tr>
<tr>
<td>Average</td>
<td>-4.6</td>
<td>-7.0</td>
<td>-5.6</td>
</tr>
<tr>
<td>Rainfed crop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Karak governorate (Jordan)</td>
<td>wheat</td>
<td>-1.5</td>
<td>-15.5</td>
</tr>
<tr>
<td></td>
<td>barley</td>
<td>-7.0</td>
<td>-17.3</td>
</tr>
<tr>
<td>Average</td>
<td>4.3</td>
<td>16.4</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Source: Adapted from FAO, 2007.
4. Adaptation Measures and IWRM Options and Tools

- Water resources
- Water storage and quality aspects
- Water harvesting
- Rain-fed farming
- Irrigated farming

5. Implementation Matrix and Areas for Action

- Screening adaptation measures
- Stakeholders analysis
- Increasing adaptive capacity
- National and regional actions

**Figure 8.** Application of the IWRM concept for CCA to agriculture

**Figure 38.** A schematic diagram of regional adaptation strategy to climate change
1. Introduction
• Objectives
• Target audience

2. Impacts on Water and Health
• Extreme events impacts
• Flood related diseases
• Heat wave related mortality and morbidity
• Indirect health consequences
• Vector borne diseases
• Microbiological drinking water quality

3. Vulnerability Assessment of the Health Sector
• Vulnerability and adaptation using WHO guidance
• Health within the National Adaptation Plan (NAP) process

Figure 2. Primary exposure pathways by which climate change affects health

Source: Adapted from U.S. Climate resilience Toolkit https://toolkit.climate.gov/topics/human-health.
4. Adaptation Measures for Health Sector & Implementation

- Institutional and strategic interventions
- Environmental quality monitoring and control
- Awareness and capacity development
- Adaptation implementation matrix
- Institutional analysis methods
- Barriers and opportunities for successful implementation

5. Implementation Matrix and Areas for Action

- National assessments
- Monitoring process of CC impacts
- Effective adaptation strategies and policies
- Moving from science to policy
- Follow up on adaptation programs at the global policy level
- Institutional analysis methods
- Barriers and opportunities for successful implementation
**Figure 7.** WHO guidance to protect health from climate change through health adaptation planning: health within the NAP process (HNAP)

<table>
<thead>
<tr>
<th>Frame and scope assessment</th>
<th>Assess</th>
<th>Manage and monitor risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Defining the geographical region and health outcomes of interest:</strong></td>
<td><strong>Vulnerability:</strong> Current burden of disease; Current health protection programmes</td>
<td><strong>Health harms and benefits in other sectors</strong></td>
</tr>
<tr>
<td>Identifying the questions to be addressed and steps to be used; Identifying the policy context for the assessment; Establishing a project team and a management plan; Establishing a stakeholder process; Developing a communications plan.</td>
<td><strong>Future impacts:</strong> Changing burden without climate change; Projected health impacts of climate change</td>
<td><strong>Communicate plan and implement</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Adaptation:</strong> Identify and prioritize additional interventions; Identifying resources and barriers to implementation</td>
<td><strong>Monitor and evaluate</strong></td>
</tr>
</tbody>
</table>
Human Settlements (1/2)

1. Introduction
- Objectives
- Targeted Stakeholders

2. Framing Sectoral Problems
- Intermittent supply
- Enhancing water efficiency at the city level
- Resource challenge
- Management of storm and wastewater infrastructures

3. Impacts of CC and Vulnerability Assessment
- Drainage networks performance under various climate scenarios
- Impacts on drainage network design

Table 1. Water losses in the water supply distribution system in selected Arab countries, 2005

<table>
<thead>
<tr>
<th>Country</th>
<th>% of loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>15</td>
</tr>
<tr>
<td>Egypt</td>
<td>50</td>
</tr>
<tr>
<td>Iraq</td>
<td>50</td>
</tr>
<tr>
<td>Jordan</td>
<td>50</td>
</tr>
<tr>
<td>Kuwait</td>
<td>8-10</td>
</tr>
<tr>
<td>Lebanon</td>
<td>50</td>
</tr>
<tr>
<td>Oman</td>
<td>23</td>
</tr>
<tr>
<td>Palestine</td>
<td>40</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>25-40</td>
</tr>
<tr>
<td>Syrian Arab republic</td>
<td>48</td>
</tr>
<tr>
<td>Yemen</td>
<td>30</td>
</tr>
</tbody>
</table>


Figure 1. Continuity of water supply in Jordan

Source: League of Arab States, ESCWA and ADWUA, 2015.
4. IWRM Tools for Identifying Adaptation Measures
- Water harvesting
- Water demand management
- Reuse of grey water
- Treatment technologies for grey water recycling
- Water footprint tool
- Reducing non-revenue water
- Updating urban planning policies
- Wastewater treatment and reuse
- Water Tariffs
- Managed groundwater recharge (aquifer recharge/recovery)
- Desalination by renewable energy

5. Implementation of Adaptation Measures
- Screening
- Planning at sectoral and local level
- Planning at the national level

6. Measuring and Reporting Progress of CCA in Human Settlements
- Indicator framework
- Using MDG+ and SDG indicators
- Best practices
- Governance
- Social factors
- Economic factors
- Cost of water adaptation measures
# Economic Development (1/2)

## 1. Introduction
- Objectives
- Module structure

## 2. Economic Development and Resources Management
- Macro-economic impacts
- Integrated assessments economic models (IAMs)
- Economic implications of extreme events
- Climate finance
- Criteria
- Global architecture

## 3. Vulnerability Outlook
- VA integration with IAM’s and linkage to RICCAR outputs
- Economic indicators used in VA
- Economic cost of CC impacts

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*Figure 2.* Estimates of economic losses from climate change

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![Climate Models Diagram](https://example.com/climate-models-diagram)
Economic Development (2/2)

4. CC Adaptation Measures

- Adaptation risk management
- Climate proofing
- Investment planning
- No regret and low regret measures
- Global and national funds

5. Applications

- Best practices
- Governance
- Participatory capacity
- Transparency and accountability
- Technical and managerial competence
- Education and training

Table 9. Multilateral funds active in the Arab region

<table>
<thead>
<tr>
<th>Fund</th>
<th>Amount approved ($ million)</th>
<th>Number of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation for Smallholder Agriculture Programme (ASAP)</td>
<td>18.00</td>
<td>3</td>
</tr>
<tr>
<td>Adaptation Fund (AF)</td>
<td>19.42</td>
<td>3</td>
</tr>
<tr>
<td>Clean Technology Fund (CTF)</td>
<td>725.00</td>
<td>5</td>
</tr>
<tr>
<td>Global Environment Facility-Strategic Priority on Adaptation (GEF-SPA)</td>
<td>55.04</td>
<td>1</td>
</tr>
<tr>
<td>Global Environment Facility - 2006-2010 funding period (GEF4)</td>
<td>4.62</td>
<td>16</td>
</tr>
<tr>
<td>Global Environment Facility – 2011-2014 funding period (GEF5)</td>
<td>33.85</td>
<td>13</td>
</tr>
<tr>
<td>Global Climate Change Alliance (GCCA)</td>
<td>4.05</td>
<td>1</td>
</tr>
<tr>
<td>Least Developed Countries Fund (LDCF)</td>
<td>34.56</td>
<td>8</td>
</tr>
<tr>
<td>MDG Achievement Fund (MGF-F)</td>
<td>8.00</td>
<td>2</td>
</tr>
<tr>
<td>CTF Pilot Program for Climate Resilience (PPCR)</td>
<td>20.50</td>
<td>2</td>
</tr>
<tr>
<td>Special Climate Change Fund (SCCF)</td>
<td>38.01</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Adapted from Barnard and others, 2014.
This training manual benefits a wide variety of officials from the public sector, academia, non-governmental organisations and the private sector.

The manual presents the issues on CCA and IWRM within a regional context and based on the practical experiences of practitioners working in the Arab region.

Gender-related issues in each sector were taken into consideration throughout the modules and case studies, as gender is not a standalone sector and needs to be mainstreamed as a cross-cutting issue in all sectors and systems as well as in IWRM.

A set of exercises were included in the modules to provide an opportunity for practitioners to learn more, extend their understanding of the various concepts underlying IWRM and exchange knowledge on inter-linkages with climate change adaptation and sector issues.
Thank you.....