Regional Initiative for the Assessment of Climate Change Impacts on Water Resources & Socio-Economic Vulnerability in the Arab Region (RICCAR)

Overview for Workshop on Environmental Statistics and Information for Sustainable Development in the Arab Region
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UN Economic and Social Commission for Western Asia
Intergovernmental mandates calling for Climate Change Assessment in the Arab Region have existed for only just over a decade.

First Arab Ministerial Declaration on Climate Change
CAMRE 2007

Arab Economic and Social Summit
Resolution on Climate Change & Water Project 2009

ESCWA 25th Ministerial Session

Arab Ministerial Water Council

ESCWA 30th Ministerial Session
Resolution setup Center for Arab Climate Change Policies 2018

Arab Permanent Committee for Meteorology

Arab Ministerial Council of for Meteorology & Climate 2018

ACSAD Board of Directors
Resolution 2013

Foreign Affairs & Planning

Water

Meteorology

Agriculture & Food Security
Integrated Assessment for Arab Region

GCM: Global Climate Modelling
RCM: Regional Climate Modelling
RHM: Regional Hydrological Modeling

VA: Vulnerability Assessment
IM: Integrated Mapping
From R.K Kolli, WMO
RICCAR EGM #2 (Beirut, 2010)
These RCPs do not represent a 1.5°C temperature increase scenario, which IPCC has modelled through a new set of socio-economic projections.

Graph adapted from: Meinshausen et al., 2010
Regional Climate Modeling & Hydrological Modeling

Different Global Climate Models

- General Circulation Model (GCM)
- Regional Climate Model (RCM)

Same Representative Concentration Pathway (RCP)

300 km x 300 km

50 km x 50 km

25 km x 25 km

Ensembles used to reduce uncertainty at level of RCMs & RHMs

Ensembles aggregate findings of different RCMs & RHMs applied for same RCP & Domain

Bias-Corrected to support impact assessments

Extreme climate indices
### Extreme Events Indices: For Past & Future Projections

<table>
<thead>
<tr>
<th>Extreme temperature indices</th>
<th>Extreme precipitation indices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index</strong></td>
<td><strong>Full name</strong></td>
</tr>
<tr>
<td>SU</td>
<td>Number of summer days</td>
</tr>
<tr>
<td>SU35</td>
<td>Number of hot days</td>
</tr>
<tr>
<td>SU40</td>
<td>Number of very hot days</td>
</tr>
<tr>
<td>TR</td>
<td>Number of tropical nights</td>
</tr>
<tr>
<td>SDII</td>
<td>Simple precipitation intensity index</td>
</tr>
</tbody>
</table>

In presenting data and analysis, need to consider appropriateness of providing data in terms of changes in value or changes in percentage, and choice of units (e.g., +1 mm/month of precipitation may be significant change when viewed as a percentage change in water scarce Arab Region).
Vulnerability Assessment

- Exposure
- Sensitivity
  - Potential Impact
  - Adaptive Capacity

Source: Based on IPCC, 2007
Report Launched September 2017
Temperature in the Arab region is increasing and is expected to continue to increase until the end of the century based on Reanalysis Datasets drawn from and validated against Observed Datasets.
Precipitation trends are largely decreasing across, although limited areas projected to exhibit an increase in the intensity & volume of precipitation.
Mean change in annual evapotranspiration
Mean change in annual evapotranspiration
Subdomains for hydrological analysis
Mean change in runoff and evapotranspiration

Moroccan Highlands (MH)

**RUNOFF**

**EVAPOTRANSPIRATION**
# Vulnerability Assessment

## SECTORS

<table>
<thead>
<tr>
<th>SECTORS</th>
<th>SUBSECTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>Water availability</td>
</tr>
<tr>
<td><strong>Biodiversity and Ecosystems</strong></td>
<td>Area covered by forests</td>
</tr>
<tr>
<td></td>
<td>Area covered by wetlands</td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td>Water available for crops</td>
</tr>
<tr>
<td></td>
<td>Water available for livestock</td>
</tr>
<tr>
<td><strong>Infrastructure and Human</strong></td>
<td>Inland flooding area</td>
</tr>
<tr>
<td><strong>Settlements</strong></td>
<td></td>
</tr>
<tr>
<td><strong>People</strong></td>
<td>Water available for drinking</td>
</tr>
<tr>
<td></td>
<td>Health conditions due to heat stress</td>
</tr>
<tr>
<td></td>
<td>Employment rate for the agricultural sector</td>
</tr>
</tbody>
</table>
Impact chain:
**Water Availability**

**EXPOSURE (0.50)**
- **RCM**
  - Change in temperature (0.17)
  - Change in precipitation (0.17)
- **RHM**
  - Change in runoff (0.17)
  - Change in evapotranspiration (0.17)
- **EXTREME EVENTS INDICES**
  - Change in maximum length of dry spell (0.15)
  - Change in maximum length of wet spell (0.16)

**SENSITIVITY (0.50)**
- **POPULATION (0.50)**
  - Population density (0.14)
  - Total renewable water available per capita (0.50)
  - Water consumption per capita (0.13)
  - Share of water consumption in agriculture (0.13)
  - Refugee population (0.10)
- **NATURAL (0.26)**
  - Land use/land cover (0.17)
  - Soil storage capacity (0.25)
  - Degradation of vegetation cover (0.26)
  - Wetlands (0.22)
- **MANMADE (0.24)**
  - Urban extent (0.47)
  - Areas served by dams (0.53)

**ADAPTIVE CAPACITY (0.50)**
- **KNOWLEDGE & AWARENESS (0.10)**
  - E-Government development (0.33)
  - Tertiary enrolment (0.32)
  - Adult literacy rate (0.35)
- **TECHNOLOGY (0.10)**
  - Number of scientific and technical journal articles (0.46)
  - Information and communication technologies index (0.54)
- **INSTITUTIONS (0.10)**
  - Governance index (0.54)
  - Disaster risk reduction committees (0.46)

**VOLNERABILITY ASSESSMENT**

**ECONOMIC RESOURCES (0.11)**
- GDP per capita (0.36)
- ODA (0.30)
- Food imports as % of merchandise exports (0.34)

**EQUITY (0.09)**
- Female-to-male literacy ratio (0.51)
- Migrants/refugees index (0.49)
Water Availability Vulnerability
(Reference Period to RCP 8.5 end century projection)
Water Availability for Crops (RCP 8.5)
Welcome to the
RICCAR REGIONAL KNOWLEDGE HUB

www.riccar.org
Support for development of national Disaster Loss Inventories

https://www.unisdr.org/we/inform/disaster-statistics
Hazards which cause Economic losses can be quite different from those responsible for the highest levels of mortality. For example, in Morocco forest fires cause 42% of economic losses, but only 9% of disaster-related deaths.
1980 – 2011

Lebanon

2527 records
156 deaths
48 million US$ estimated losses
181 houses destroyed
1366 houses damaged
17700 ha of crops damaged

Frequency:
- FOREST FIRE, 1392, 55%
- SNOWSTORM, 429, 17%
- FLOOD, 115, 4%
- FLASH FLOOD, 168, 7%
- STORM, 70, 3%
- EROSION, 102, 4%
- LANDSLIDE, 69, 3%
- RAIN, 66, 3%
- OTHERS, 116, 4%

Spatial footprint of frequency

Hydro-meteorological related impacts:
- 75% of all records
- 100% of mortalities.
- 86% of economic losses.
1918 records  
330 deaths  
684 million US$ estimated losses  
17821 houses destroyed  
24728 houses damaged  
837000 ha of crops damaged

Hydro-meteorological related impacts:

99% of all records
100% of mortalities!
98% of economic losses.
Thank you