Vulnerability of livestock to climate change

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Livestock Area:

Study area

Agriculture

Water available for crops
Water available for livestock

Study area based on *Number of (**sheep, cattle, goats and camels**) in heads more than 10 heads per km² unit*

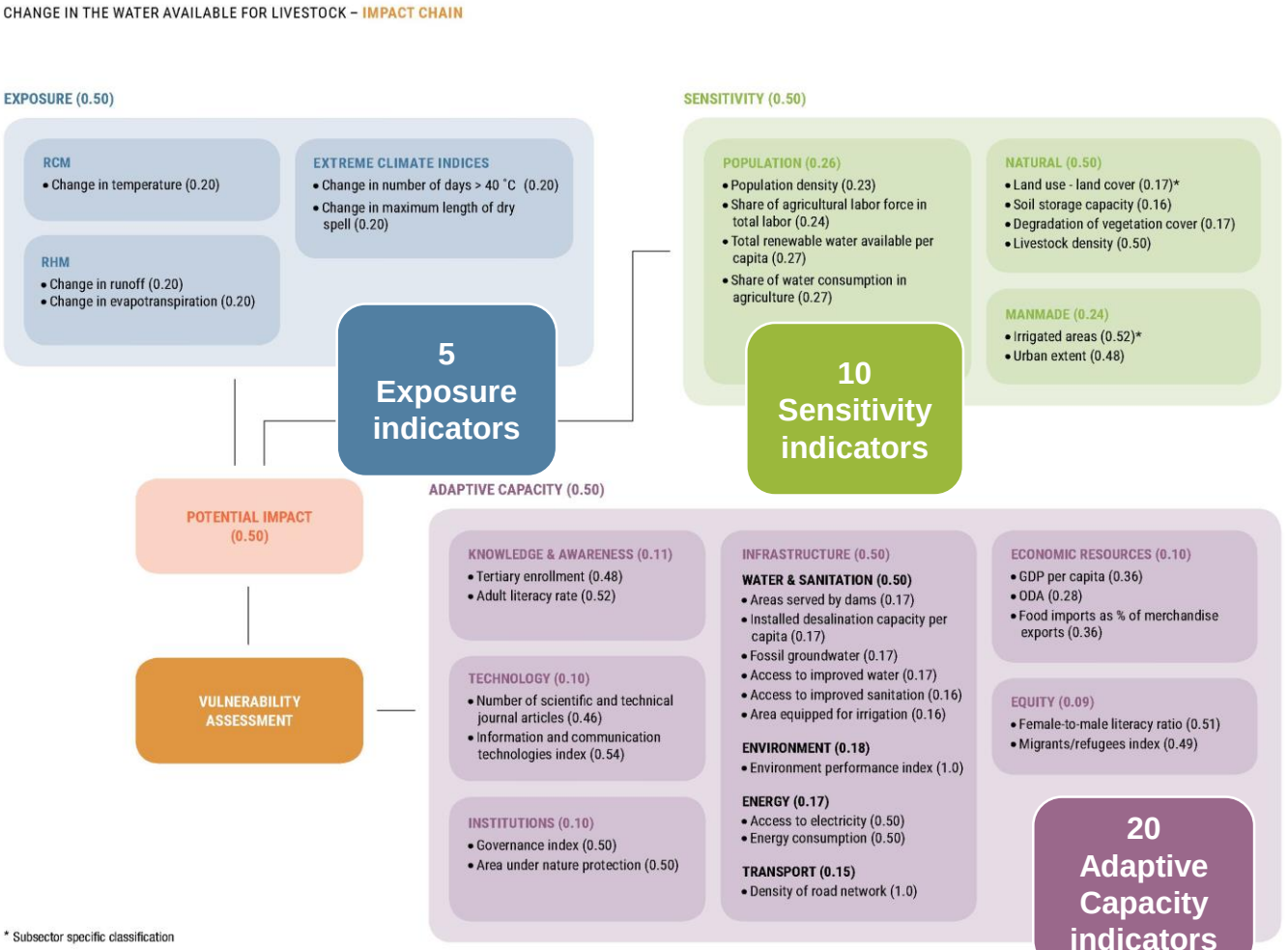
136 million sheep

66 million goats

6 million camels

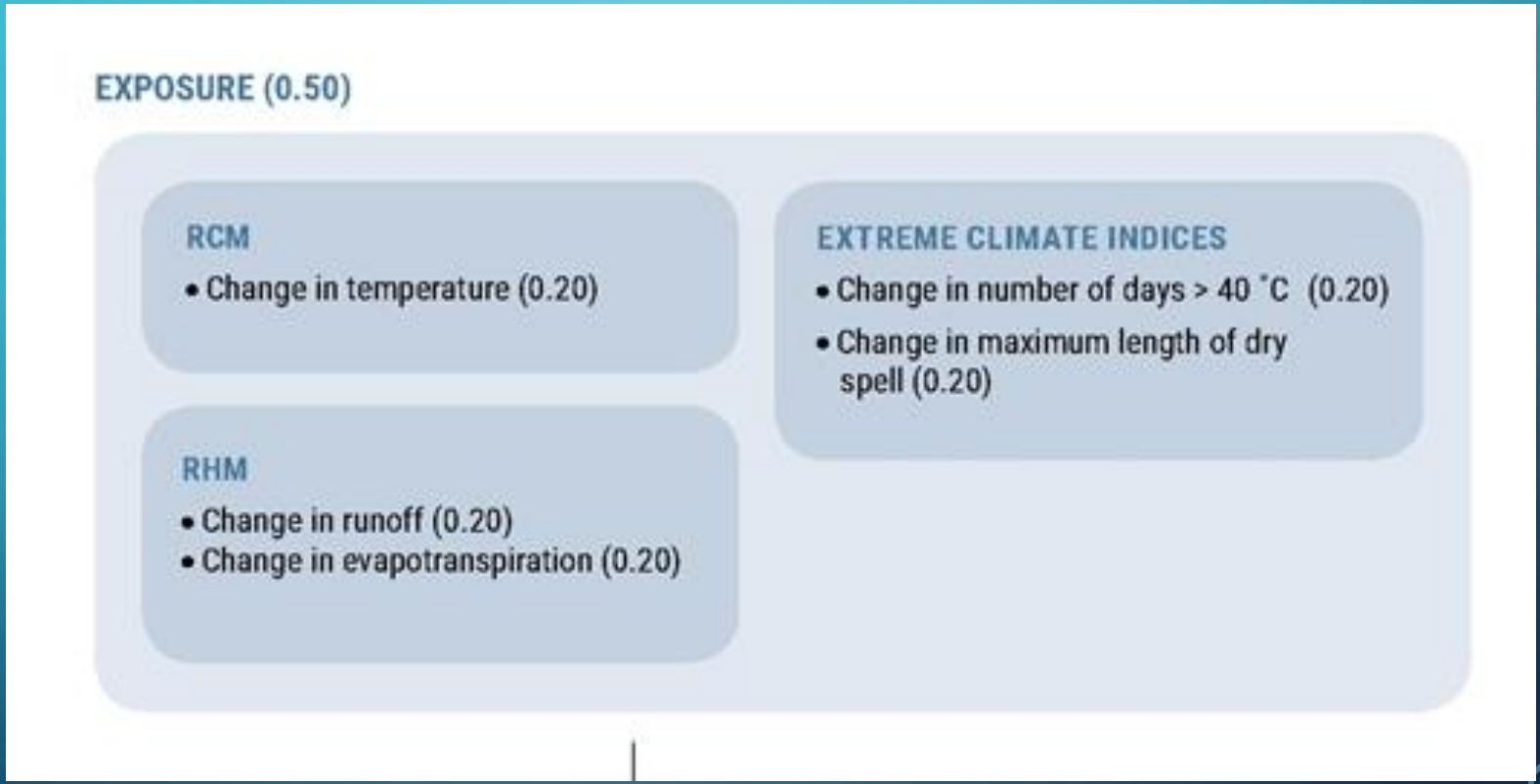
23 million cattle

Impact Chain

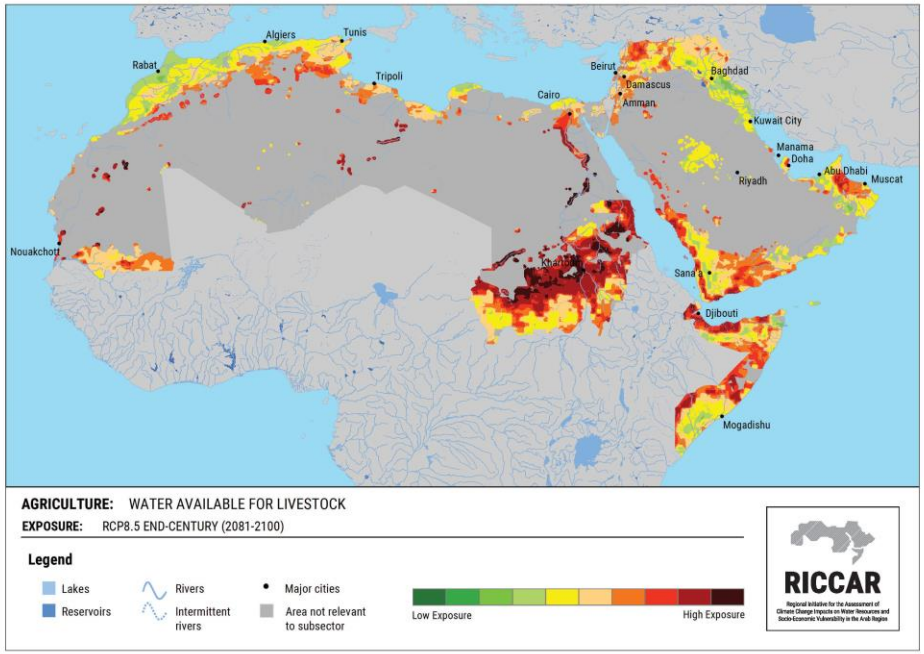


Exposure

5
Exposure indicators



Exposure –rcp8.5 End-Century



Scenario	Percentage of study area		
	Low EX	Moderate EX	High EX
RCP 4.5 Mid-century	21%	76%	3%
RCP 8.5 Mid-century	8%	69%	23%
RCP 4.5 End-century	15%	67%	18%
RCP 8.5 End-century	0%	53%	47%

Areas with highest Projected Exposure:

- Nile Basin,
- the Blue Nile valley just south of Khartoum,
- coastal areas near the Gulf of Aden
- and the Asir Mountains.
- livestock areas in the Sahara Desert

Areas with lowest Projected Exposure

- Atlas Mountain
- Tigris&Euphrates Basin
- Jabal Alakhdar (Lybia)

Sensitivity

10 Sensitivity indicators

SENSITIVITY (0.50)

POPULATION (0.26)

- Population density (0.23)
- Share of agricultural labor force in total labor (0.24)
- Total renewable water available per capita (0.27)
- Share of water consumption in agriculture (0.27)

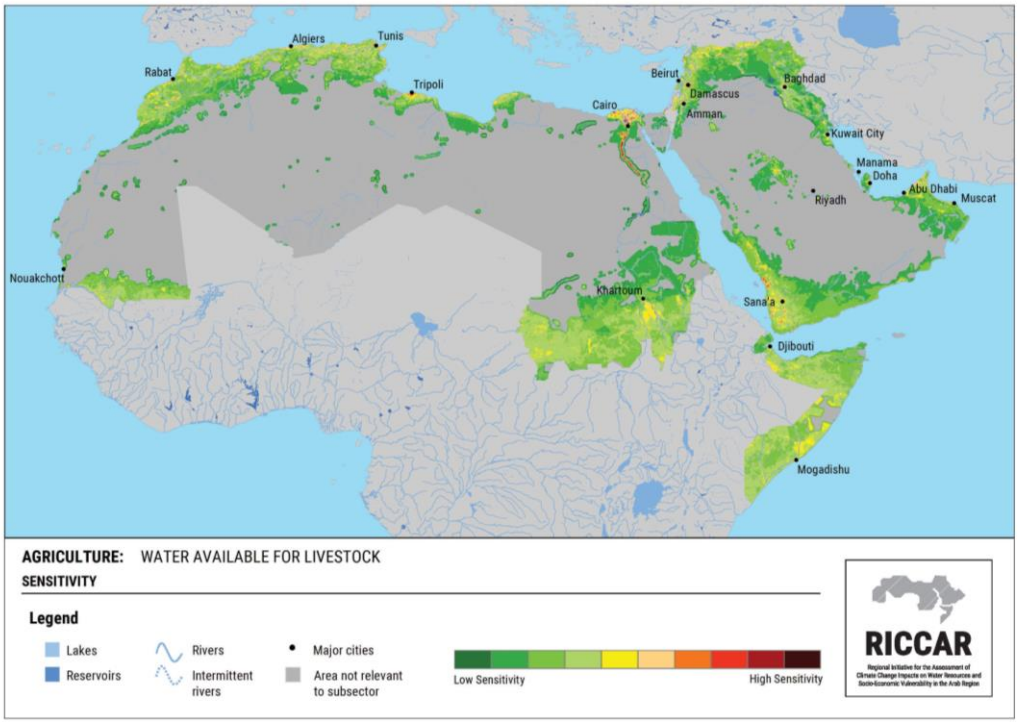
NATURAL (0.50)

- Land use - land cover (0.17)*
- Soil storage capacity (0.16)
- Degradation of vegetation cover (0.17)
- Livestock density (0.50)

MANMADE (0.24)

- Irrigated areas (0.52)*
- Urban extent (0.48)

Sensitivity –rcp8.5 End-Century

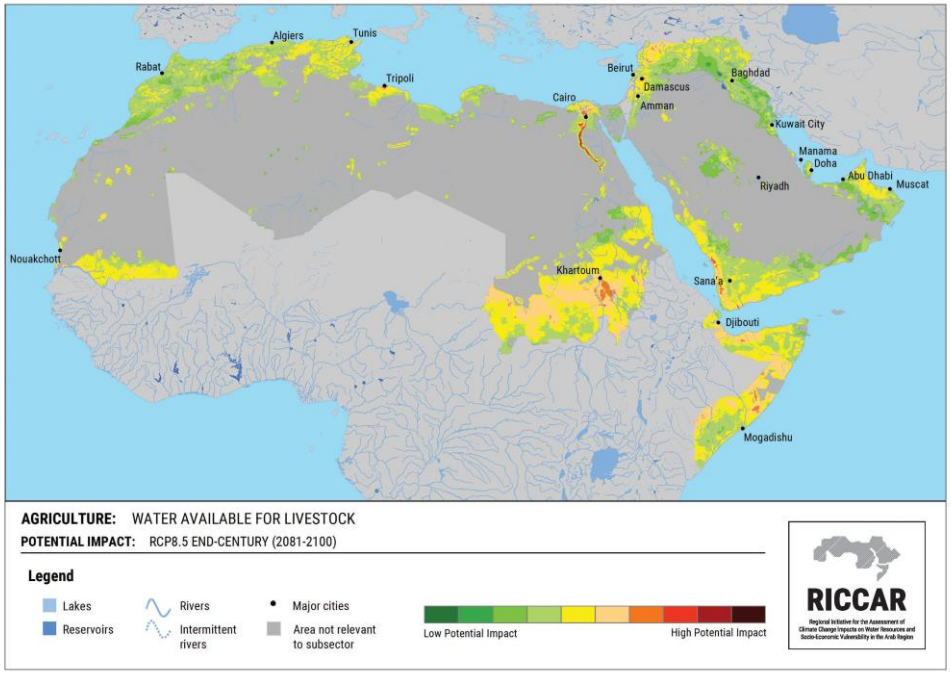


Areas with High Sensitivity:

- Nile Basin.
- Dlta,
- Asir Mountain,
- Isolated areas in Levant Region.

Scenario	Percentage of study area		
	Low SE	Moderate SE	High SE
All climate scenarios	66%	33%	1%

Potential Impact –rcp8.5 End-Century



Scenario	Percentage of study area		
	Low PI	Moderate PI	High PI
RCP 4.5 Mid-century	42%	58%	0%
RCP 8.5 Mid-century	26%	74%	0%
RCP 4.5 End-century	34%	66%	0%
RCP 8.5 End-century	10%	89%	1%

Areas with highest potential impact:

- the lower Nile River and Delta,
- the Blue Nile valley just south of Khartoum,
- and the Asir Mountains.

Adaptive Capacity

20 Adaptive Capacity indicators

ADAPTIVE CAPACITY (0.50)

KNOWLEDGE & AWARENESS (0.11)
- Tertiary enrollment (0.48)
- Adult literacy rate (0.52)

TECHNOLOGY (0.10)
- Number of scientific and technical journal articles (0.46)
- Information and communication technologies index (0.54)

INSTITUTIONS (0.10)
- Governance index (0.50)
- Area under nature protection (0.50)

INFRASTRUCTURE (0.50)

WATER & SANITATION (0.50)
- Areas served by dams (0.17)
- Installed desalination capacity per capita (0.17)
- Fossil groundwater (0.17)
- Access to improved water (0.17)
- Access to improved sanitation (0.16)
- Area equipped for irrigation (0.16)

ENVIRONMENT (0.18)
- Environment performance index (1.0)

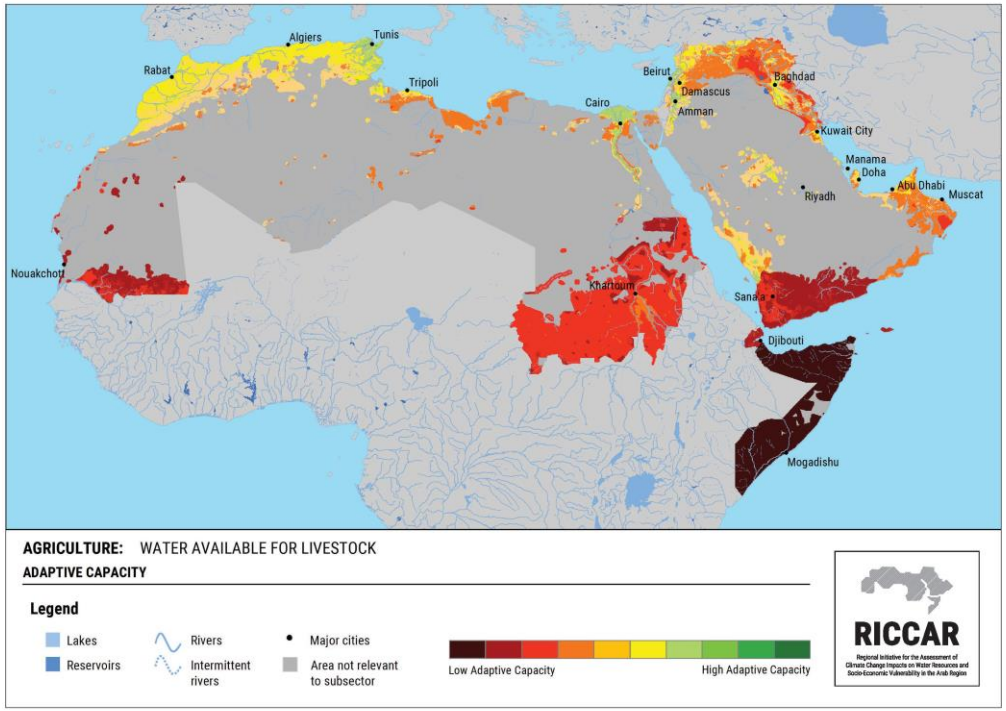
ENERGY (0.17)
- Access to electricity (0.50)
- Energy consumption (0.50)

TRANSPORT (0.15)
- Density of road network (1.0)

ECONOMIC RESOURCES (0.10)
- GDP per capita (0.36)
- ODA (0.28)
- Food imports as % of merchandise exports (0.36)

EQUITY (0.09)
- Female-to-male literacy ratio (0.51)
- Migrants/refugees index (0.49)

Adaptive Capacity

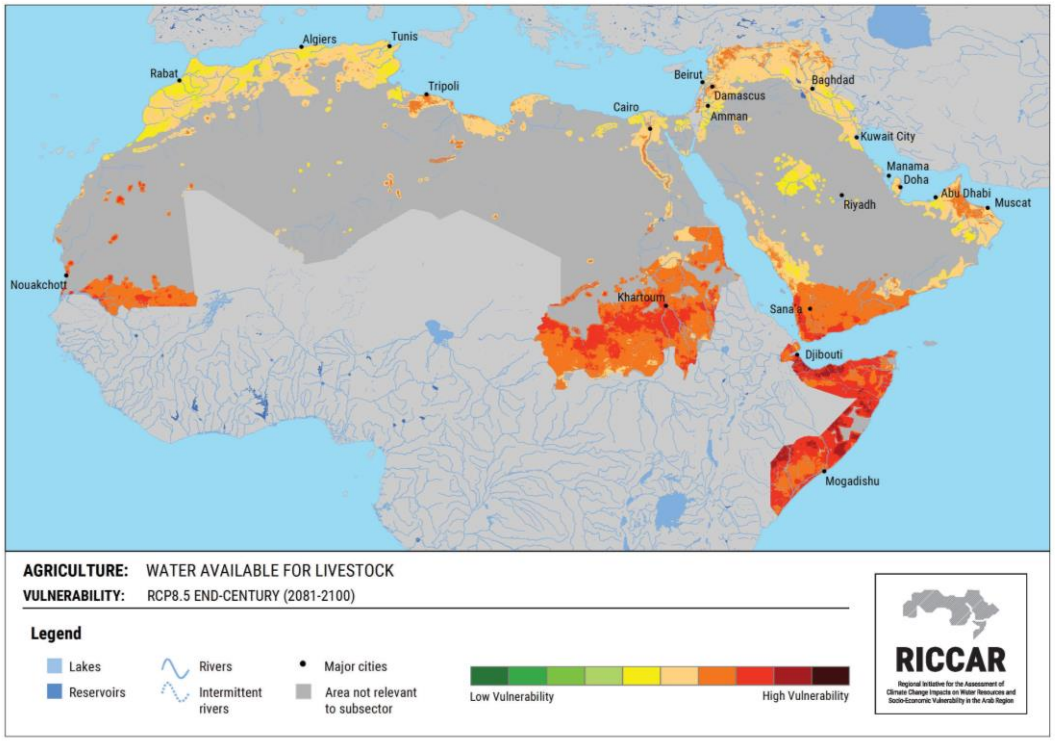


Areas with lowest adaptive capacity:

- the Horn of Africa
- sub-Saharan Africa,
- southwestern Arabian Peninsula,
- areas within the Tigris-Euphrates Basin.

Scenario	Percentage of study area		
	Low AC	Moderate AC	High AC
All climate scenarios	53%	44%	3%

Vulnerability –rcp8.5 End-Century



Scenario	Percentage of study area		
	Low Vul	Moderate Vul	High Vul
RCP 4.5 Mid-century	0%	67%	33%
RCP 8.5 Mid-century	0%	55%	45%
RCP 4.5 End-century	0%	58%	42%
RCP 8.5 End-century	0%	46%	54%

Areas with highest vulnerability:

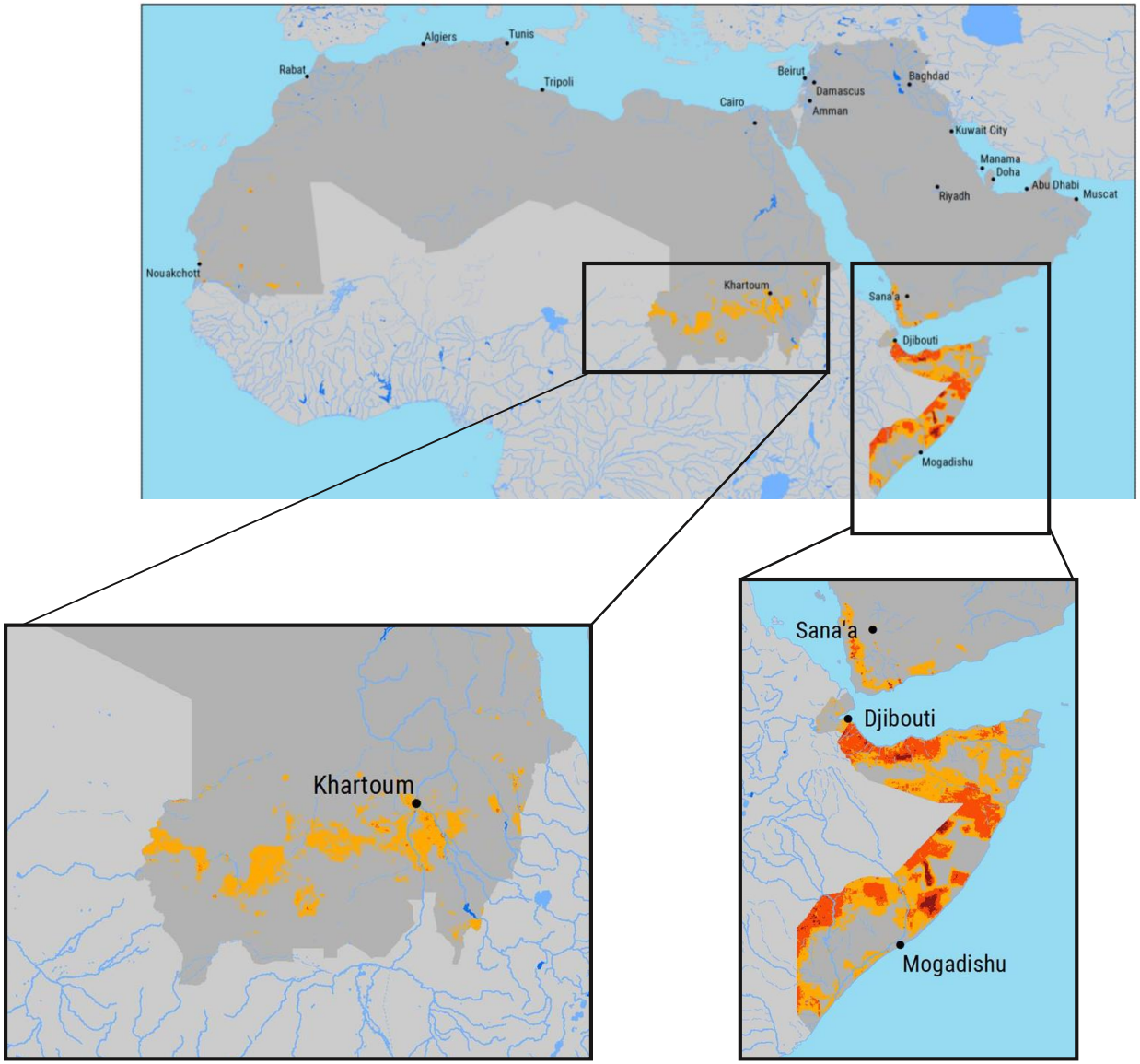
- sub-Saharan Africa,
- the Levant,
- African Horn.
- **Areas with lowest vulnerability**:
- Atlas Mountains and Plains
- the central Arabian Desert

Vulnerability trends:
Livestock Areas

- Vulnerability changes under RCP8.5 are more pronounced, revealing increasing vulnerability.
- African Horn and Sudan largest increase from mid- to end-century (RCP8.5)

- for RCP4.5, differences between mid- and end-century vulnerability tends to be relatively small

Hotspots:
Livestock Areas



Vulnerability hotspots:

- Sudan
- the southwestern Arabian Peninsula,
- Horn of Africa

Percentage of ruminant population by vulnerability classification for each projected scenario

Ruminant	Climate scenario	Percentage of population by vulnerability classification	
		Moderate	High
Camels	RCP4.5 Mid-Century	35%	65%
	RCP8.5 Mid-Century	21%	79%
	RCP4.5 End-Century	25%	75%
	RCP8.5 End-Century	14%	86%
Cattle	RCP4.5 Mid-Century	34%	66%
	RCP8.5 Mid-Century	27%	73%
	RCP4.5 End-Century	29%	71%
	RCP8.5 End-Century	23%	77%
Goats	RCP4.5 Mid-Century	44%	56%
	RCP8.5 Mid-Century	37%	63%
	RCP4.5 End-Century	39%	61%
	RCP8.5 End-Century	28%	72%
Sheep	RCP4.5 Mid-Century	67%	33%
	RCP8.5 Mid-Century	61%	39%
	RCP4.5 End-Century	64%	36%

RICCAR

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