

Economic and Social Commission for Western Asia

# Impacts of Climate Change on Water Resources, Agriculture and Food Security in the Arab region

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Koronivia Joint Work on Agriculture  
Virtual Regional Workshop  
July 27, 2020

# Climate Modelling and Impacts Assessment

**The Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-economic Vulnerability in the Arab Region (RICCAR)**

**Objective: 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.**

**Assessment**

**Adaptation**

**Mitigation**

**Negotiations**



# Average Mean Annual Temperatures may increase by more than 5° C in Arab States

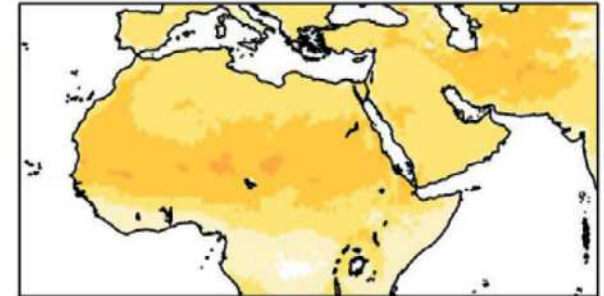
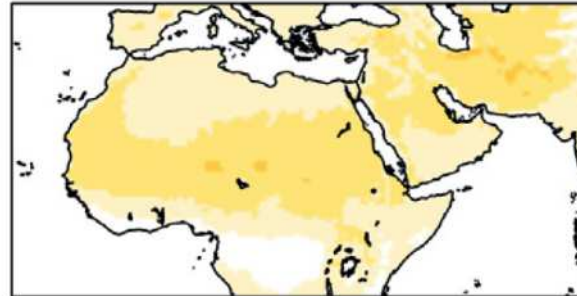
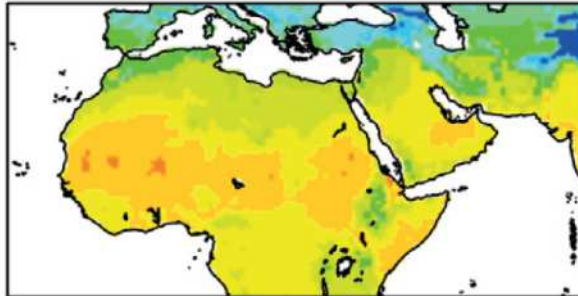
Reference Period

Moderate Scenario (RCP 4.5)

1986-2005

2046-2065

2081-2100



Mean Temperature (°C)



Change in Temperature (°C)



Change in Temperature (°C)

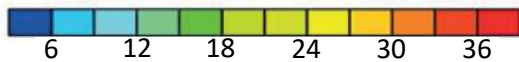
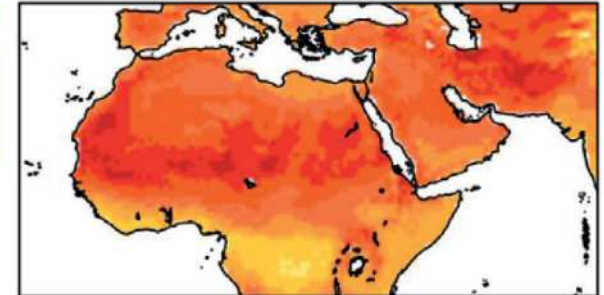
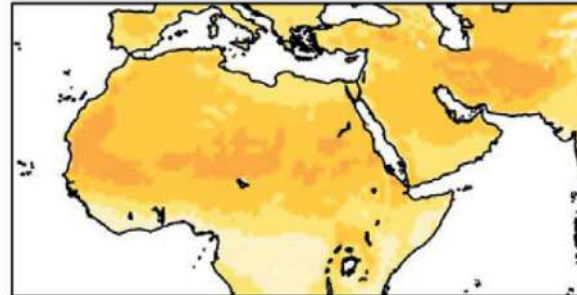
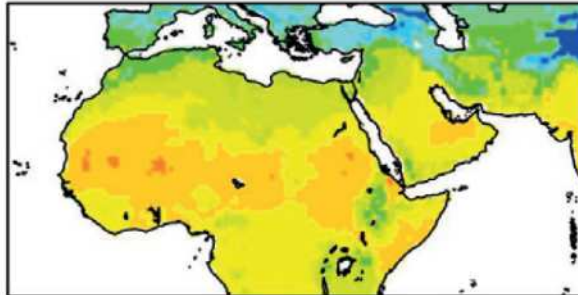
Reference Period

Extreme Scenario (RCP 8.5)

1986-2005

2046-2065

2081-2100



Mean Temperature (°C)

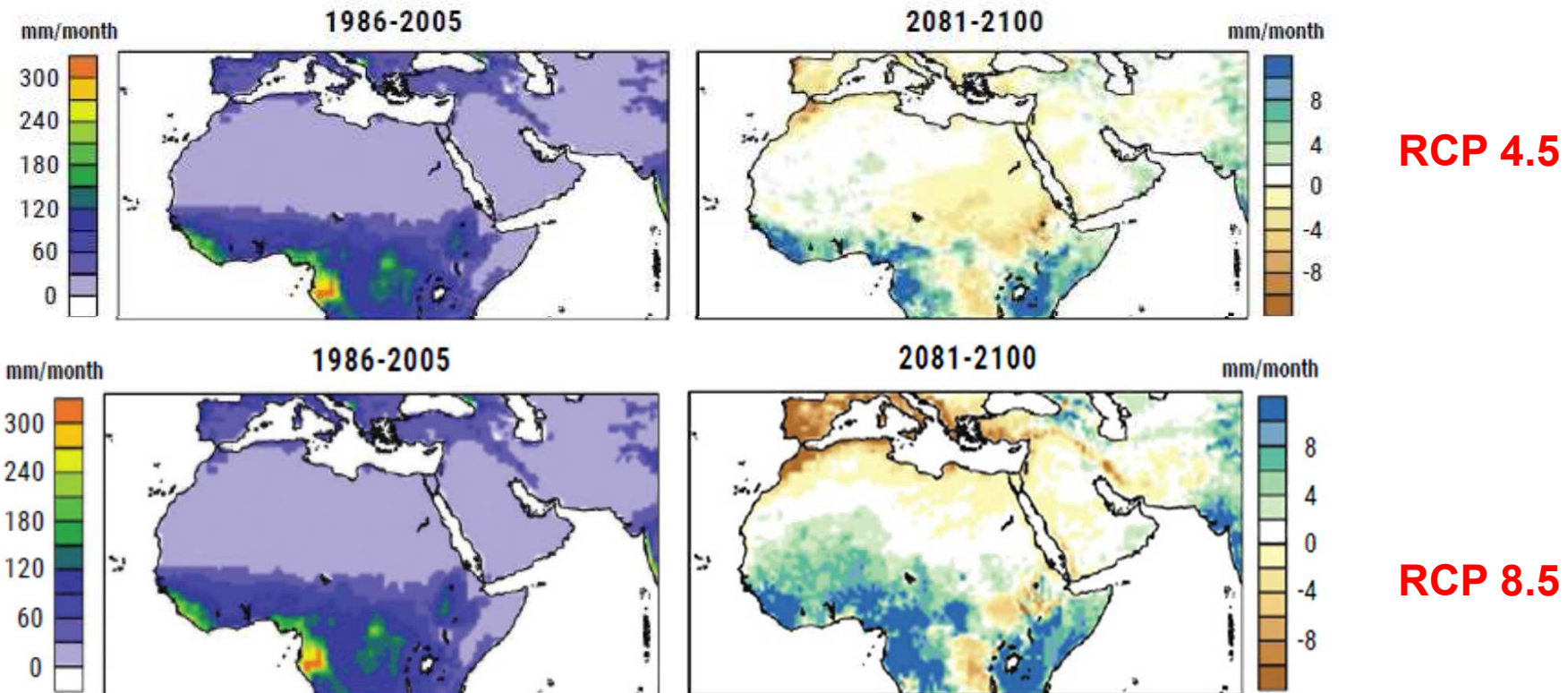


Change in Temperature (°C)



Change in Temperature (°C)

# Changes in the average monthly precipitation for end of century

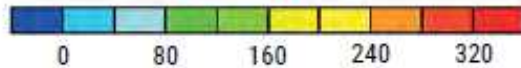
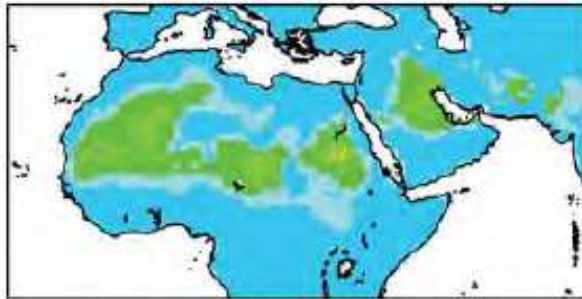


- Both scenarios show a reduction of the average monthly precipitation reaching 8-10 mm in the coastal areas of the domain, mainly around the Atlas Mountains in the West and upper Euphrates and Tigris river basins in the East.

# Dramatic increases in the number of “Very Hot Days” > 40°C per year

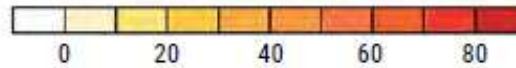
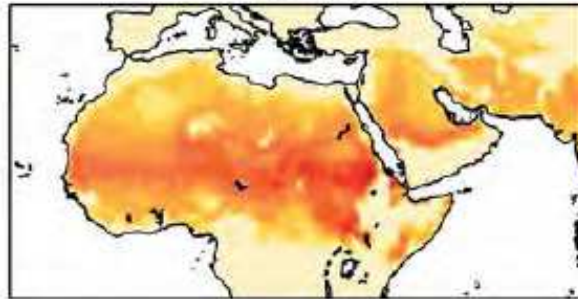
Reference Period

1986-2005

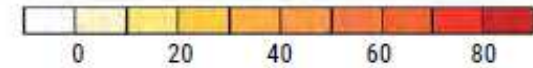
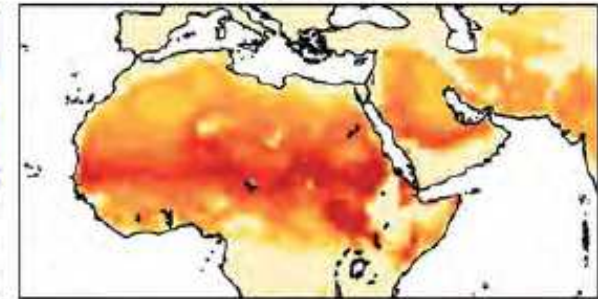


Moderate Scenario (RCP 4.5)

2046-2065



2081-2100

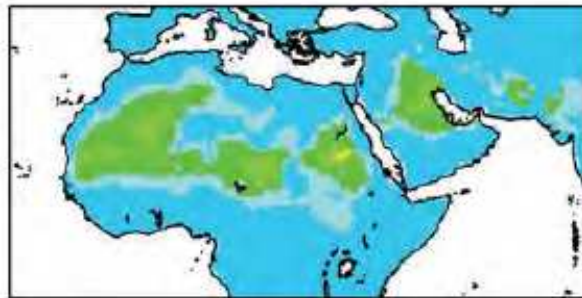


Number of days/year

Increase in Number of Days/year

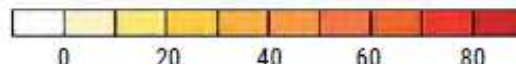
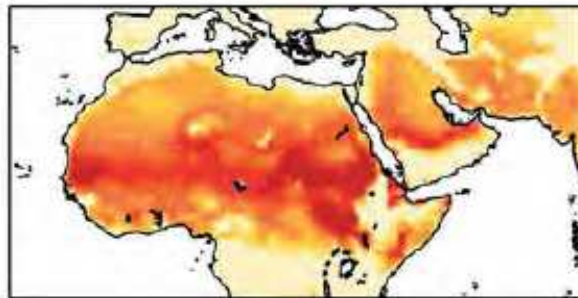
Reference Period

1986-2005

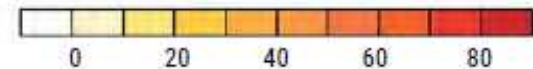
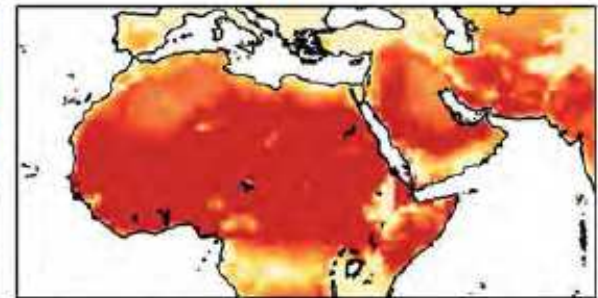


Extreme Scenario (RCP 8.5)

2046-2065



2081-2100

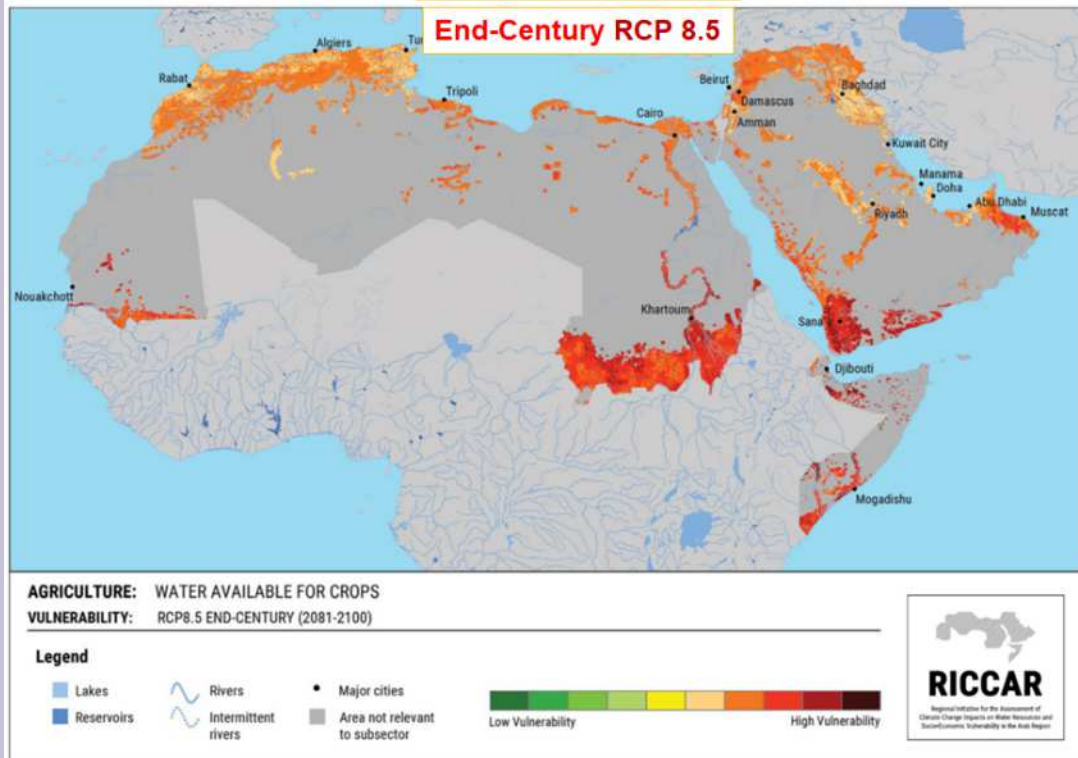


Increase in Number of Days/year



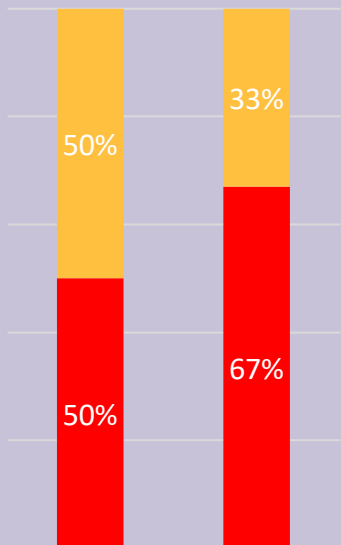
# The Agriculture Sector is one of the most vulnerable sectors to climate change in the Arab region

## Water Available for Crops: Vulnerability



Up to 84% of Agricultural Land in the Arab Region is Highly Vulnerable to Water Availability under Climate Change

### Mid Century (% Study Area)

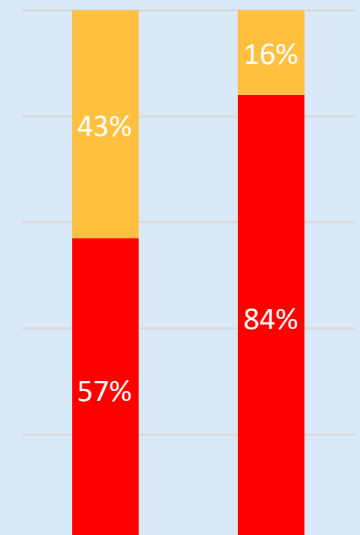


Moderate Scenario    Extreme Scenario

- Low Vulnerability
- Moderate Vulnerability
- High Vulnerability

### End Century

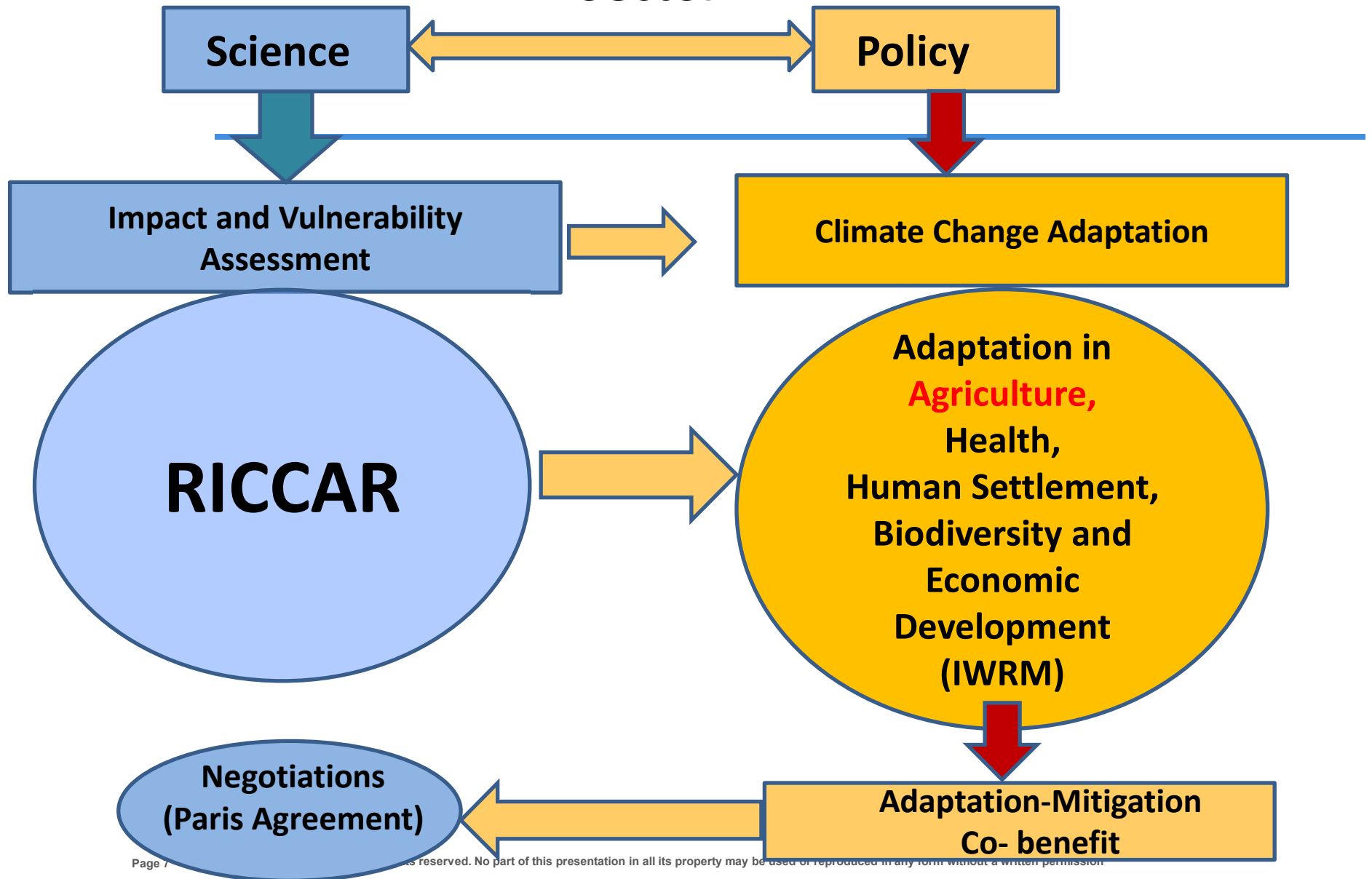
(% Study Area)



Moderate Scenario    Extreme Scenario

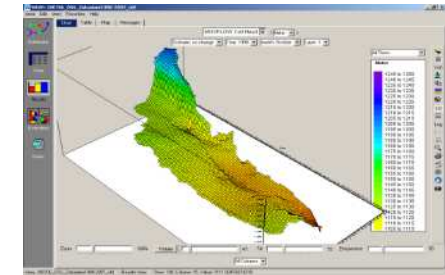
- Low Vulnerability
- Moderate Vulnerability
- High Vulnerability

# Science – Policy Interface for Adaptation in Agriculture Sector





# Agriculture (1/2)



## 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

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

Second order (biophysical)	Third order (socioeconomic)
<ul style="list-style-type: none"> <li>• Physiological effects on crops, pasture, forests and livestock (quantity and quality)</li> <li>• Change in land, soil and water resources (quantity and quality)</li> <li>• Increased weed and pest challenges</li> <li>• Shifts in spatial and temporal distribution of impacts</li> <li>• Sea level rise, changes to seawater salinity and acidity</li> <li>• Sea temperature rise causing fish to inhabit different ranges</li> </ul>	<ul style="list-style-type: none"> <li>• Decline in yields and production</li> <li>• Reduced marginal GDP from agriculture</li> <li>• Fluctuations in world market prices</li> <li>• Changes in geographical distribution of trade patterns</li> <li>• Increased number of people at risk of hunger and food insecurity</li> <li>• Migration and civil unrest</li> <li>• High demographic fluctuations</li> <li>• Fragile socioeconomic conditions of women, children and elderly people</li> <li>• Spread of unconventional diseases affecting humans, animals and plants</li> <li>• Lower livestock production due to constant conflict between humans and animals on land use</li> </ul>

Source: Adapted from FAO, 2007.

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

Location	Crop	Climate scenario			
		RCP4.5		RCP8.5	
		At the mid-century (2046-2065)	At the end of the century (2081-2100)	At the mid-century (2046-2065)	At the end of the century (2081-2100)
<b>Irrigated crop</b>					
<b>At Orontes watershed (Lebanon)</b>	eggplant	-9.4	-13.3	-9.8	-27.3
	maize	-7.4	-12.3	-9.9	-17.1
	potato	-3.9	-5.2	-5.2	-10.7
<b>At North Delta (Egypt)</b>	maize	0.3	-1.0	-1.5	-8.9
	wheat	-4.1	-5.7	-4.0	-5.5
	cotton	-3.0	-4.3	-3.2	-6.3
	Average	-4.6	-7.0	-5.6	-12.6
<b>Rainfed crop</b>					
<b>At Karak governorate (Jordan)</b>	wheat	-1.5	-15.5	-5.2	-55.3
	barley	-7.0	-17.3	-2.4	-59.3
	Average	4.3	16.4	3.8	57.3





# Agriculture (2/2)

## 4. Adaptation Measures and IWRM Options and Tools

- Water resources
- Water storage and quality aspects
- Water harvesting
- Rain-fed farming
- Irrigated farming
- Forestry and agro-forestry
- Livestock management
- Pasture management
- Fisheries and aquaculture

## 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

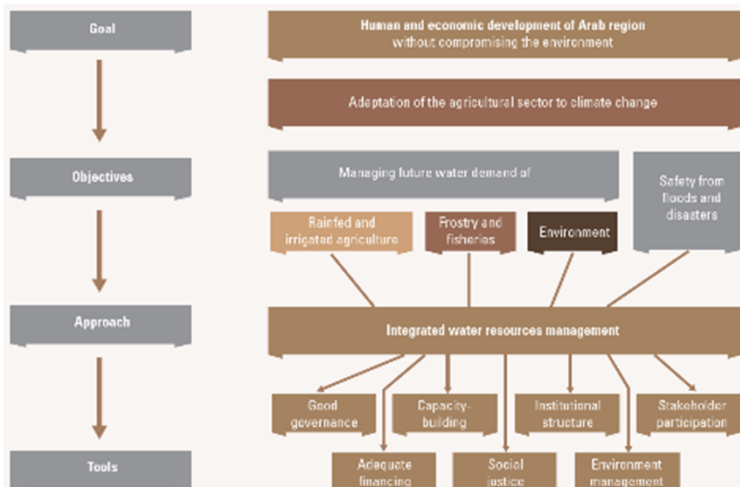


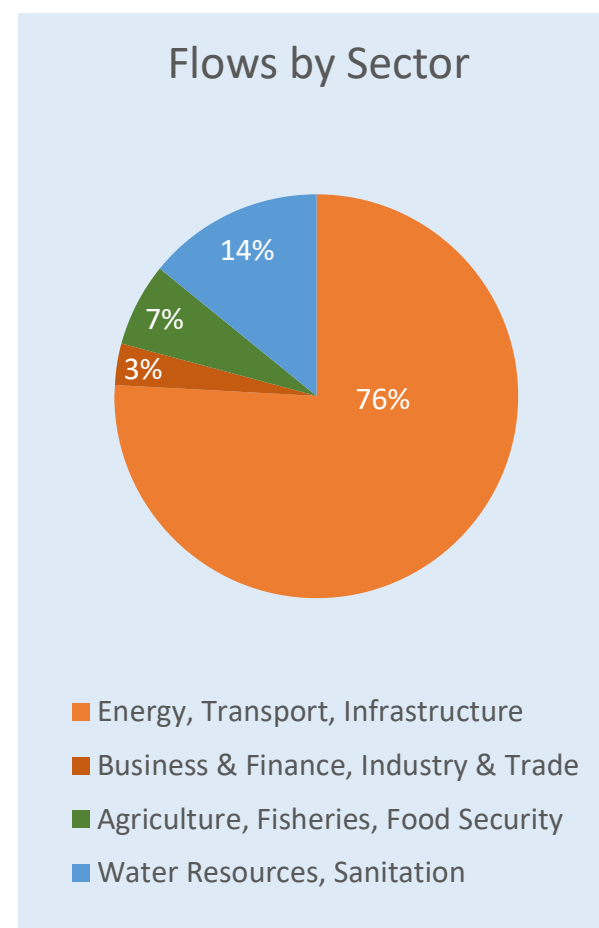
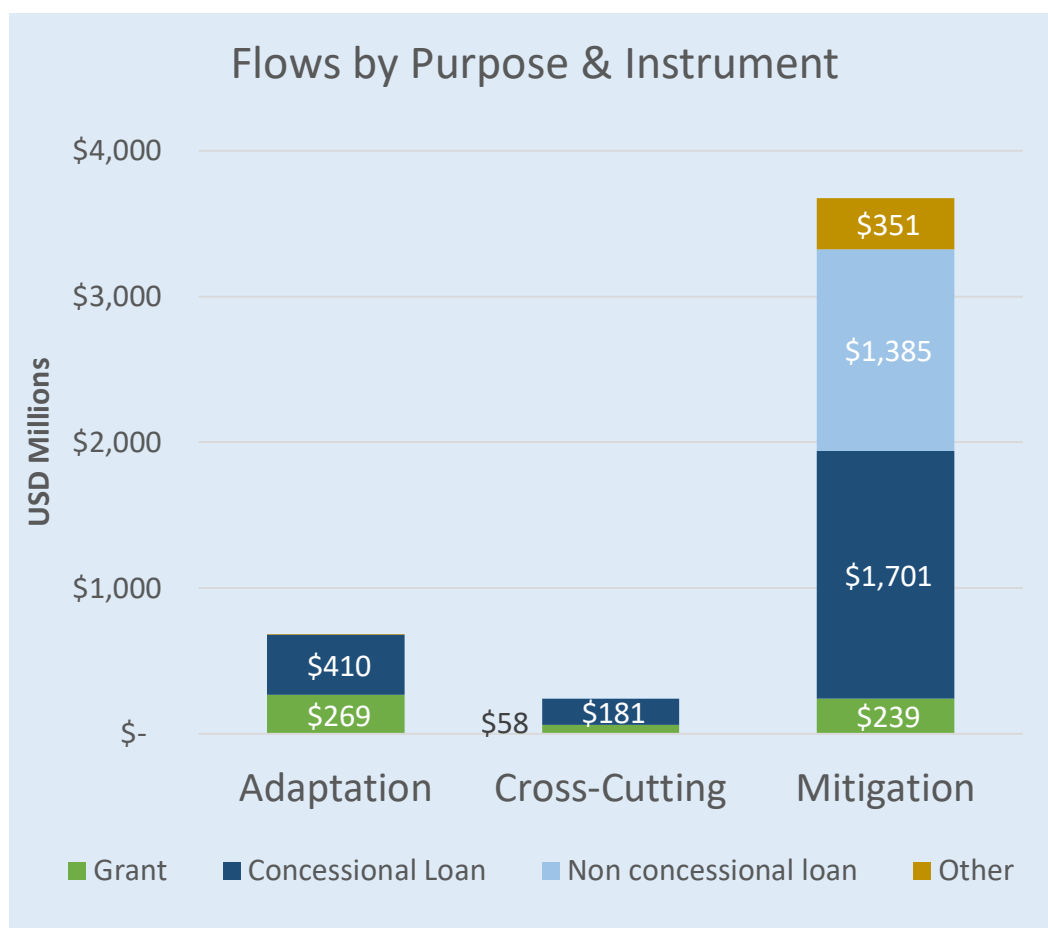
Figure 38. A schematic diagram of regional adaptation strategy to climate change



Source: Ribeiro et al., 2009.

# Adaptation is the priority for the Arab Region; Climate finance share for agriculture sector is only 7% among all sectors

Bilateral, Regional, & Other Flows\* to Arab States & MENA region reported by developed countries to UNFCCC, 2016



\* Note: Includes flows from a single source state to one or more recipient states. Excludes flows via multilateral funds and via multilateral development banks.



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# Food Security, Agriculture, & Climate Change...

## Projection & Monitoring Tools for Policy Formulation