UN-LAS
Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR)

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

Objective

- To assess the impact of climate change on freshwater resources in the Arab Region through a consultative and integrated regional initiative that seeks to identify the socio-economic and environmental vulnerability caused by climate change impacts on water resources based on regional specificities.

The Regional Initiative aims to provide a common platform for addressing and responding to climate change impacts on freshwater resources in the Arab region by serving as the basis for dialogue, priority setting and policy formulation on climate change adaptation at the regional level.
**UN-LAS Regional Mandates & Coordination Mechanisms**

### Mandates

- **Arab Ministerial Declaration on Climate Change (Dec 2007)** - adopted by the LAS Council of Arab Ministers Responsible for the Environment (CAMRE).

- **ESCWA 25th Ministerial Session Resolution on Climate Change (May 2008)** - called for the preparation of an assessment of socio-economic vulnerability caused by climate change impacts on water resources (Sana’a).

- **Arab Summit for Economic and Social Development (Jan 2009)** - accepted the preparation of project to assess impacts of climate change on water.

- **Arab Ministerial Water Council (AMWC) (July 2010)** - approved IWRM project brief submitted by LAS & ACSAD called “Assessment of Climate Change Impacts on Available Water Resources in the Arab Region” based on Regional Initiative concept note to support Arab Water Security Strategy.

### Coordination Mechanisms

- **UN-LAS 9th Sectoral Meeting focused on Climate Change (June 2009)** - called for UN-LAS joint action on vulnerability studies to assess climate change impacts on water, land, drought, desertification, biodiversity, health and agriculture.

- **Regional Initiative Core Group (Oct 2009)** – UN-LAS core partners established group following 1st expert group meeting (Oct 2009); regular EGMs.

- **Regional Coordination Mechanism/Thematic Working Group on Climate Change (Nov 2010)** - Initiative adopted & reported on as a joint UN-LAS inter-agency initiative by UNEP.

- **AMWC: Ministerial Council, Executive Bureau, and Technical Scientific & Advisory Committee (June 2011, Jan & June 2012)** – Receive progress reports by ACSAD & ESCWA on Regional Initiative.

- **CAMRE Permanent Sub-Committee for Meteorology & Climate and Climate Change Sub-Committee (January 2012, March 2012)** – Endorsement of Regional Initiative.
Mapping Inter-Agency Support

Arab Ministerial Water Council
Climate Change Impact on Water Resources Project

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SIDA-Funded Project:
Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region
including Extreme Events & Regional Knowledge Hub
LAS, ESCWA, ACSAD, SMHI, WMO, UNISDR

UNU Info Hub
UNESCO RCM
UNEP CC Networks + National UNFCCC Support

Preparation of National UNFCCC Communications & CC Strategies

Establishment of Regional Early Warning System

GIZ Project:
Adaptation to Climate Change in the Water Sector in the MENA Region
Including Vulnerability Tools & Knowledge Hub with Adelphi, ESCWA, ACSAD

Arab Permanent Sub-Committee for Meteorology
Support to Met Offices
الهيكل التنفيذي للمشروع –

**Implementation Framework**

**حصر المعلومات الأساسية المتاحة وإدارتها**
Baseline Review & Knowledge Management

**تقييم تأثير التغير المناخي**
Climate Change Impact Assessment

**تقييم قابلية التأثر من التغير المناخي**
Climate Change Vulnerability Assessment

**بناء القدرات**
Capacity Building & Institutional Strengthening
for Water Ministries, Meteorological Offices, Arab Research Centers

**رفع الوعي**
Awareness Raising & Information Dissemination
Step 1: Global Climate Modeling using General Circulation Model
Step 2: Regional Climate Modeling
Step 3: Regional Hydrological Modeling
Step 4: Vulnerability Assessment
Step 5: Integrated Mapping
**Impact Assessment Component**

Different GCMs for the Same RCP

- **General Circulation Model (GCM)**
  - GCM at 300 km x 300 km
  - Ensemble Average used to reduce uncertainty at level of RCMs & RHMs

- **Regional Climate Model (RCM)**
  - Ensembles compare findings of different RCMs & RHMs applied for same RCP & Domain

- **Regional Hydrological Model (RHM)**
  - Calibration
Inter-Governmental Panel on Climate Change: Areas considered for regional averages in IPCC AR4

From R.K Kolli, WMO Regional Initiative EGM #2 (Beirut, 2010)
Regional Climate Modeling: Establishing an Arab Domain under CORDEX

CORDEX: COordinated Regional climate Downscaling EXperiment

- Arab Domain establishes the **limiting boundary conditions** (LBCs) for regional climate modeling
- Arab Domain vetted for approval by CORDEX.
- SMHI completed Sensitivity Analysis & set up Arab Domain in consultation with partners
- Domain covers headwaters of Nile & Indian Ocean effects
- Comoros to be covered in parallel maps in own domain.

*Arab Domain shown here only for illustrative & comparative purposes; domain is larger*

Illustration adapted from Giorgi et al., 2009, p.178, as drawn from collective CORDEX effort displayed at: http://www.meteo.unican.es/en/projects/CORDEX.
Regional Hydrological Modeling (RHM)

General Circulation Model (GCM)
(300 km x 300 km):

Over Land and Ocean: Air temperature and pressure, Wind speed and direction, humidity (specific, relative), Precipitation (rain & snow), number of sunny / cloudy days, river discharge / runoff, soil moisture, Earth Radiation Budget, Ozone, Aerosols.

Ocean: Salinity, Sea level, Sea ice, Currents, Ocean Layering,

Terrestrials: River discharge / Surface Runoff, Snow cover, Glaciers and ice caps, Permafrost, Soil moisture, Vegetation

Regional Climate Model (RCM)
(50km x 50km or 25km x 25km)

Over Land and Ocean: Air temperature and pressure, Wind speed and direction, humidity (specific, relative), Precipitation (rain & snow), river discharge / runoff, soil moisture, number of sunny / cloudy days, Aerosols

@ Terrestrials: River discharge / Surface Runoff, Snow cover, Soil moisture, Vegetation

RHM Incorporates:
- RCM Outputs
- Elevation Data (DEM)
- Land Parameters
- Hydrological data on surface water
- Hydrological data on groundwater

Regional Hydrological Model (RHM)

Hydrologic Stations: Air Temperature and pressure at Surface, Surface Evapotranspiration, Precipitation (rain & snow)

Surface: Runoff, Flow (into/out of), Snow amount, snow Melt, Soil Moisture Content


Two Options:
RCM to Regional HM
or
RCM to Basin HM

Basin-Centered Hydrological Model (BHM)

Groundwater: water table, Change in Groundwater Level, Groundwater Infiltration Rate, aquifer safe yield, Seawater Intrusion, Salinization

Surface: soil moisture, runoff, Crop Water Demand, Agricultural Productivity
Integrated Mapping

4. Integrated Mapping for Vulnerability Assessment

3. Irrigated / Rainfed Areas

2. Impacts of Climate Change on Water Resources

- Primary Impact: Crop Water Demand
- Secondary Impact: Groundwater Level

1. Human Activities

- Overall Vulnerability Map

Identification of Vulnerability Hotspots
Regional Initiative Implementation Partners

Partners

- ESCWA
- UNEP
- WMO
- ACSAD
- LAS
- SMHI
- UNESCO
- UNU-INWEH
- ISDR
- giz

Donors

- Sida

National Research Institutes (under formalization)

- Environmental and Climate Research Institute (ECRI)
- Ministry of Water Resources and Irrigation (Egypt)
- Center of Excellence for Climate Change Research
- King Abdulaziz University (KSA)
- KAUST, Climate Services Center (CSC) – to be confirmed
Thank you!

Additional Information on the Regional Initiative available at:

www.escwa.un.org/RICCAR

For additional information on methodology, see guidance document:

Assessing the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region:
A Methodological Framework for Pursuing an Integrated Assessment

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