Vulnerability of Water Available for Crops

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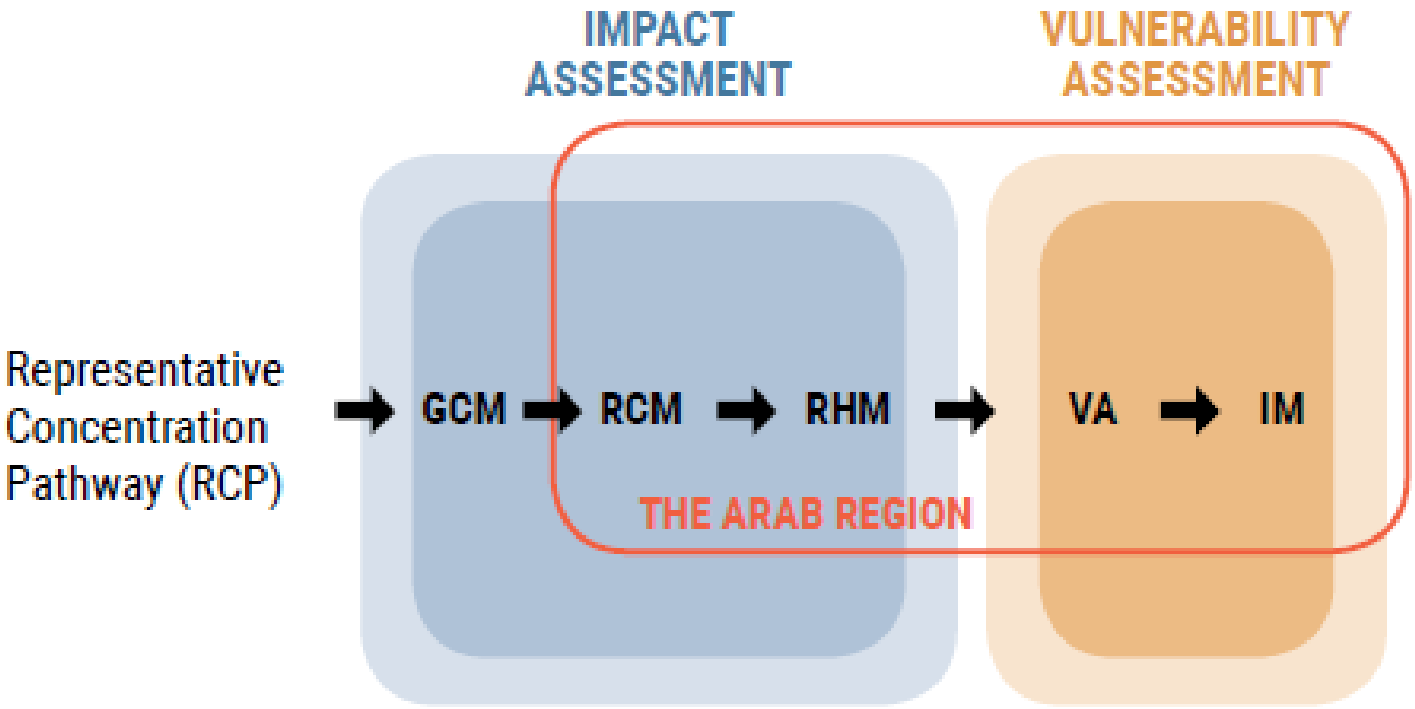
The integrated Assessment model



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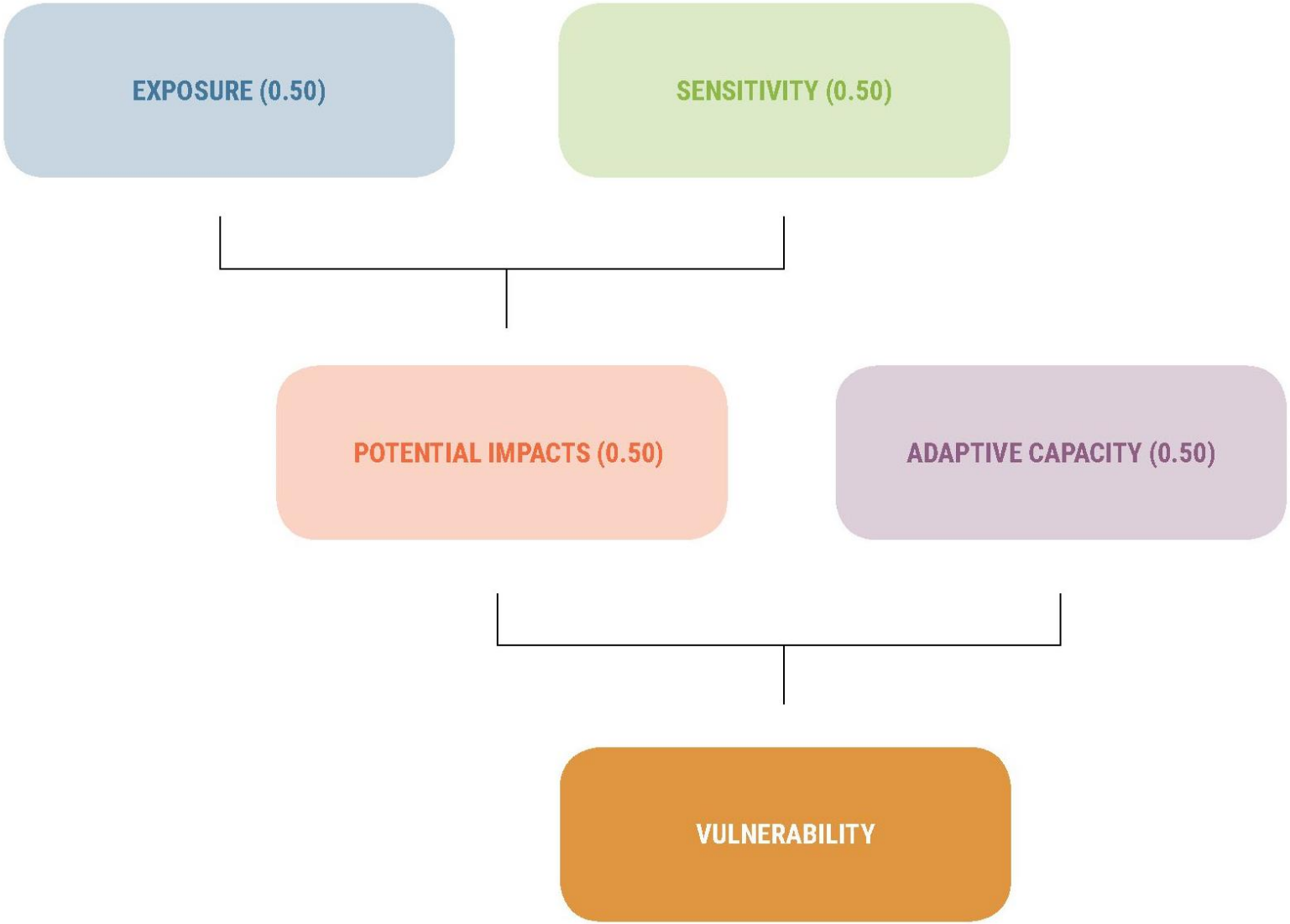
Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region

Components of vulnerability



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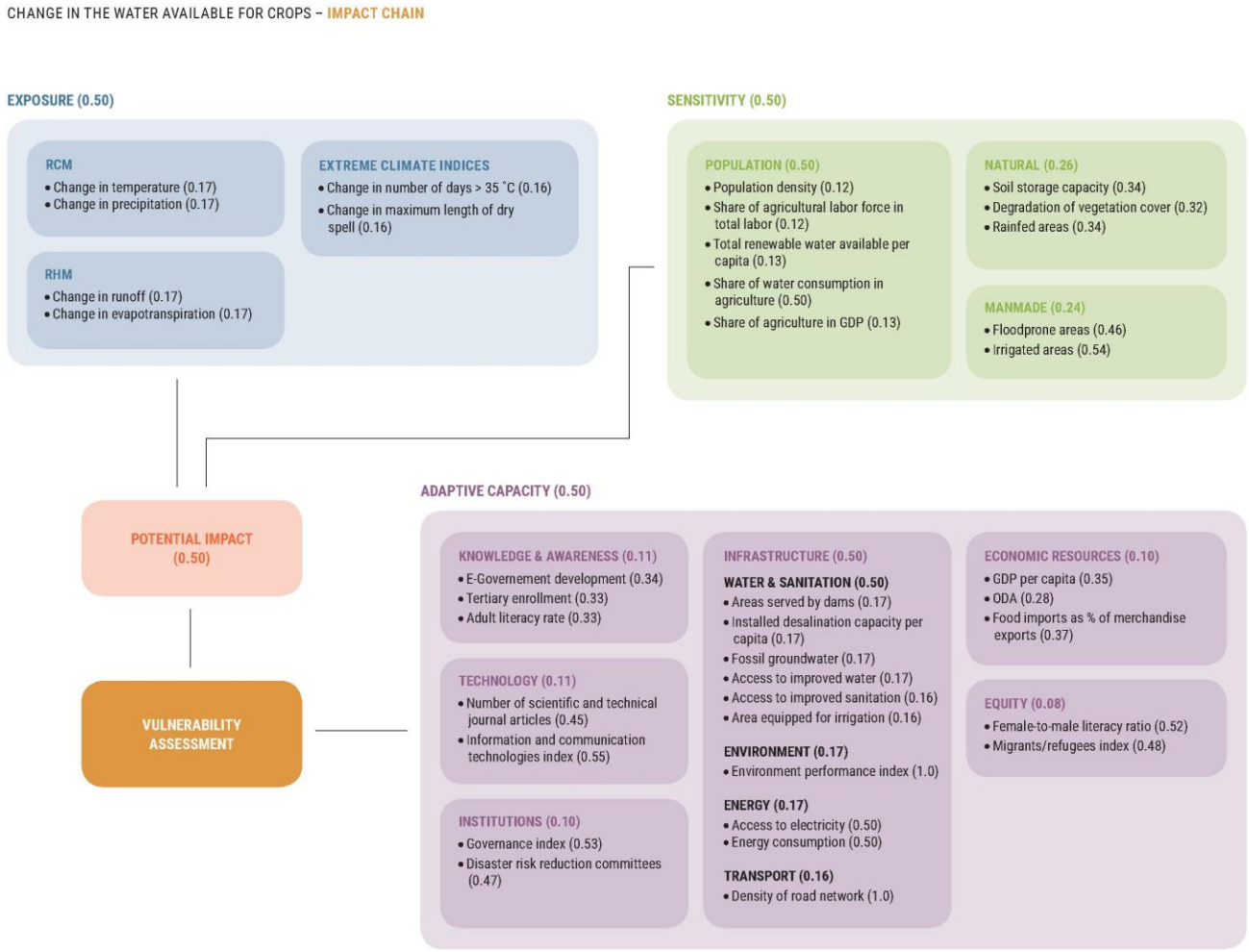
	SECTORS	SUBSECTORS
	**Water**	Water availability
	**Biodiversity and Ecosystems**	Area covered by forests Area covered by wetlands
	**Agriculture**	Water available for crops Water available for livestock
	**Infrastructure and Human Settlements**	Inland flooding area
	**People**	Water available for drinking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

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



6 Exposure indicators

10 Sensitivity indicators

20 Adaptive Capacity indicators

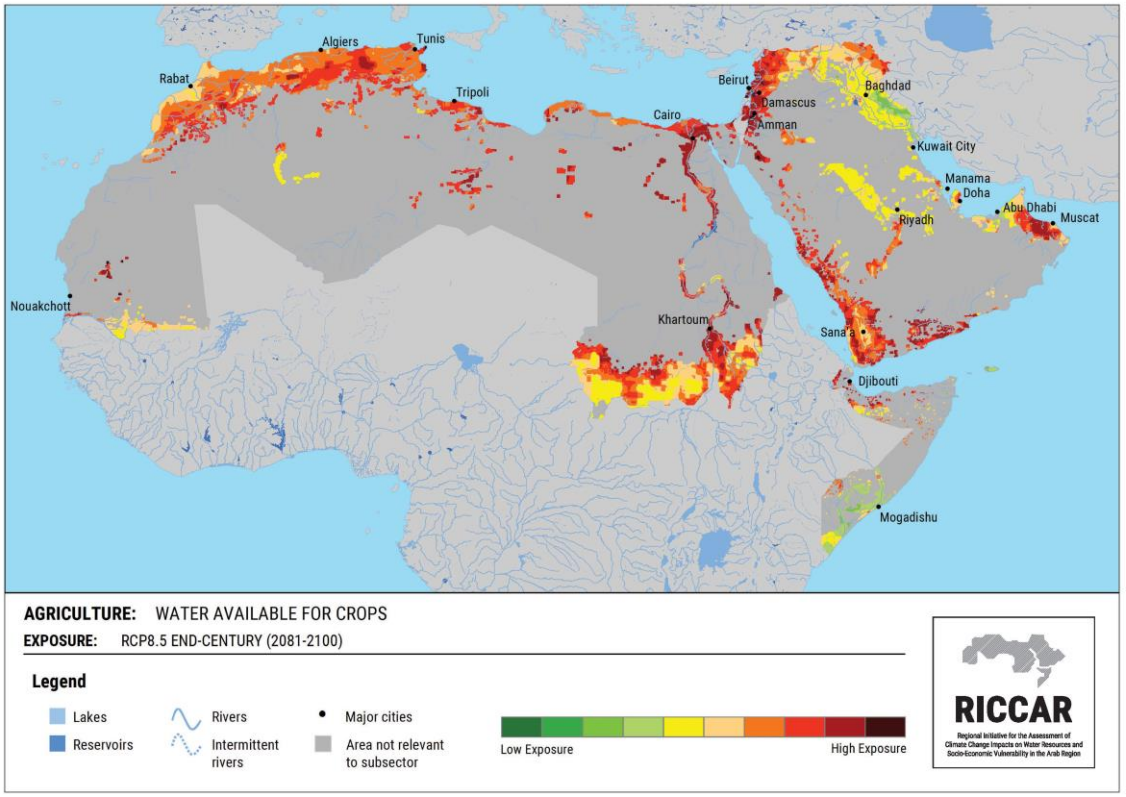
Exposure

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%

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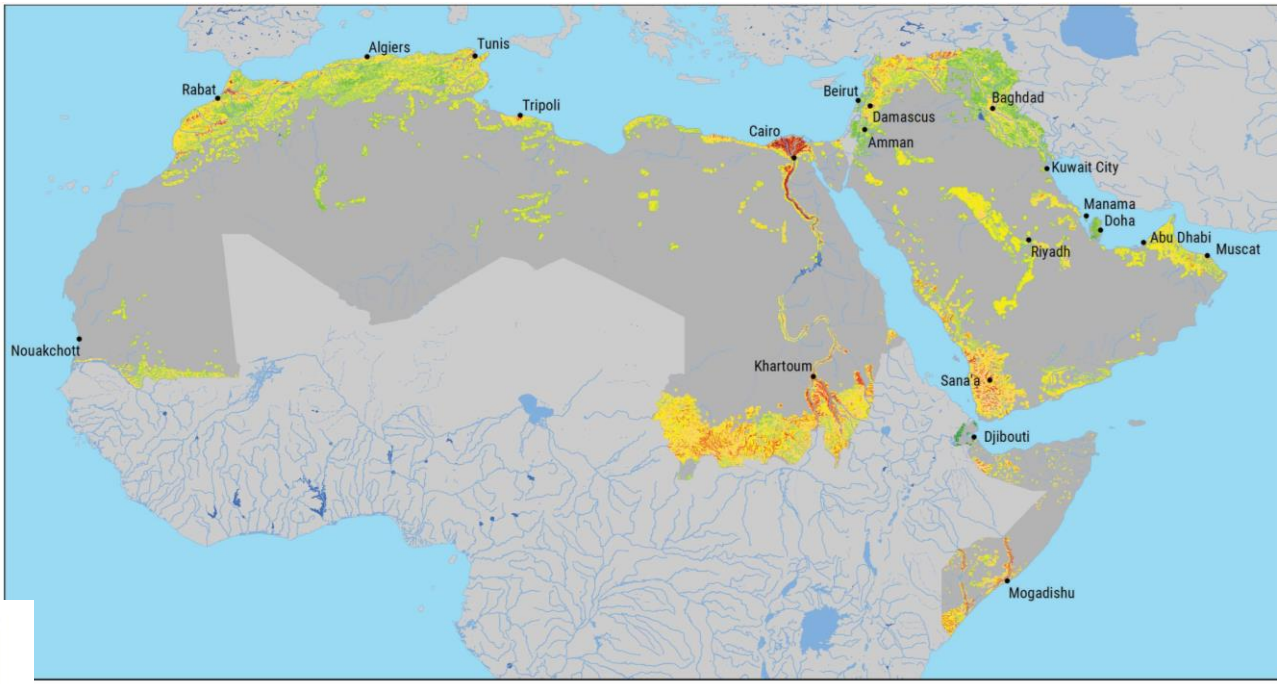
sensitivity



POPULATION (0.50)
- Population density (0.12)
- Share of agricultural labor force in total labor (0.12)
- Total renewable water available per capita (0.13)
- Share of water consumption in agriculture (0.50)
- Share of agriculture in GDP (0.13)

NATURAL (0.26)
- Soil storage capacity (0.34)
- Degradation of vegetation cover (0.32)
- Rainfed areas (0.34)

MANMADE (0.24)
- Floodprone areas (0.46)
- Irrigated areas (0.54)

AGRICULTURE: WATER AVAILABLE FOR CROPS
SENSITIVITY

Legend

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

Low Sensitivity — High Sensitivity

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

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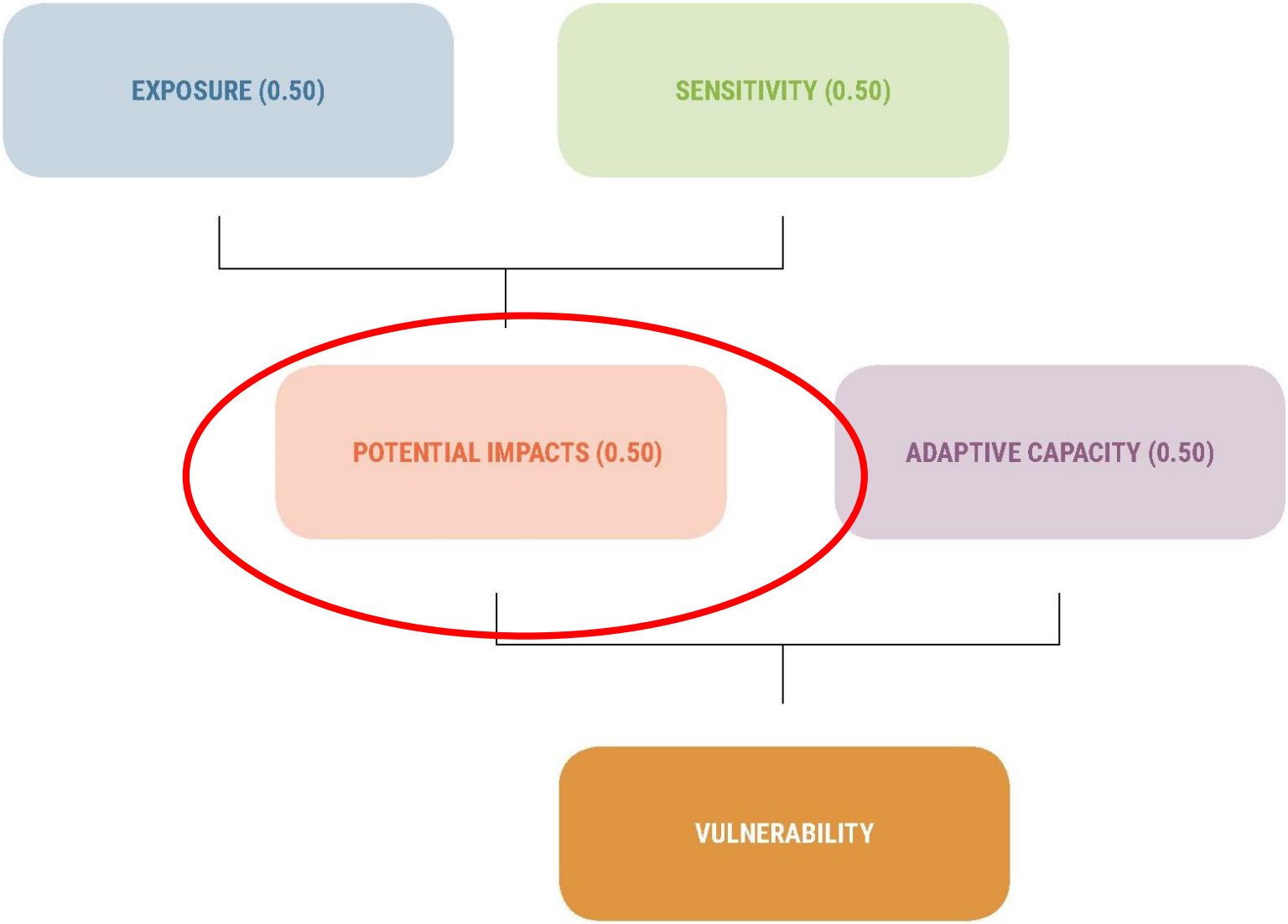
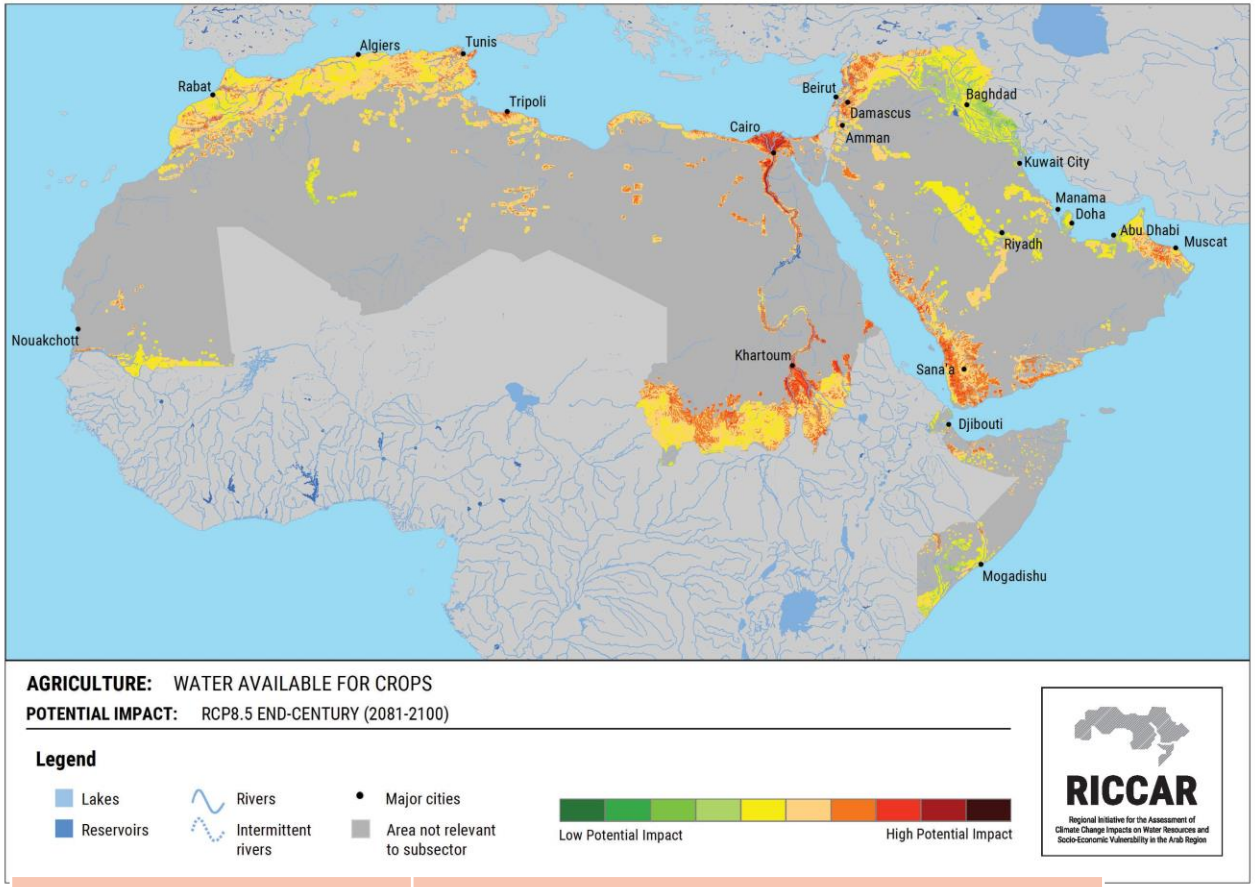
Components of vulnerability



potential impact



Scenario	Percentage of study area		
	Low PI	Moderate PI	High PI
RCP 4.5 Mid-century	3%	94%	4%
RCP 8.5 Mid-century	0%	90%	10%
RCP 4.5 End-century	2%	89%	9%
RCP 8.5 End-century	0%	79%	21%

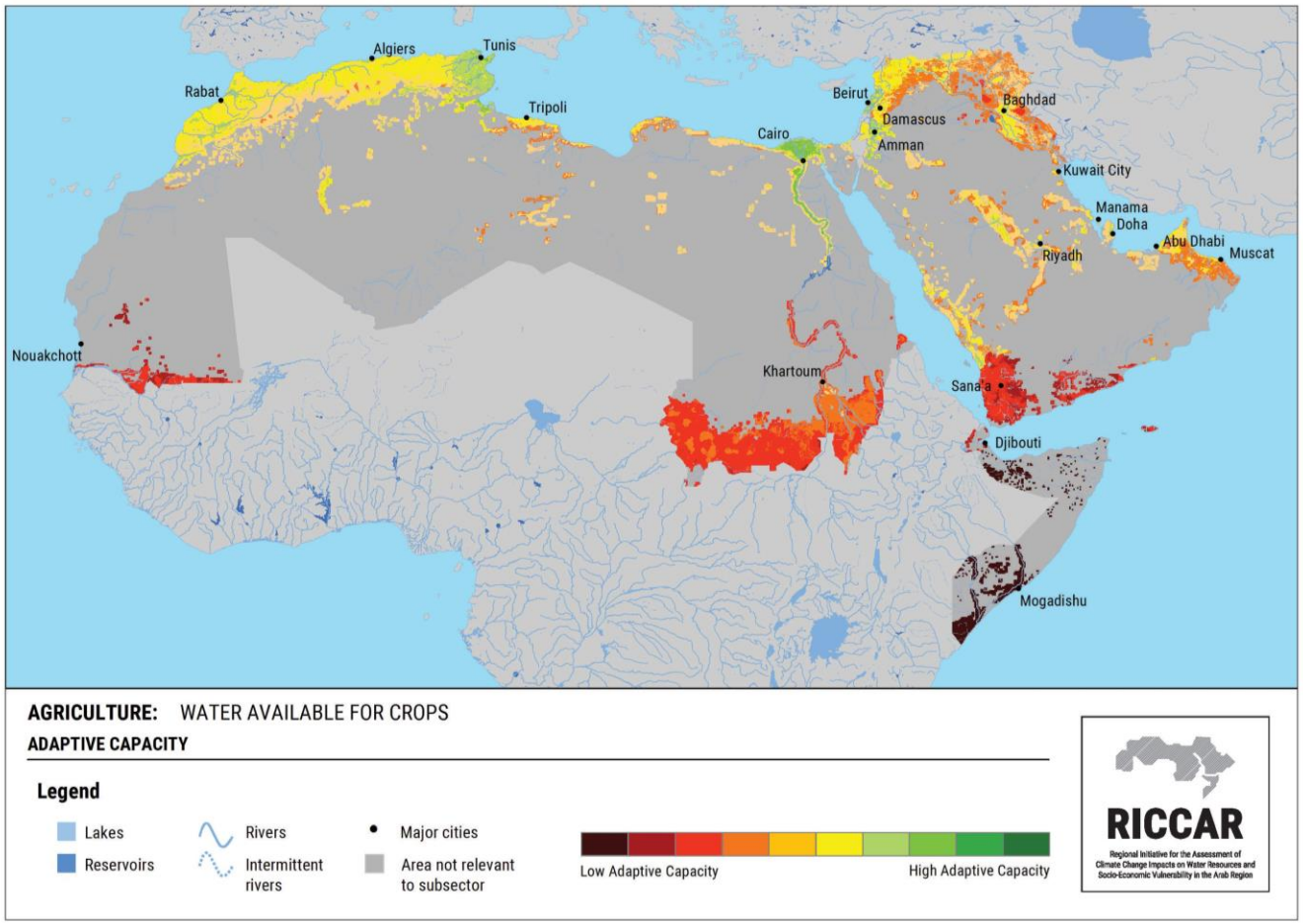
Areas with highest potential impact:

- The lower Nile River valley
- The eastern ME cost

Areas with lowest potential impact

- Tigris-Euphrates Basin

Adaptive capacity



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%

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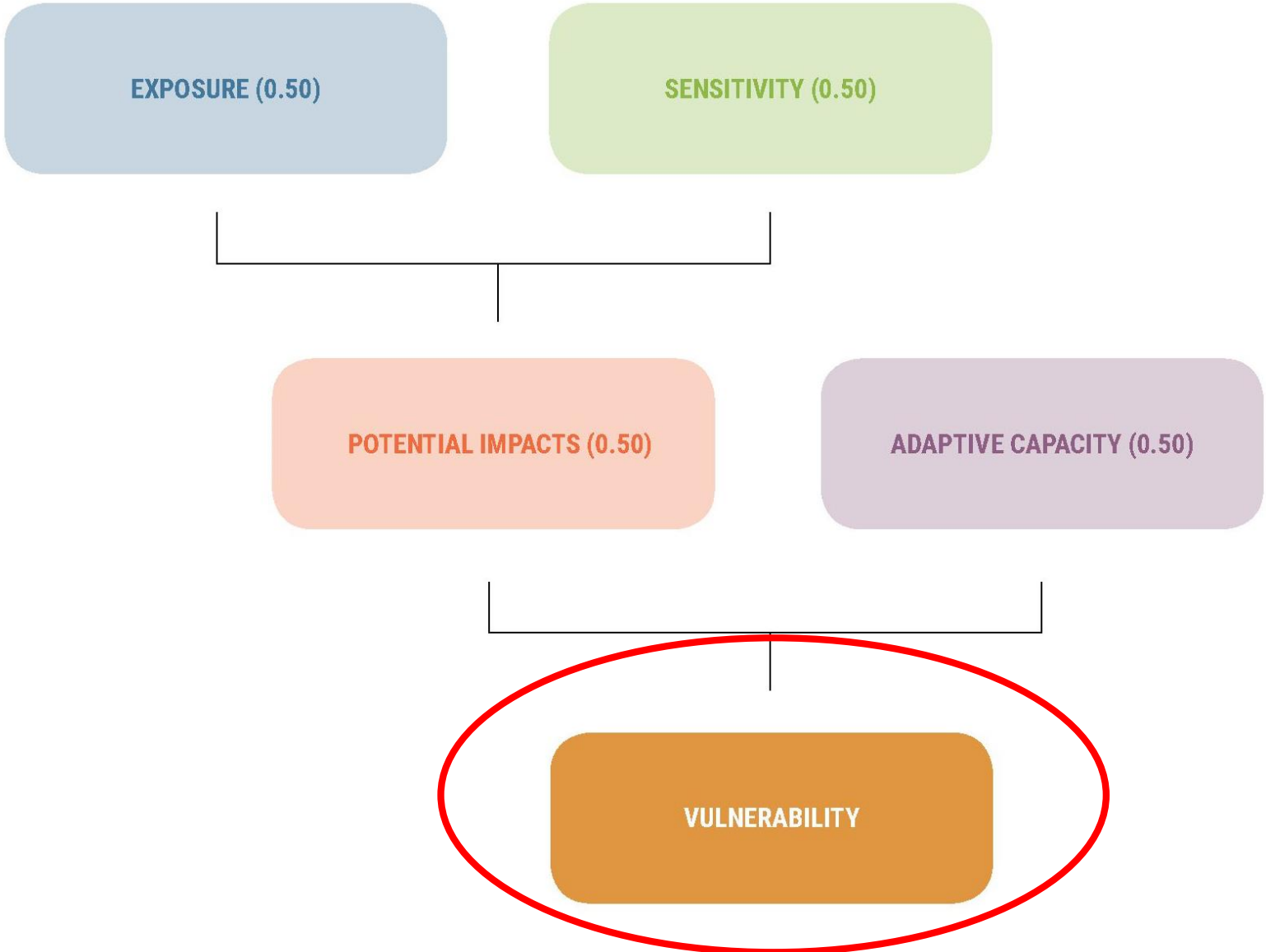
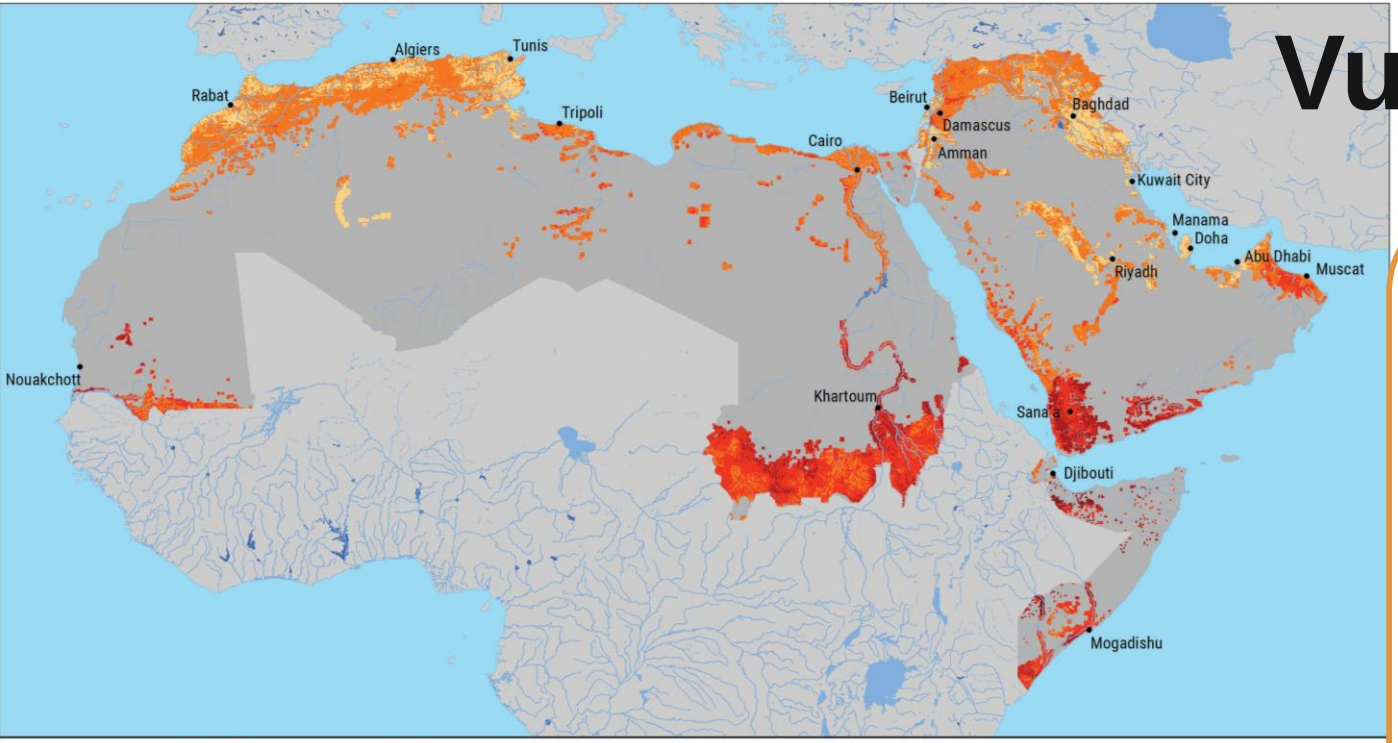
Components of vulnerability



Vulnerability



AGRICULTURE: WATER AVAILABLE FOR CROPS
VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)

Legend

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

Low Vulnerability — High Vulnerability

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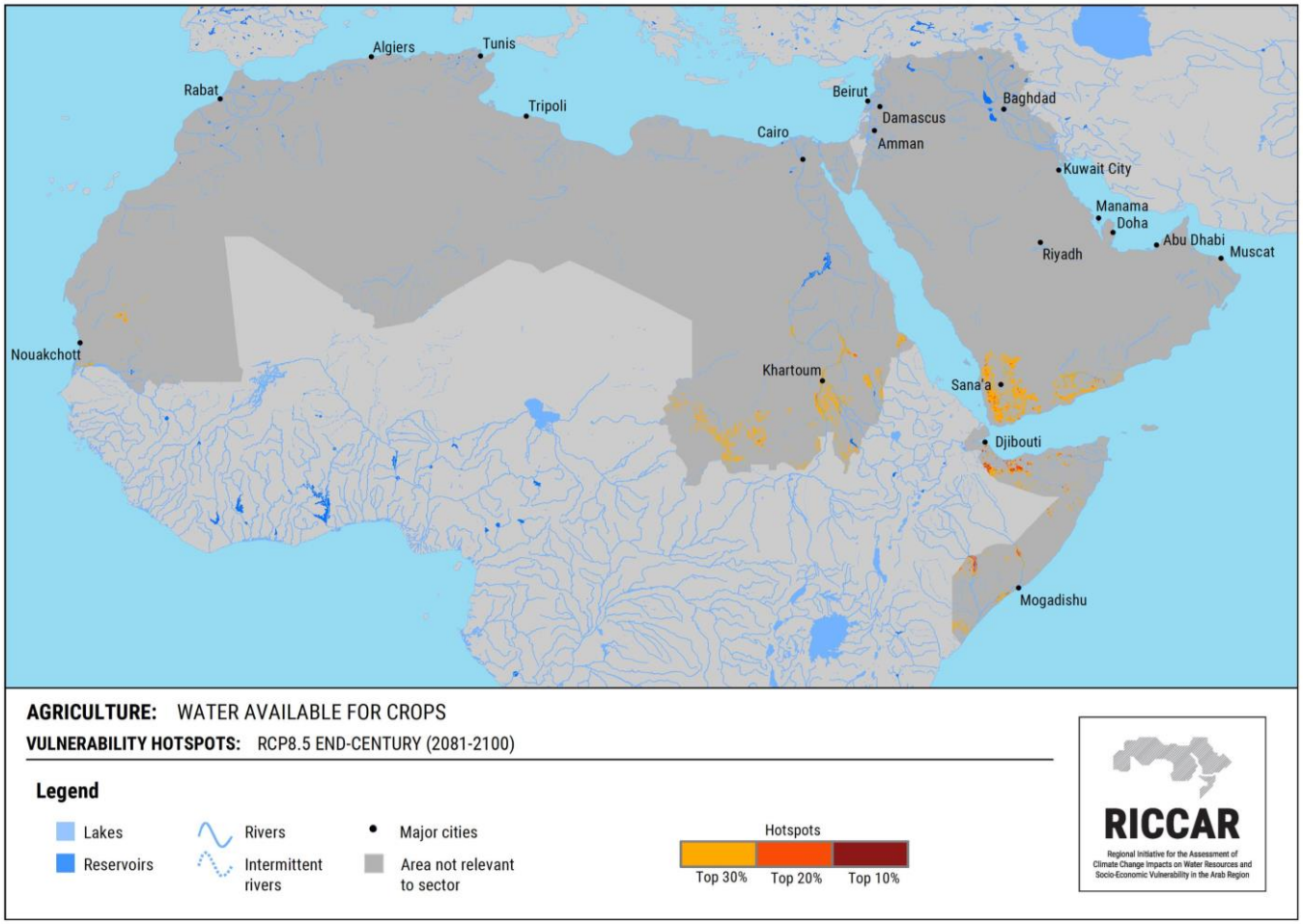
Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	50%	50%
RCP 8.5 Mid-century	0%	33%	67%
RCP 4.5 End-century	0%	43%	57%
RCP 8.5 End-century	0%	16%	84%

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 hotspots:



Hotspots

- sub-Saharan Africa,
- the Horn of Africa, and
- the southwestern Arabian Peninsula

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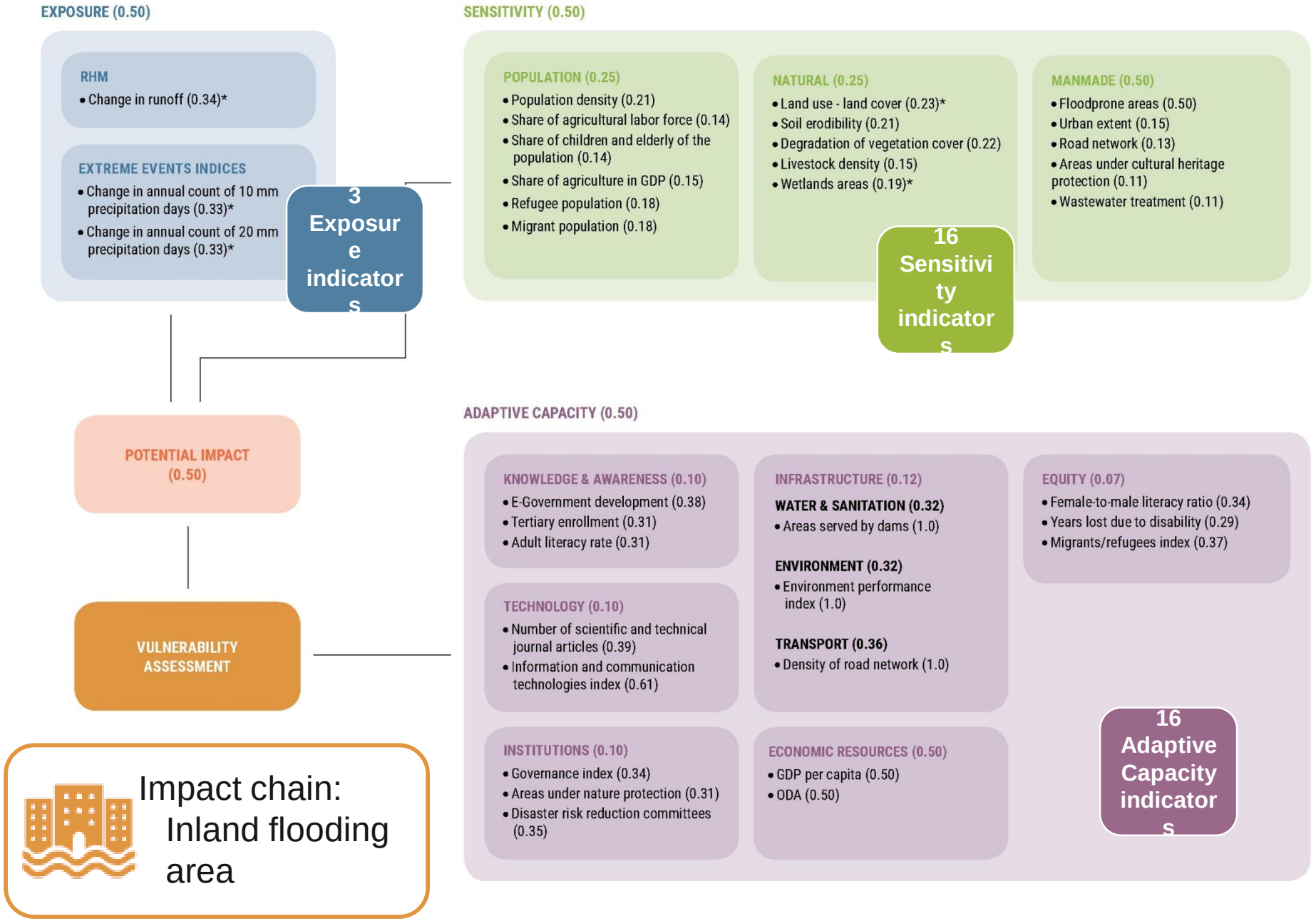
Vulnerability to inland flooding

Inland flooding areas:
Study area

Infrastructure and Human Settlements

Inland flooding area

Study area based on areas with low flood potential or greater


EXPOSURE (0.50)
RHM
• Change in runoff (0.34)*
EXTREME EVENTS INDICES
• Change in annual count of 10 mm precipitation days (0.33)*
• Change in annual count of 20 mm precipitation days (0.33)*
3 Exposure indicators
SENSITIVITY (0.50)
POPULATION (0.25)
• Population density (0.21)
• Share of agricultural labor force (0.14)
• Share of children and elderly of the population (0.14)
• Share of agriculture in GDP (0.15)
• Refugee population (0.18)
• Migrant population (0.18)
NATURAL (0.25)
• Land use - land cover (0.23)*
• Soil erodibility (0.21)
• Degradation of vegetation cover (0.22)
• Livestock density (0.15)
• Wetlands areas (0.19)*
MANMADE (0.50)
• Floodprone areas (0.50)
• Urban extent (0.15)
• Road network (0.13)
• Areas under cultural heritage protection (0.11)
• Wastewater treatment (0.11)
16 Sensitivity indicators
POTENTIAL IMPACT (0.50)
VULNERABILITY ASSESSMENT
ADAPTIVE CAPACITY (0.50)
KNOWLEDGE & AWARENESS (0.10)
• E-Government development (0.38)
• Tertiary enrollment (0.31)
• Adult literacy rate (0.31)
TECHNOLOGY (0.10)
• Number of scientific and technical journal articles (0.39)
• Information and communication technologies index (0.61)
INSTITUTIONS (0.10)
• Governance index (0.34)
• Areas under nature protection (0.31)
• Disaster risk reduction committees (0.35)
INFRASTRUCTURE (0.12)
WATER & SANITATION (0.32)
• Areas served by dams (1.0)
ENVIRONMENT (0.32)
• Environment performance index (1.0)
TRANSPORT (0.36)
• Density of road network (1.0)
ECONOMIC RESOURCES (0.50)
• GDP per capita (0.50)
• ODA (0.50)
EQUITY (0.07)
• Female-to-male literacy ratio (0.34)
• Years lost due to disability (0.29)
• Migrants/refugees index (0.37)
16 Adaptive Capacity indicators
Impact chain:
Inland flooding
area

EXPOSURE (0.50)

RHM

- Change in runoff (0.34)*

EXTREME EVENTS INDICES

- Change in annual count of 10 mm precipitation days (0.33)*
- Change in annual count of 20 mm precipitation days (0.33)*

16 indicators

SENSITIVITY (0.50)

POPULATION (0.25)

- Population density (0.21)
- Share of agricultural labor force (0.14)
- Share of children and elderly of the population (0.14)
- Share of agriculture in GDP (0.15)
- Refugee population (0.18)
- Migrant population (0.18)

NATURAL (0.25)

- Land use - land cover (0.23)*
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- Livestock density (0.15)
- Wetlands areas (0.19)*

MANMADE (0.50)

- Floodprone areas (0.50)
- Urban extent (0.15)
- Road network (0.13)
- Areas under cultural heritage protection (0.11)
- Wastewater treatment (0.11)

Exposure

EXPOSURE (0.50)

RHM

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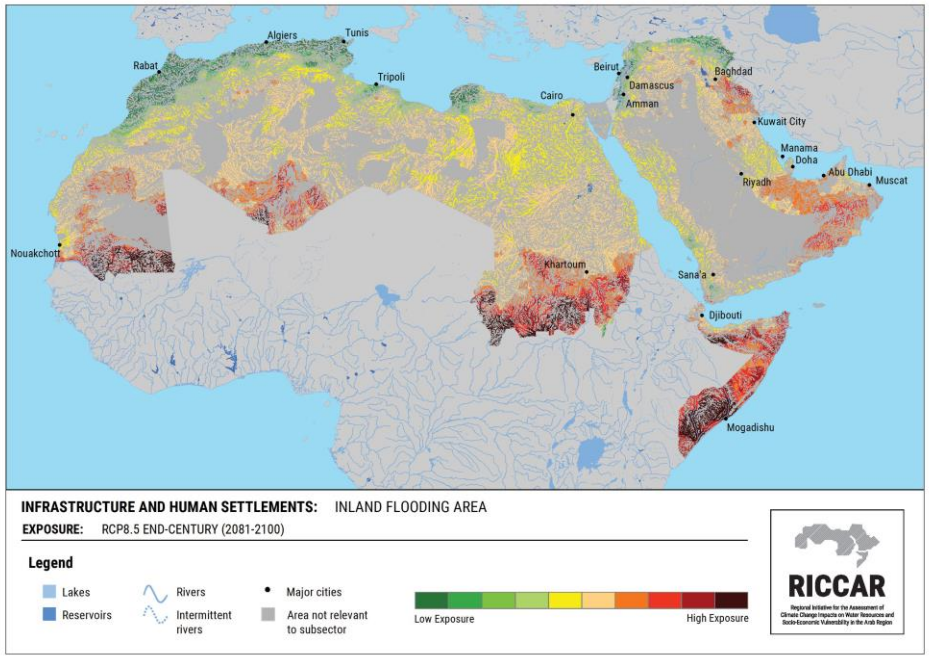
EXTREME EVENTS INDICES

- Change in annual count of 10 mm precipitation days (0.33)*
- Change in annual count of 20 mm precipitation days (0.33)*



Scenario	Percentage of study area		
	Low EX	Moderate EX	High EX
RCP 4.5 Mid-century	5%	79%	16%
RCP 8.5 Mid-century	5%	75%	20%
RCP 4.5 End-century	4%	71%	25%
RCP 8.5 End-century	7%	60%	34%

sensitivity

SENSITIVITY (0.50)

POPULATION (0.25)
- Population density (0.21)
- Share of agricultural labor force (0.14)
- Share of children and elderly of the population (0.14)
- Share of agriculture in GDP (0.15)
- Refugee population (0.18)
- Migrant population (0.18)

NATURAL (0.25)
- Land use - land cover (0.23)*
- Soil erodibility (0.21)
- Degradation of vegetation cover (0.22)
- Livestock density (0.15)
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MANMADE (0.50)
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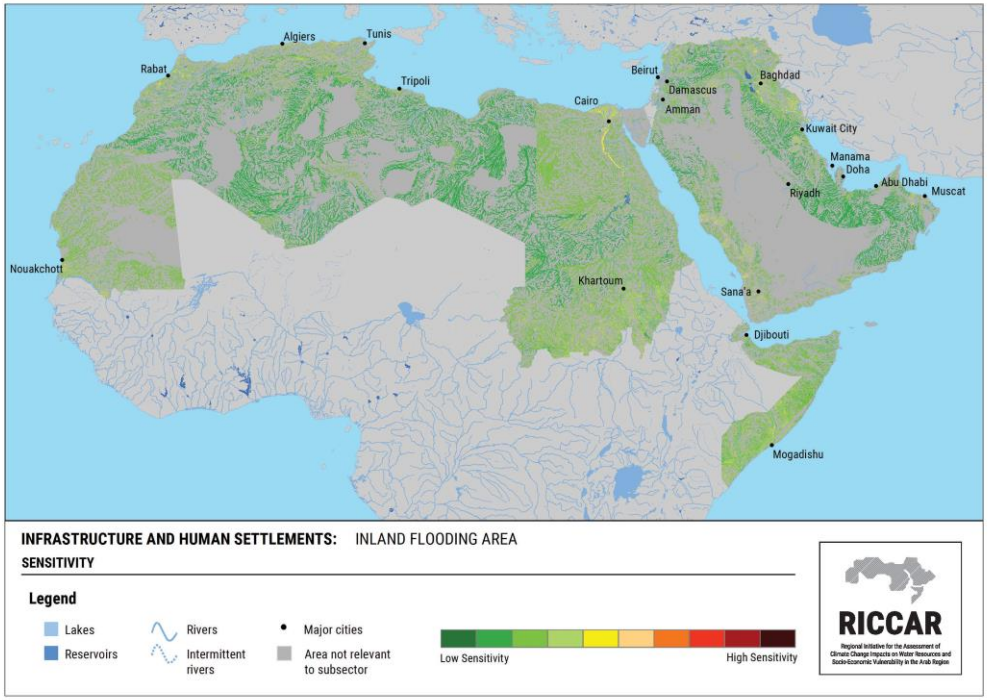
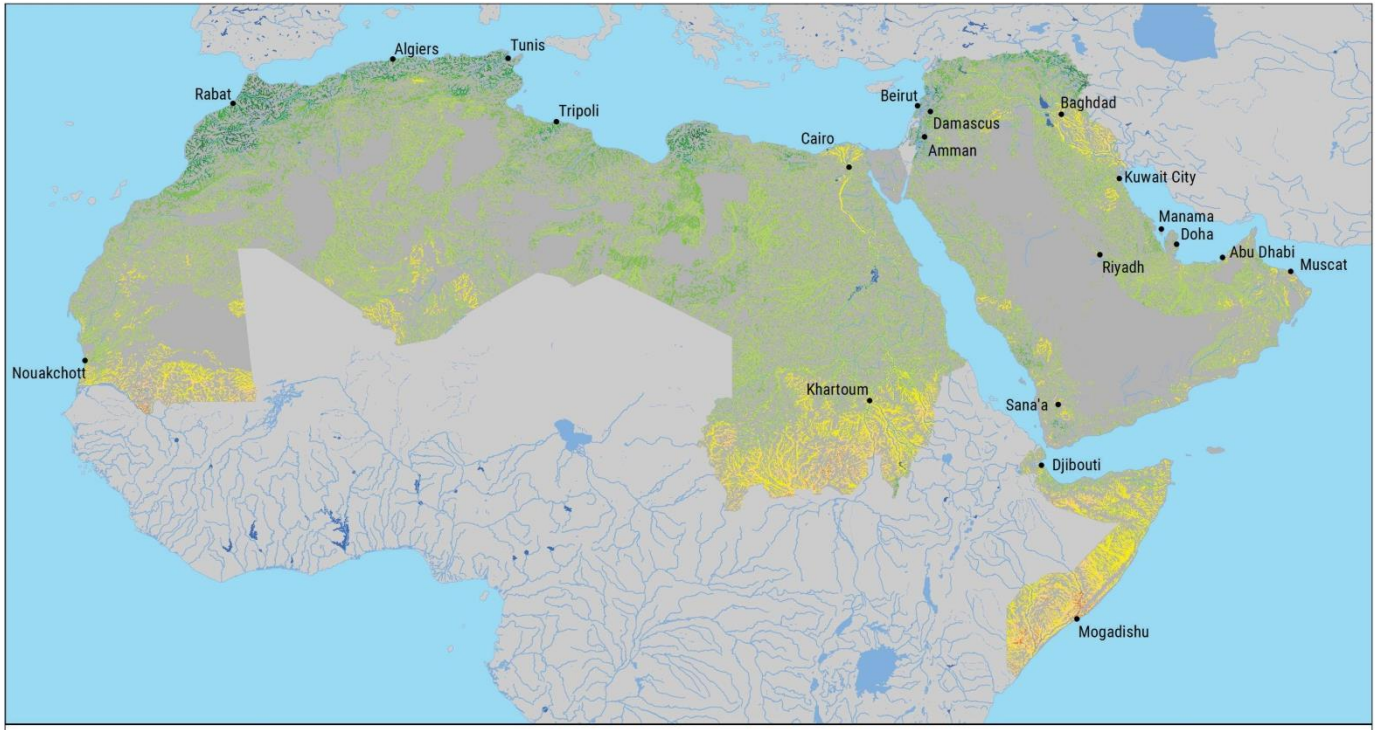


Scenario	Percentage of study area		
	Low SE	Moderate SE	High SE
All climate scenarios	89%	11%	0%



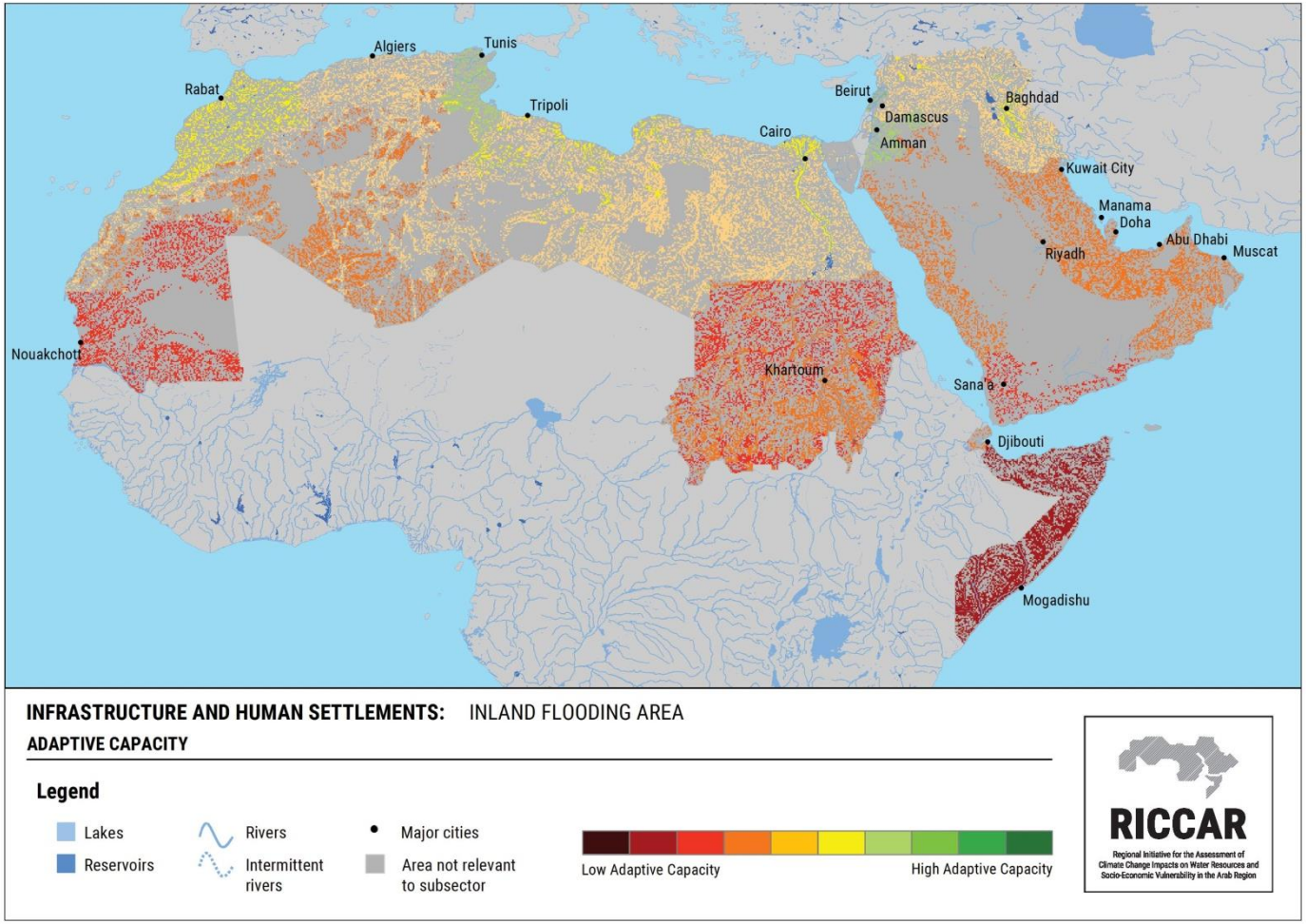
Scenario	Percentage of study area		
	Low PI	Moderate PI	High PI
RCP 4.5 Mid-century	17%	83%	0%
RCP 8.5 Mid-century	27%	73%	0%
RCP 4.5 End-century	21%	79%	0%
RCP 8.5 End-century	23%	76%	0%

Areas with highest potential impact:

- Middle valley of the Senegal River
- Jubba–Shabelle river floodplains
- Bahr el Arab floodplain (eastern Sahel)

Areas with lowest potential impact:

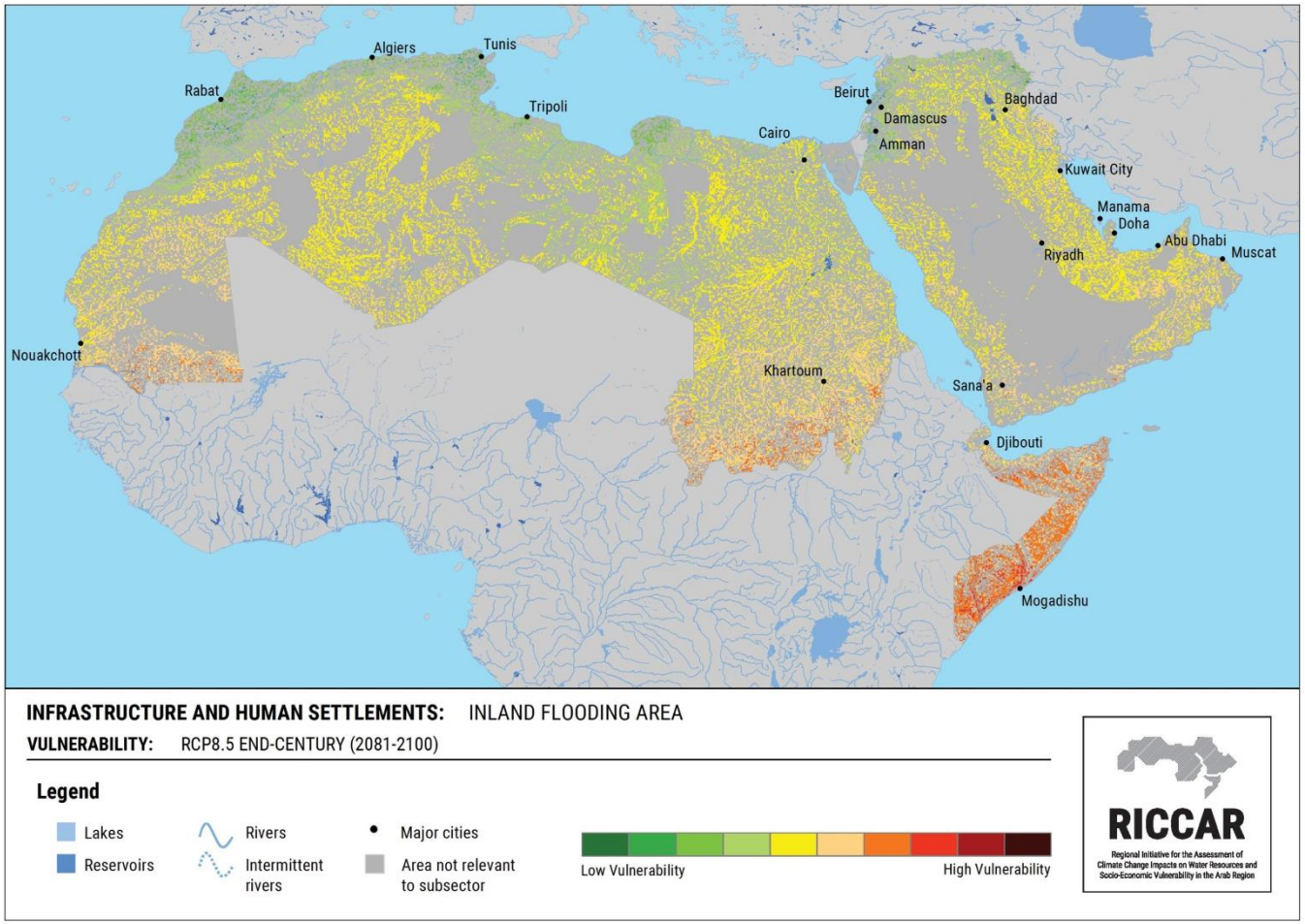
- Atlas Mountains and coastal plain
- Jafara Plain
- Green Mountains
- Coastal Levant
- Zagros Mountains



Areas with lowest adaptive capacity:

- Wadis and streams in sub-Saharan Africa
- Wadis and streams in south-western Arabian Peninsula

Scenario	Percentage of study area		
	Low AC	Moderate AC	High AC
All climate scenarios	25%	73%	2%



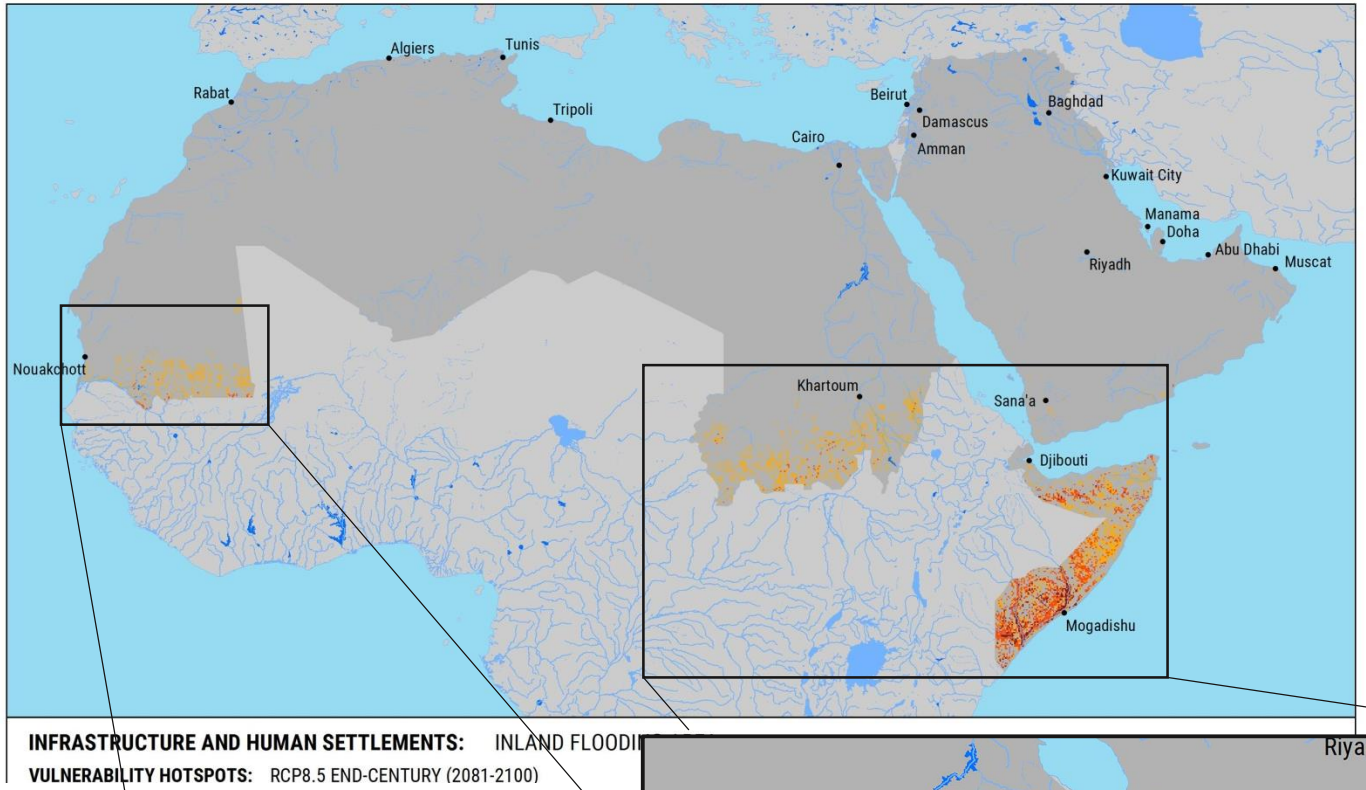
Areas with highest vulnerability:

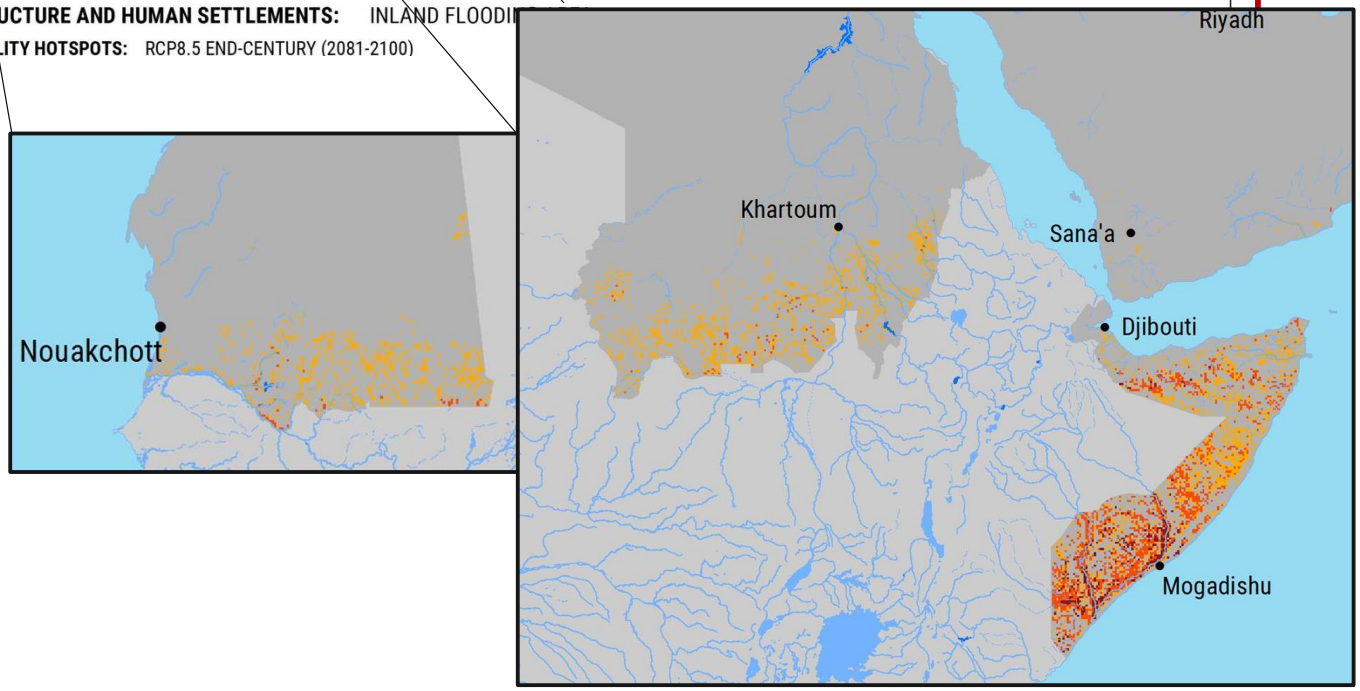
- Sub-Saharan Africa

Areas with lowest vulnerability:

- North Africa and Levantine coastal areas

Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	2%	94%	4%
RCP 8.5 Mid-century	3%	93%	4%
RCP 4.5 End-century	2%	94%	4%
RCP 8.5 End-century	4%	89%	7%





Vulnerability hotspots:

- Western Sahel
- Eastern Sahel
- Horn of Africa (particularly the Jubba and Shabelle river floodplains)
- Isolated areas- southern Arabian Peninsula

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Thank you

Infrastructure and Human Settlements

Inland flooding area