

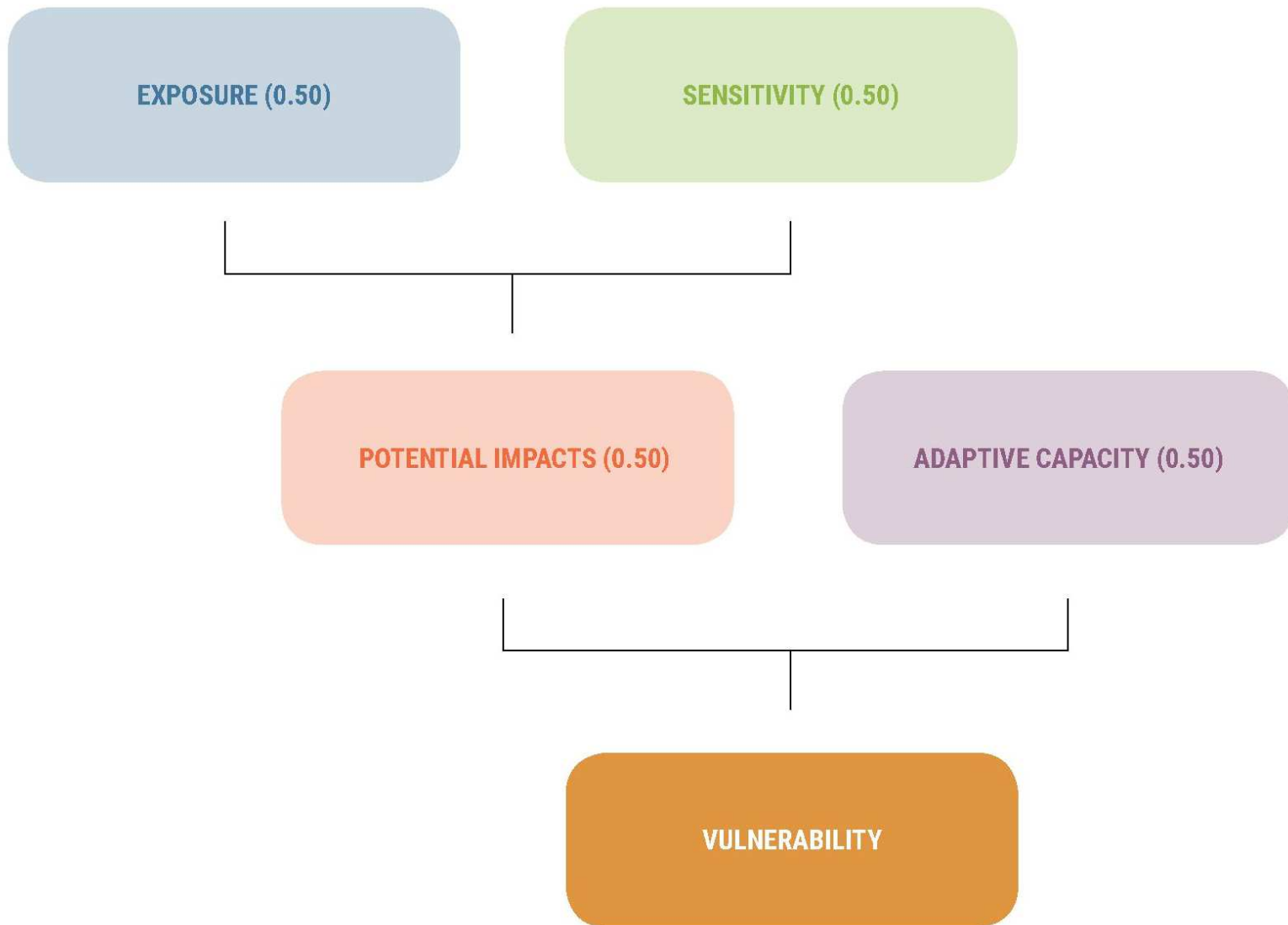
Climate Change Impacts on Socio-Economic Vulnerability of Water- dependent Sectors in the Arab Region (agriculture, ecosystems, cities, people)








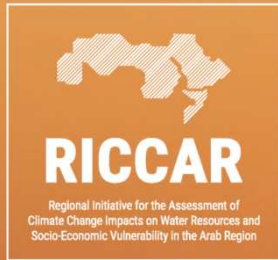
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Studies of
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**المركز العربي لدراسات المناطق الجافة و
الأراضي القاحلة (أكساد)**

Components of vulnerability



	SECTORS	SUBSECTORS
	Water	Water availability
	Biodiversity and Ecosystems	Area covered by forests Area covered by wetlands
	Agriculture	Water available for crops Water available for livestock
	Infrastructure and Human Settlements	Inland flooding area
	People	Water available for drinking Health conditions due to heat stress Employment rate for the agricultural sector



Vulnerability of Water Available for Crops

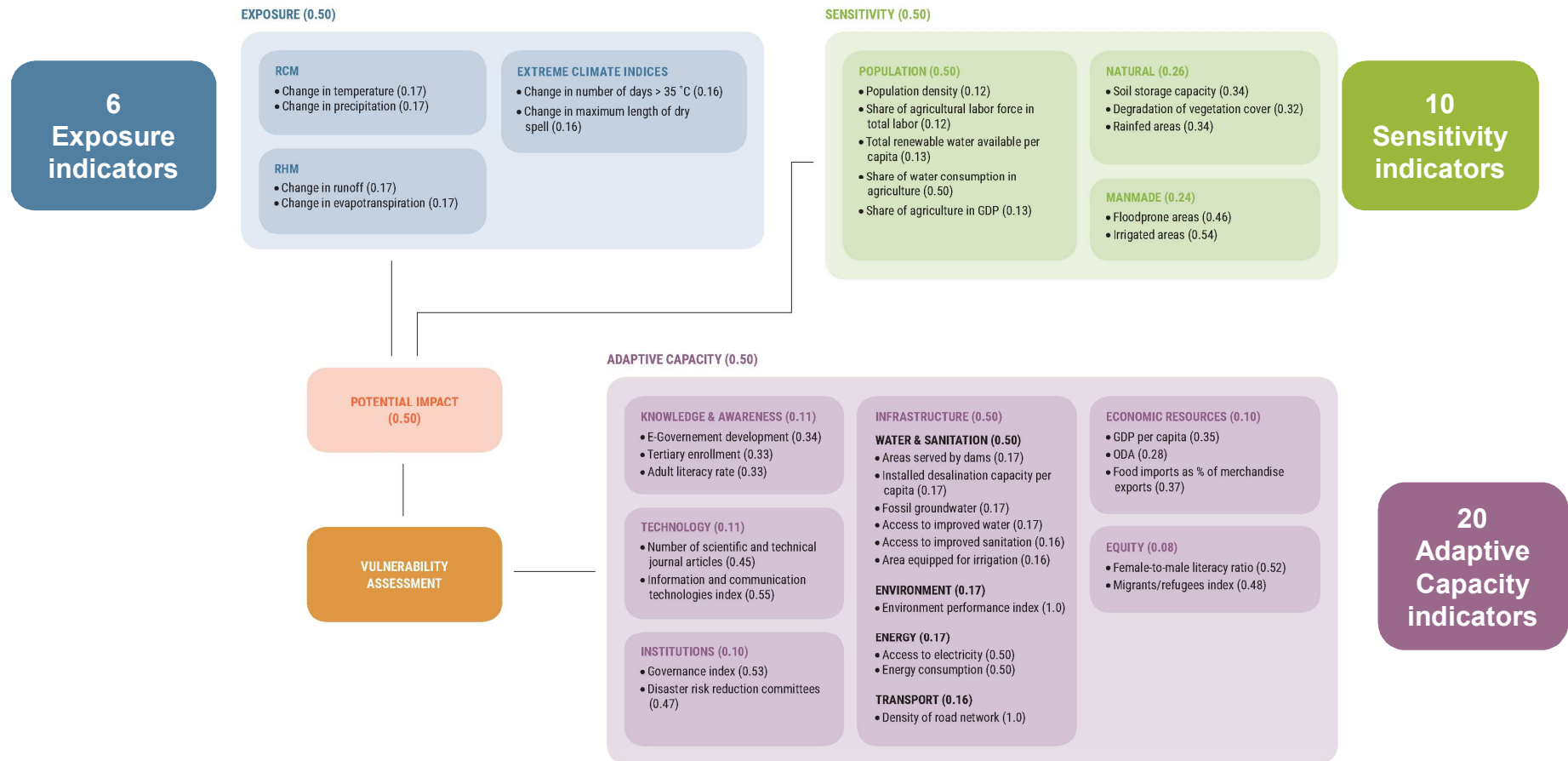
Study area

- The water availability study area represents 22% of the Arab Region and is defined by:
- rainfed cropland Area ,and
- irrigated cropland areas



Impact chain of Water Available for Crops

CHANGE IN THE WATER AVAILABLE FOR CROPS – IMPACT CHAIN



Exposure

EXPOSURE (0.50)

RCM

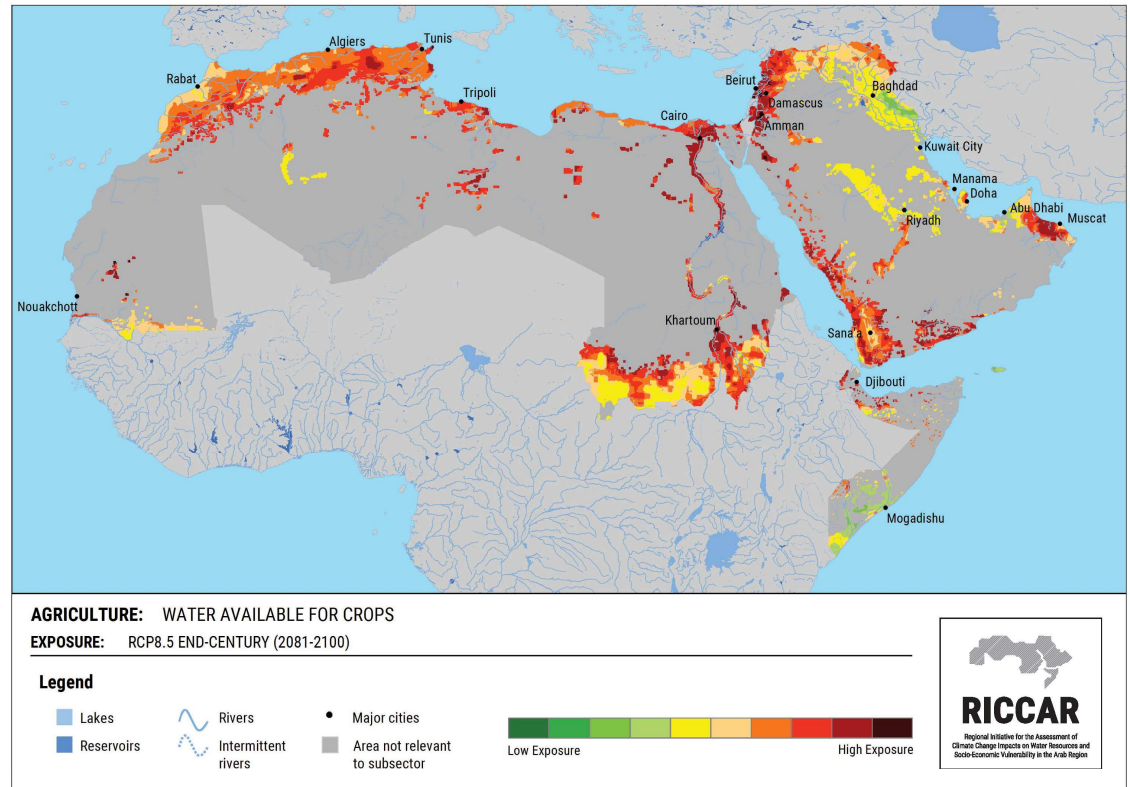
- Change in temperature (0.17)
- Change in precipitation (0.17)

EXTREME CLIMATE INDICES

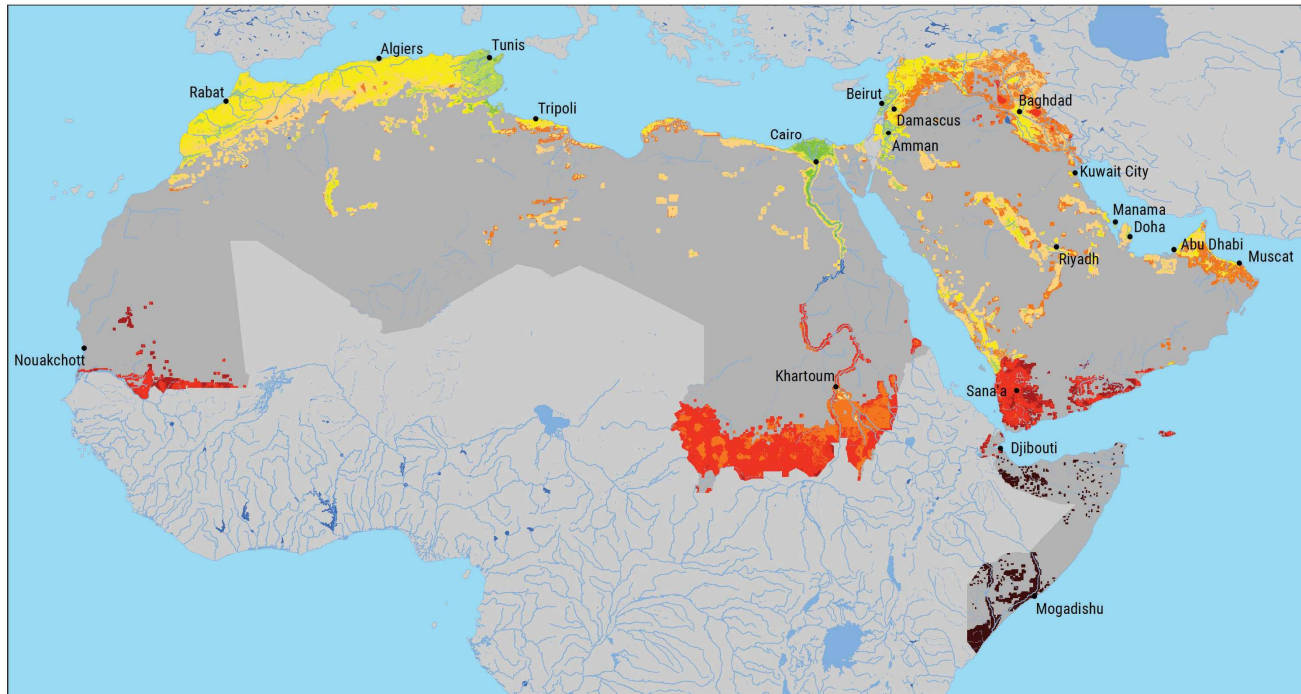
- Change in number of days > 35 °C (0.16)
- Change in maximum length of dry spell (0.16)

RHM

- Change in runoff (0.17)
- Change in evapotranspiration (0.17)



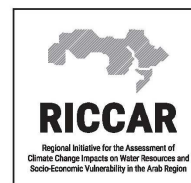
Scenario	Percentage of study area		
	Low EX	Moderate EX	High EX
RCP 4.5 Mid-century	7%	86%	7%
RCP 8.5 Mid-century	1%	67%	32%
RCP 4.5 End-century	6%	68%	26%
RCP 8.5 End-century	1%	35%	64%



AGRICULTURE: WATER AVAILABLE FOR CROPS

ADAPTIVE CAPACITY

Legend

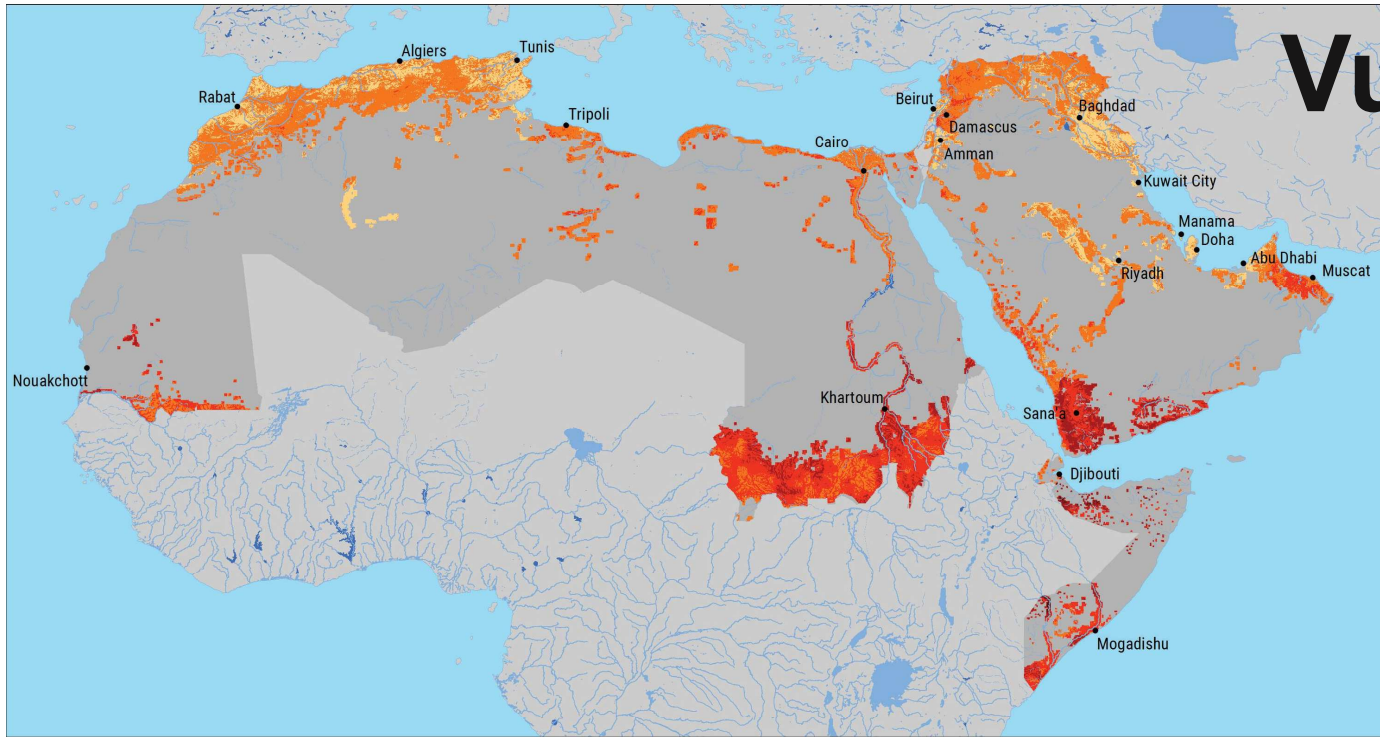


Areas with lowest adaptive capacity:

- the Horn of Africa
- The southern of Sudan,
- The southern of Mauretania and
- the southwestern Arabian Peninsula.

Scenario	Percentage of study area		
	Low AC	Moderate AC	High AC
All climate scenarios	28%	66%	7%

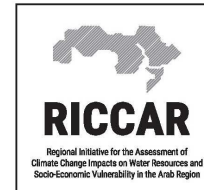
Vulnerability



AGRICULTURE: WATER AVAILABLE FOR CROPS

VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

Legend



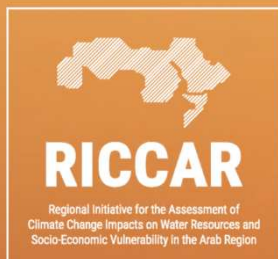
Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	50%	50%
RCP 8.5 Mid-century	0%	33%	67%
RCP 4.5 End-century	0%	43%	57%
RCP 8.5 End-century	0%	16%	84%

Areas with highest vulnerability:

- the upper Nile Valley,
- the southwestern Arabian Peninsula, and

Areas with lowest vulnerability:

- the Mediterranean coast of the Maghreb,,
- parts of the Levant, the Tigris-Euphrates Basin, and the central eastern Arabian Desert.



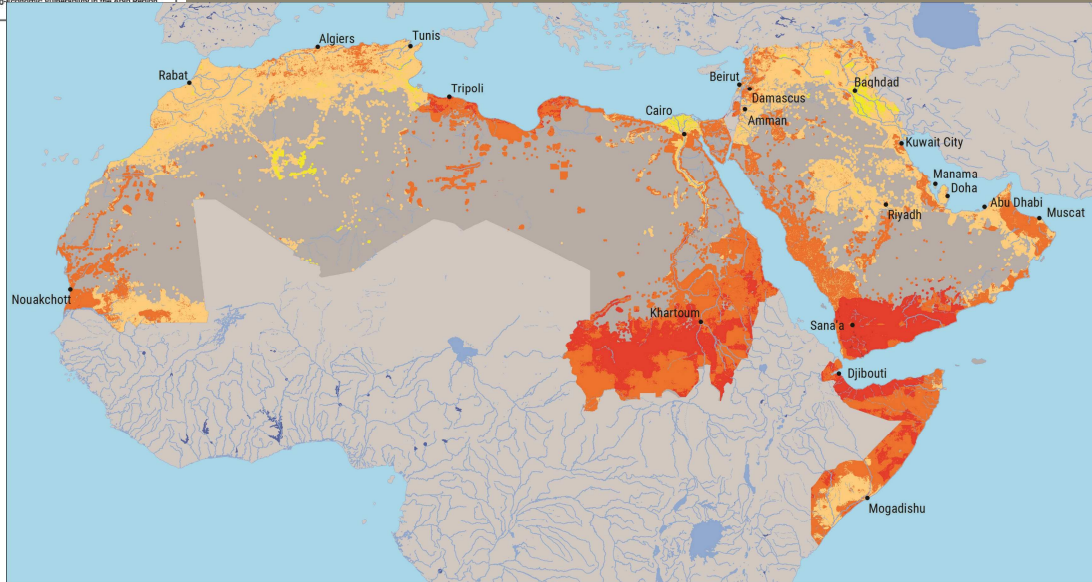
Vulnerability of Water Availability to climate change

The water availability Study area

- The water availability study area represents 49% of the Arab Region and is defined by selected indicators and water users, as reflected by the areas drawing upon fresh water resources:
 - Populated areas (greater than 2 inhabitants per sq km)
 - Irrigated cropland areas
 - Rainfed cropland areas
 - Livestock areas (greater than 10 heads per sq km)
 - Forested areas
 - Wetland areas









Vulnerability



WATER: WATER AVAILABILITY

VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

Legend

-  Lakes
-  Reservoirs
-  Rivers
-  Intermittent rivers
-  Major cities
-  Area not relevant to subsector



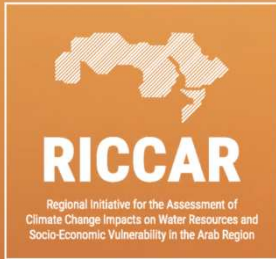
Areas with highest vulnerability:

- the upper Nile Valley,
- the southwestern Arabian Peninsula, and
- the northern Horn of Africa

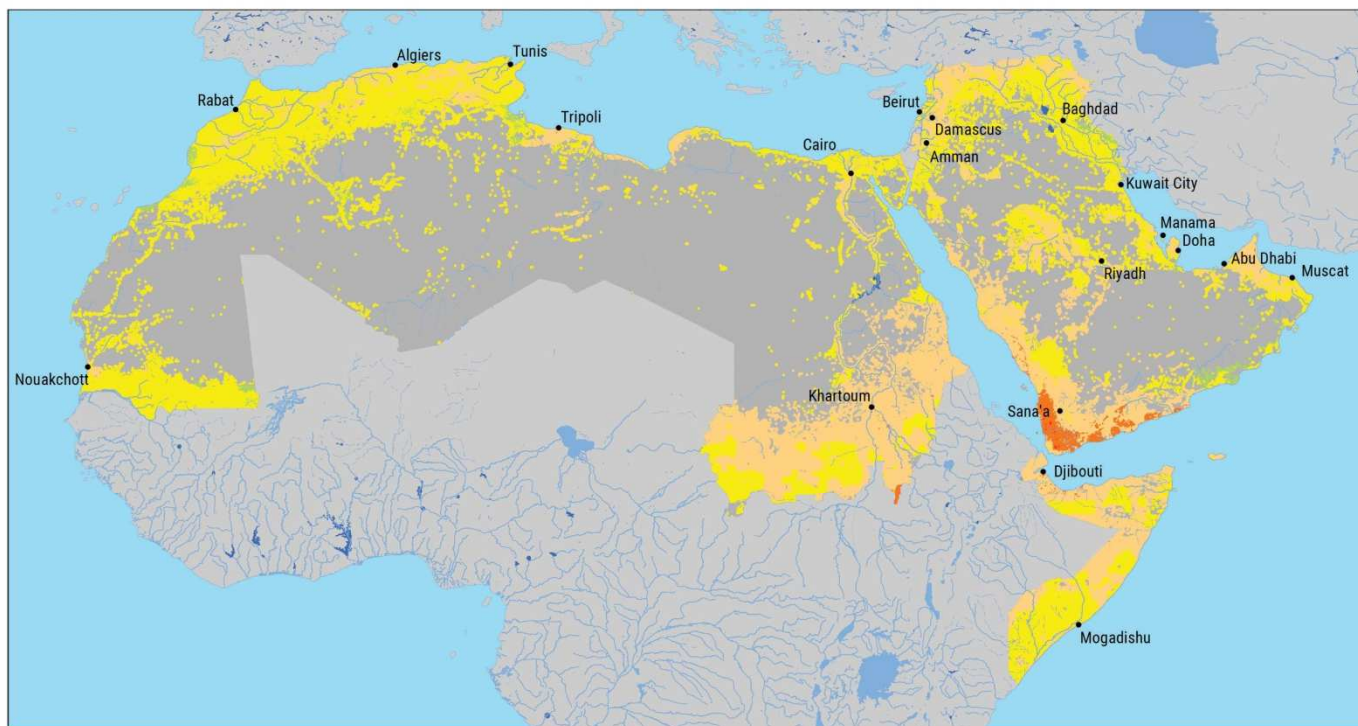
Areas with lowest vulnerability:

- the Tigris-Euphrates Basin and
- the lower Nile Valley, including the Nile Delta

Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	57%	43%
RCP 8.5 Mid-century	0%	48%	52%
RCP 4.5 End-century	0%	52%	48%
RCP 8.5 End-century	0%	43%	57%



Vulnerability of people with respect to drinking water and heat waves

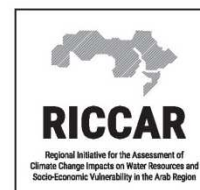
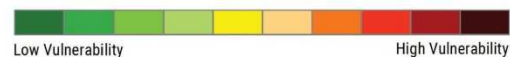


PEOPLE: WATER AVAILABLE FOR DRINKING

VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

Legend

- Lakes
- Reservoirs
- Rivers
- Intermittent rivers
- Major cities
- Area not relevant to subsector



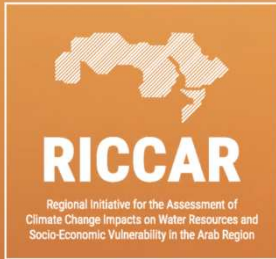
Areas with highest vulnerability:

- SW Arabian Peninsula

Areas with lowest vulnerability:

- Tigris-Euphrates Basin
- Gulf of Aden north central coastline
- Selected areas in Maghreb
- Lower Tindouf Basin/Taoudeni Basin

Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	98%	1%
RCP 8.5 Mid-century	0%	100%	0%
RCP 4.5 End-century	0%	99%	1%
RCP 8.5 End-century	0%	98%	2%



Vulnerability of forests and wetlands to climate change

Area covered by forests: Study area



**Biodiversity
and Ecosystems**

Area covered by forests

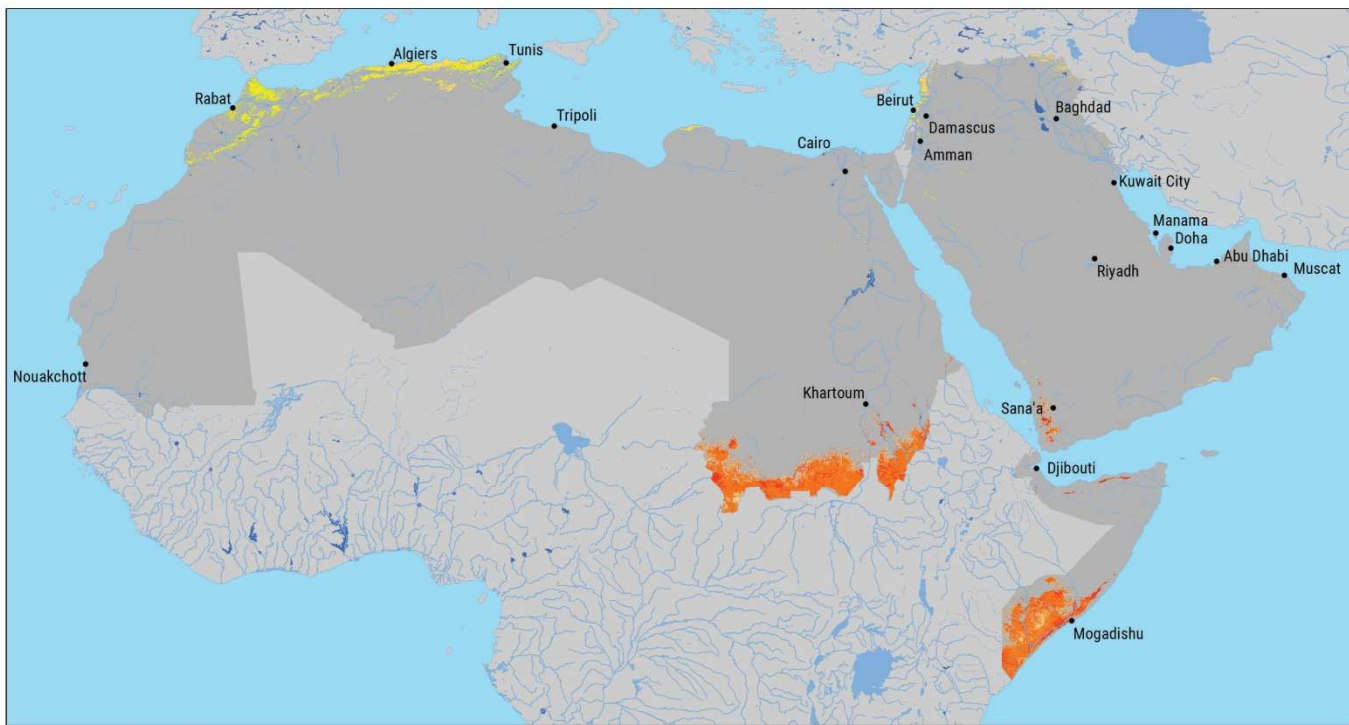
Area covered by wetlands

Study area based on *change in forest cover* indicator

Tree canopy closure over 5 m
in height for year 2000

Does not include cropland
areas





BIODIVERSITY AND ECOSYSTEMS: AREA COVERED BY FORESTS

VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

Legend

Lakes

Rivers

Major cities

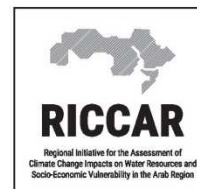
Low Vulnerability

High Vulnerability

Reservoirs

Intermittent rivers

Area not relevant to subsector



Areas with highest vulnerability:

- Tropical dry forest and tropical shrubland in sub-Saharan Africa
- Tropical mountain system forests of SW Arabian Peninsula

Areas with lowest vulnerability:

- Subtropical dry forest in Rif region (NW Africa)
- Forests of Ichkeul National Park (central N African coastline)

Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	59%	41%
RCP 8.5 Mid-century	0%	42%	58%
RCP 4.5 End-century	0%	50%	50%
RCP 8.5 End-century	0%	36%	64%

Area covered by wetlands: Study area



**Biodiversity
and Ecosystems**

Area covered by forests

Area covered by wetlands

Study area based on *wetlands*
indicator

Ramsar sites (and their buffers)

Coastal wetlands

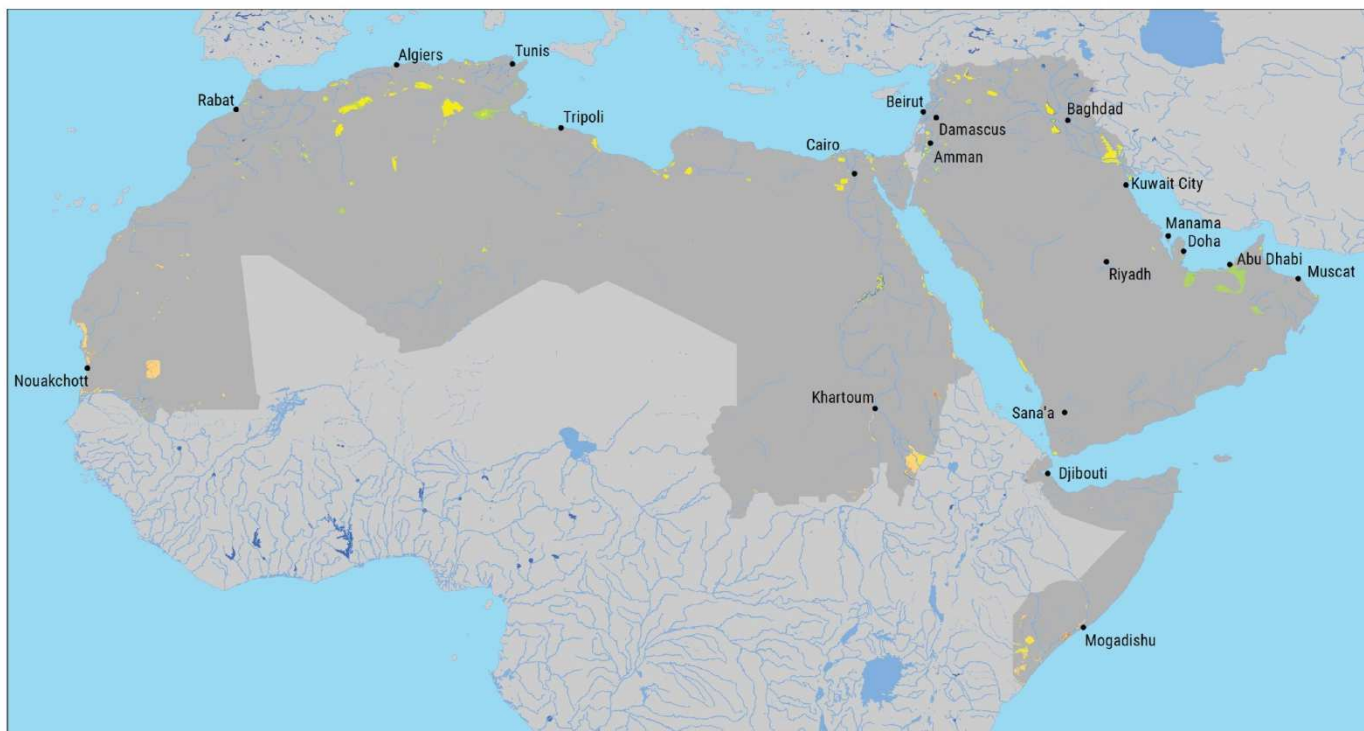
Riverine wetlands

Oases

Sabkhas

Salt pans

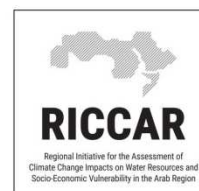




BIODIVERSITY AND ECOSYSTEMS: AREA COVERED BY WETLANDS

VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

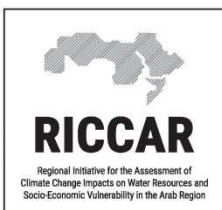
Legend



Areas with lowest vulnerability:

- Wetlands in the eastern Atlas region
 - Shott el Djerid/Shott el Fedjadj Complex
 - Sebkhet Sidi el Hani
 - Sebkhet el Melah
- Wetlands in the southern Maghreb
 - Oasis de Tamantit et Sid Ahmed Timmi
- Wetlands near the Arabian Gulf
 - Sabkha Matti

Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	5%	94%	1%
RCP 8.5 Mid-century	1%	97%	2%
RCP 4.5 End-century	6%	93%	1%
RCP 8.5 End-century	1%	97%	2%



Thank you



Biodiversity and Ecosystems

Area covered by forests
Area covered by wetlands

