



Adapting to climate change and reducing the risk of exposure to natural disasters

Ihab Jnad

المركز العربي لدراسات المناطق الجافة و الأراضي القاحلة
(ACSAD)

RICCAR Partnerships

Implementing Partners



Cairo Office

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Collaborating Research Institutes

- Center of Excellence for Climate Change Research/ King Abdulaziz University (CECCR/KAU) - KSA
- King Abdullah University of Science and Technology (KAUST) - KSA
- Climate Services Center 2.0 (CS2.0) – Germany

CORDEX/MENA housed at The Cyprus Institute



SWEDISH INTERNATIONAL DEVELOPMENT
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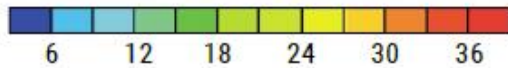
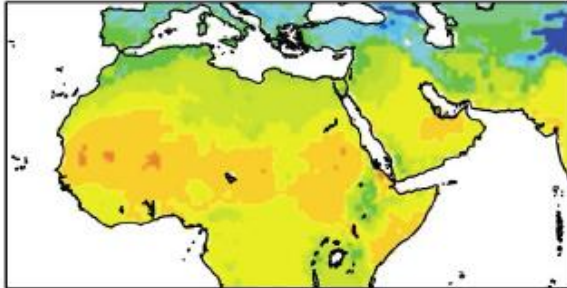


ACCWaM

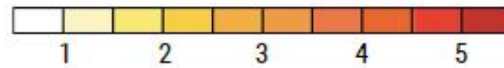
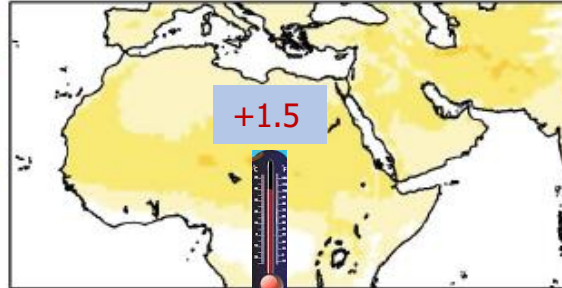
Mean change in temperature

RCP 4.5

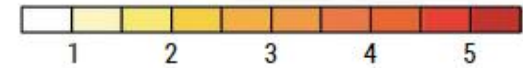
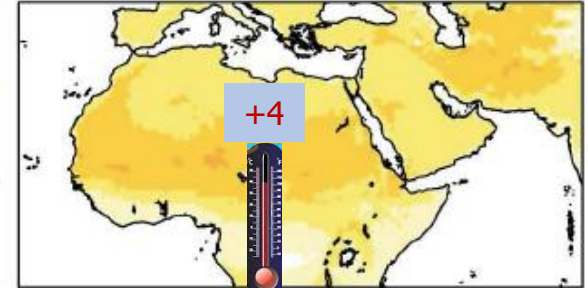
1986-2005



2046-2065



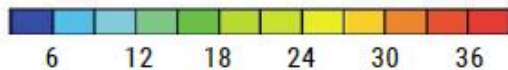
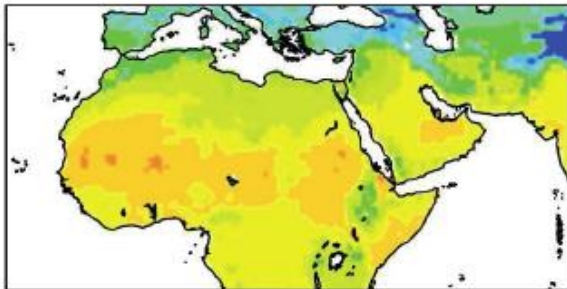
2081-2100



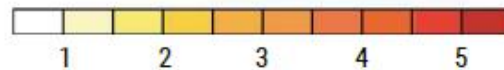
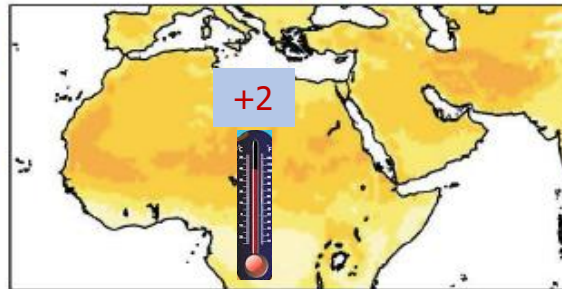
Temperature (°C)

RCP 8.5

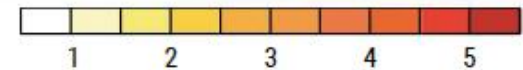
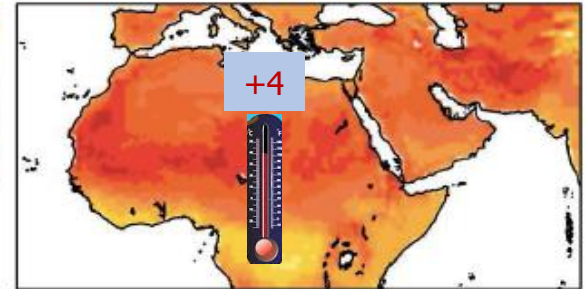
1986-2005



2046-2065



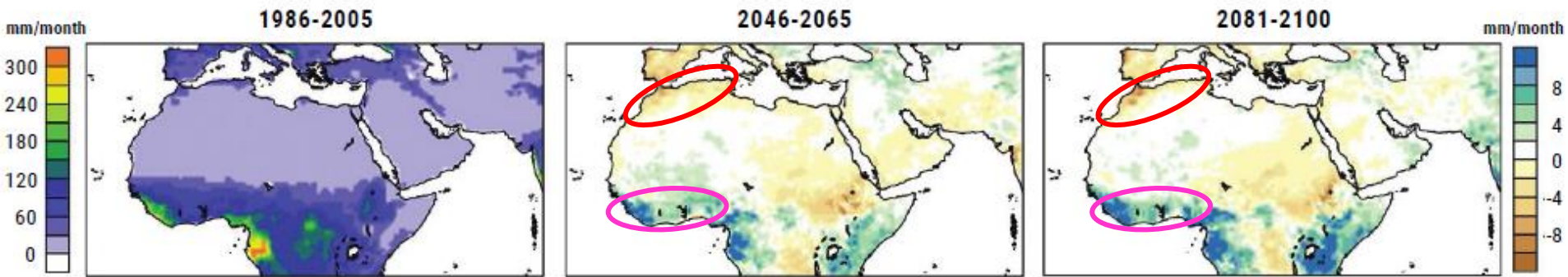
2081-2100



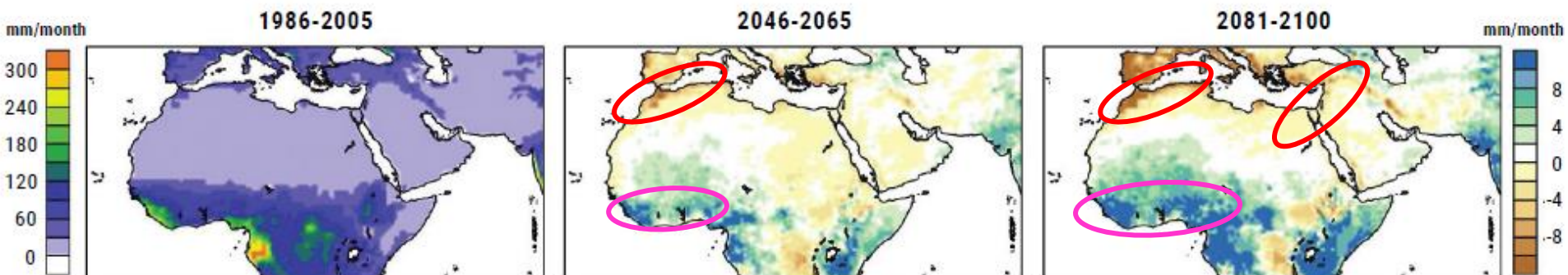
Temperature (°C)

Mean change in precipitation

RCP 4.5



RCP 8.5



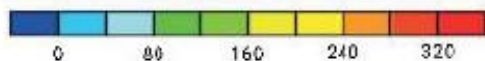
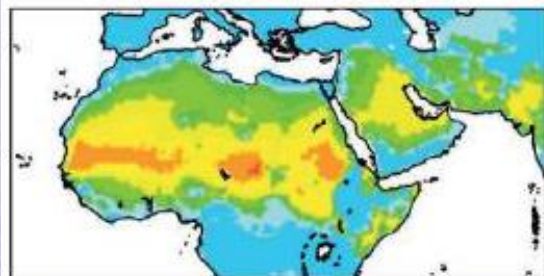
Extreme events indices

Extreme temperature indices		Extreme precipitation indices	
Index	Full name	Index	Full name
SU	Number of summer days	CDD	Maximum length of dry spell
SU35	Number of hot days	CWD	Maximum length of wet spell
SU40	Number of very hot days	R10	Annual count of 10 mm precipitation days
TR	Number of tropical nights	R20	Annual count of 20 mm precipitation days
		SDII	Simple precipitation intensity index

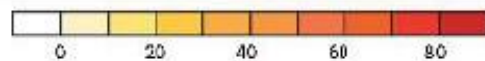
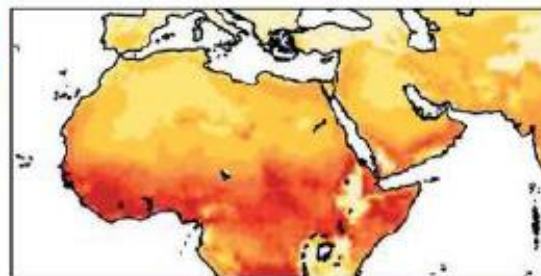
Temperature – “Hot” days ($>35^{\circ}\text{C}$)

RCP 4.5

1986-2005

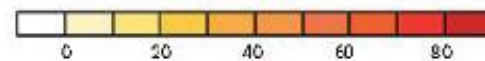
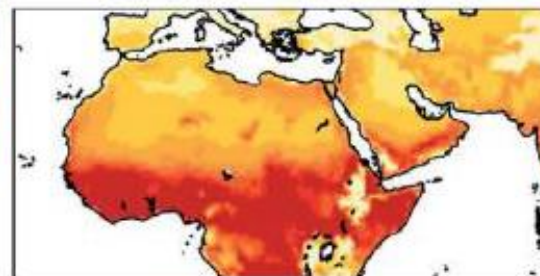


2046-2065



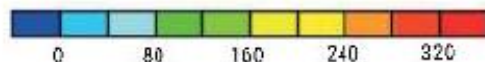
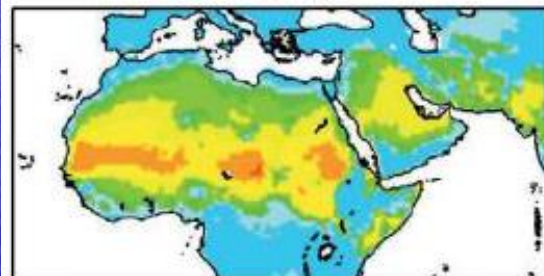
Number of days/year

2081-2100

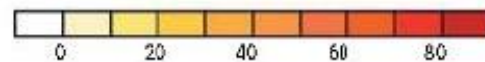
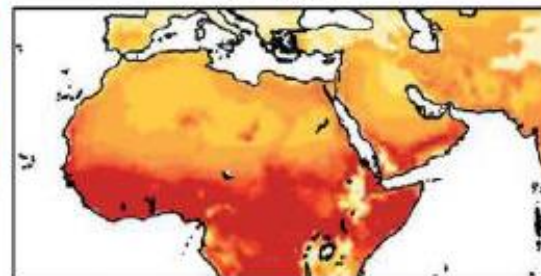


RCP 8.5

1986-2005

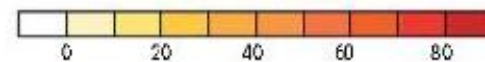
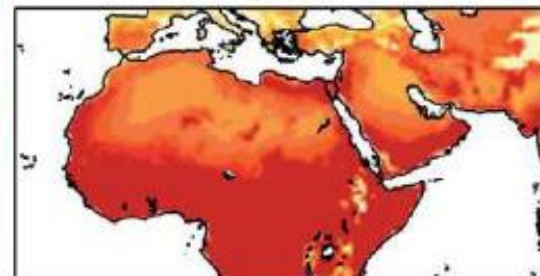


2046-2065



Number of days/year

2081-2100

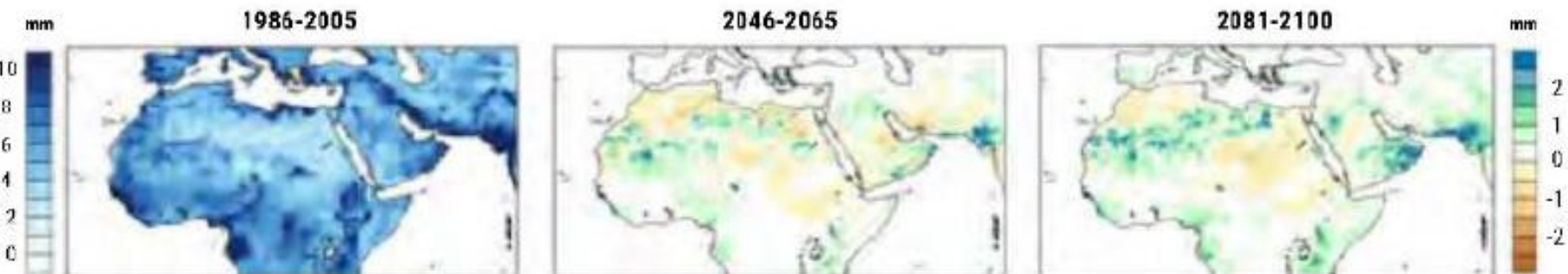




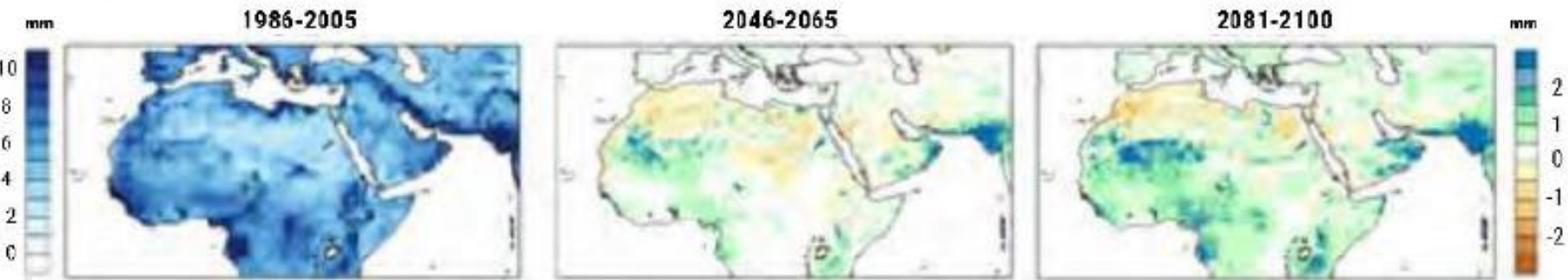
Intense Rainfall – SDII

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

RCP 4.5



RCP 8.5

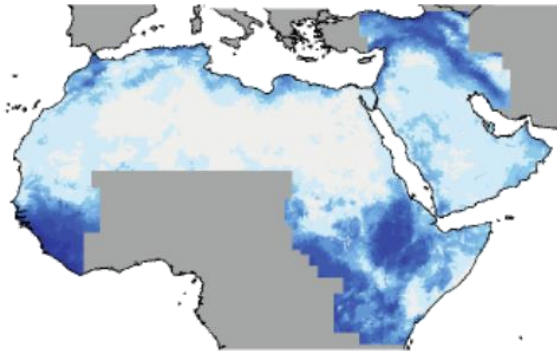


Mean change in annual runoff

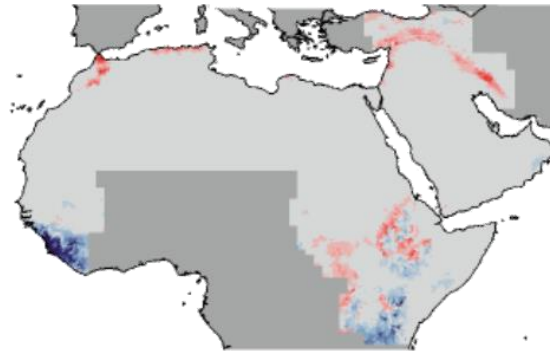
RCP 8.5

HYPE MODEL

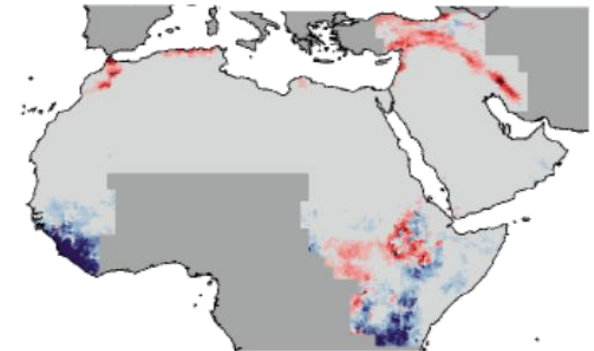
1986-2005



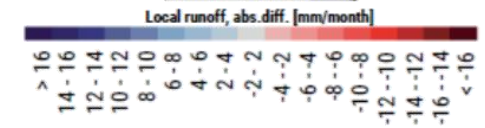
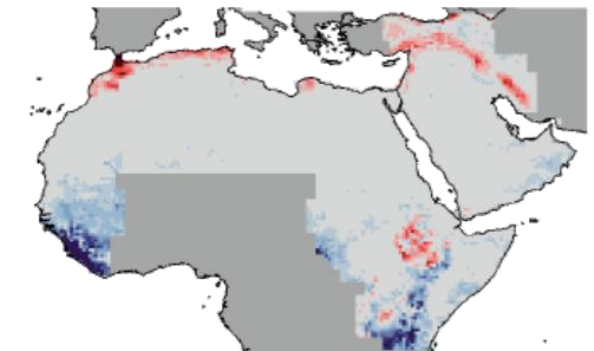
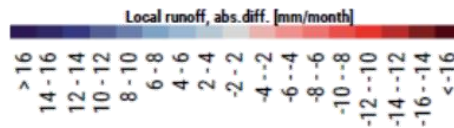
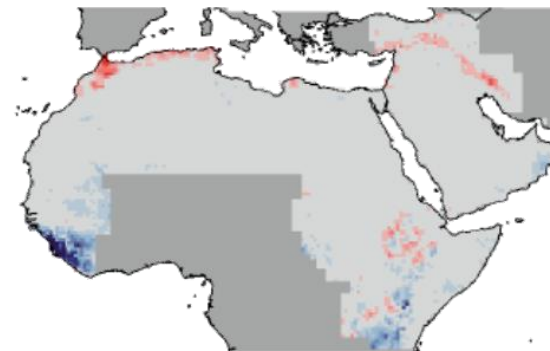
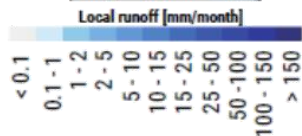
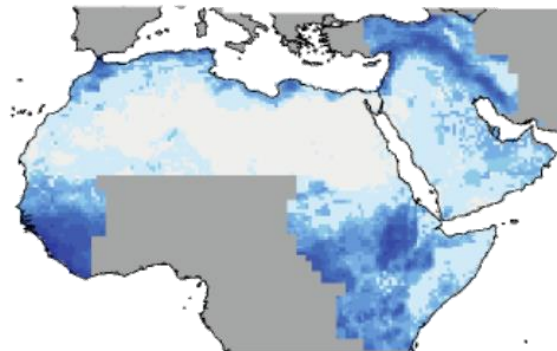
2046-2065



2081-2100



VIC MODEL



Study Area



Mejerda basin
Tunisia-Algeria

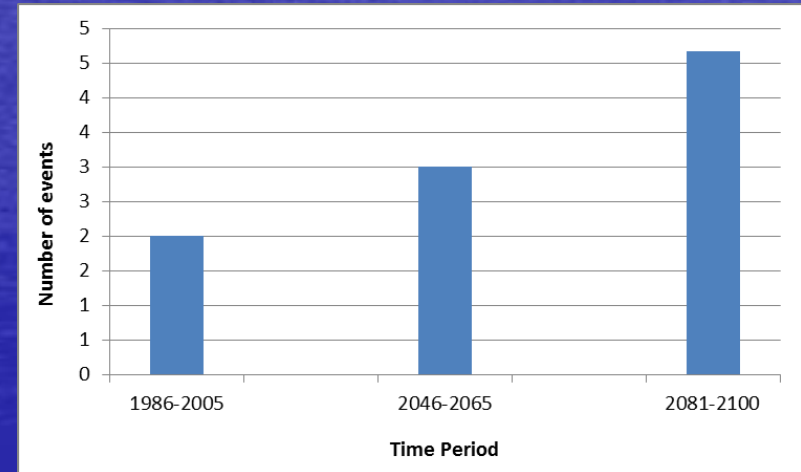
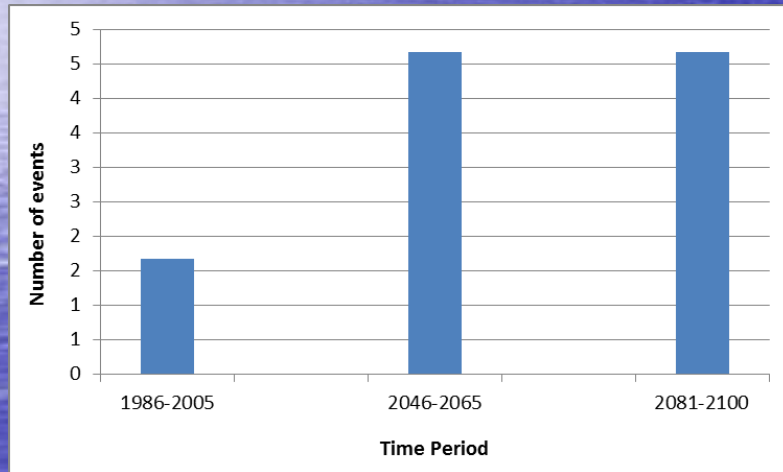
Nahr el Kabir
Al-Junoubi-
Syria-Lebanon

WADI DAYQAH
SULTANATE OF OMAN

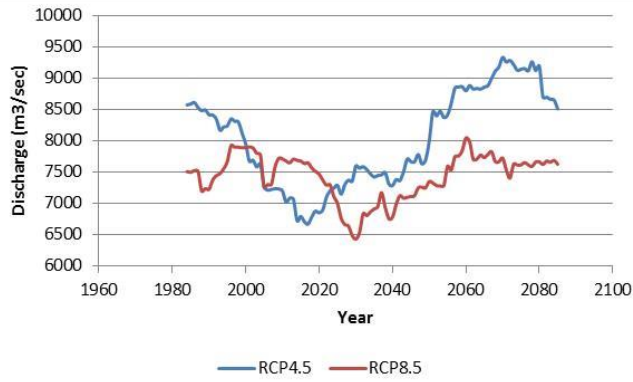
Number of extreme flood exceed 90th percentile of maximum daily value

Scenario RCP4.5

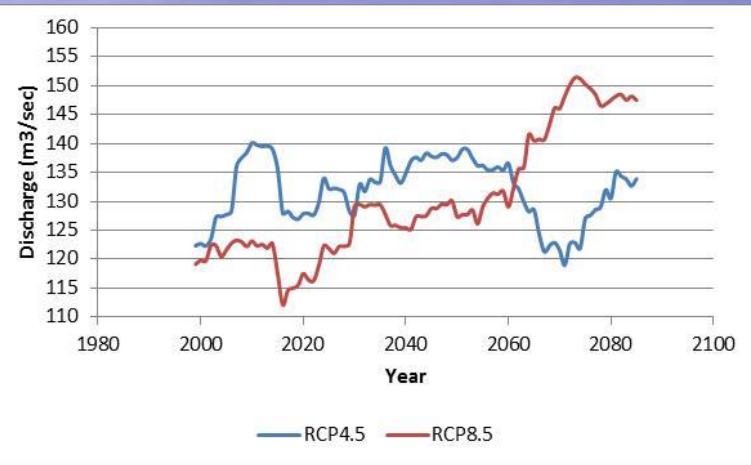
Scenario RCP8.5



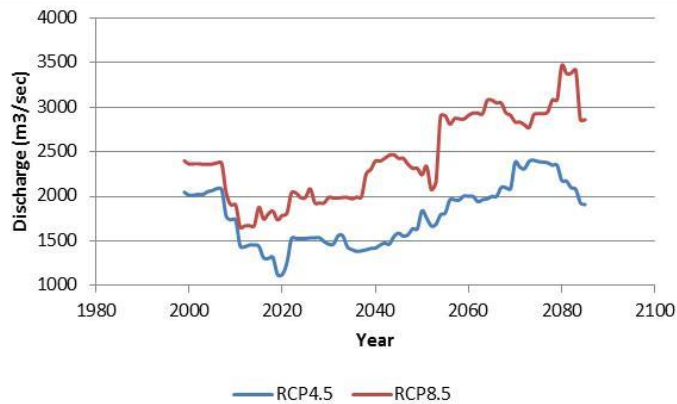
Mean ensemble change values for 100-year return period flood



Medjerda River Basin



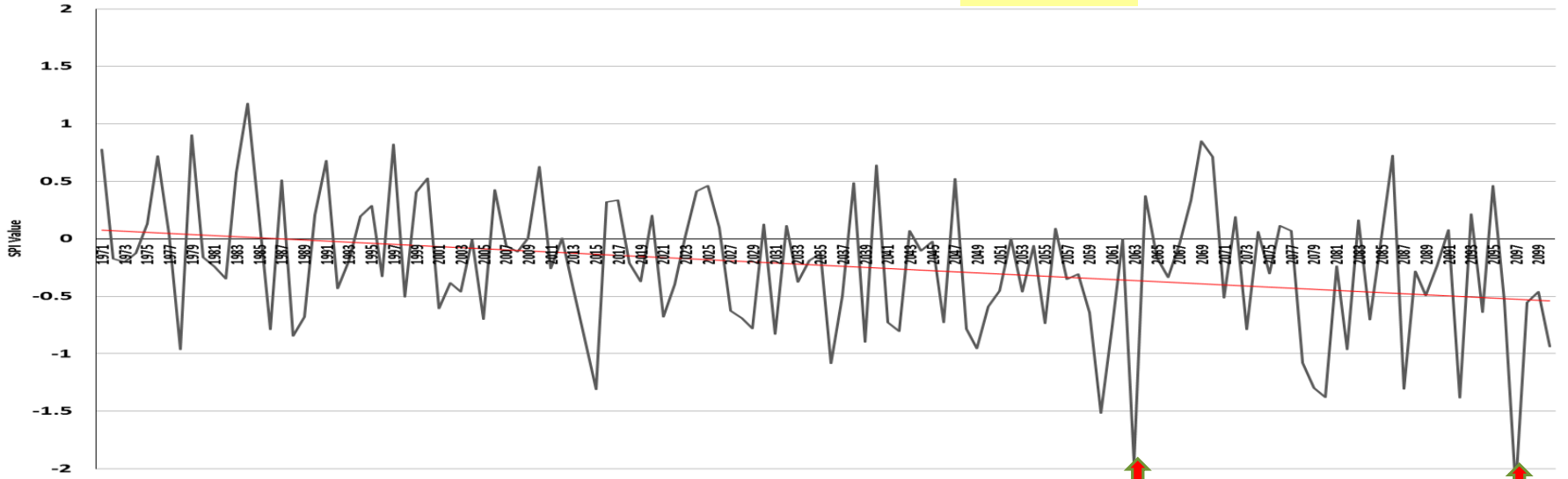
Nahr el Kabir Al-Junoubi basin



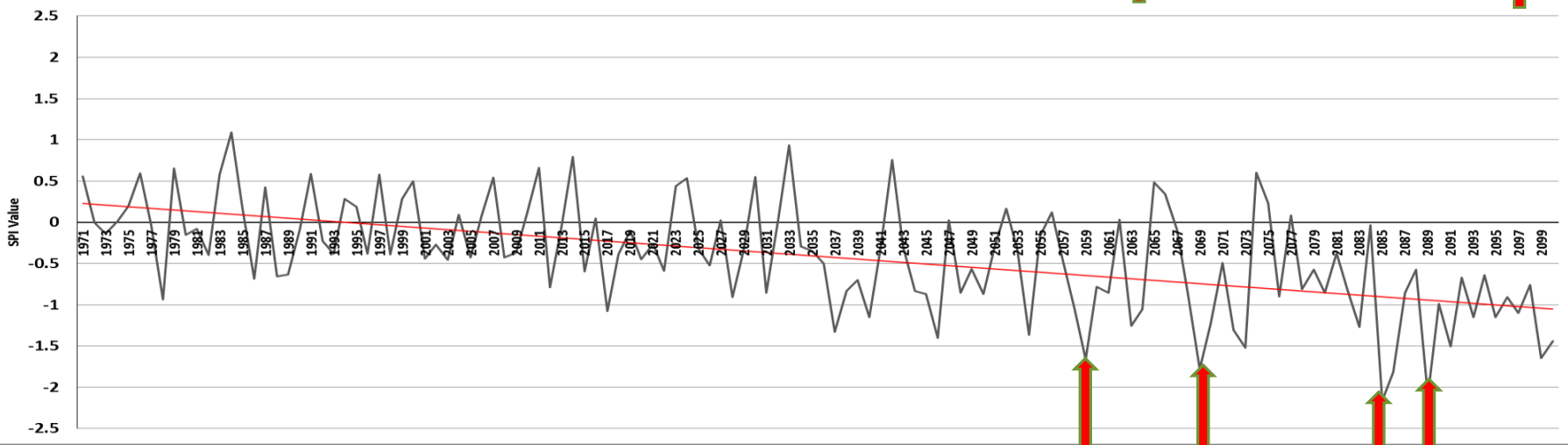
Wadi Dayqah Basin








SPI(6 month) Values_Medjerda **RCP4.5**



SPI(6 month) Values_Medjerda **RCP8.5**

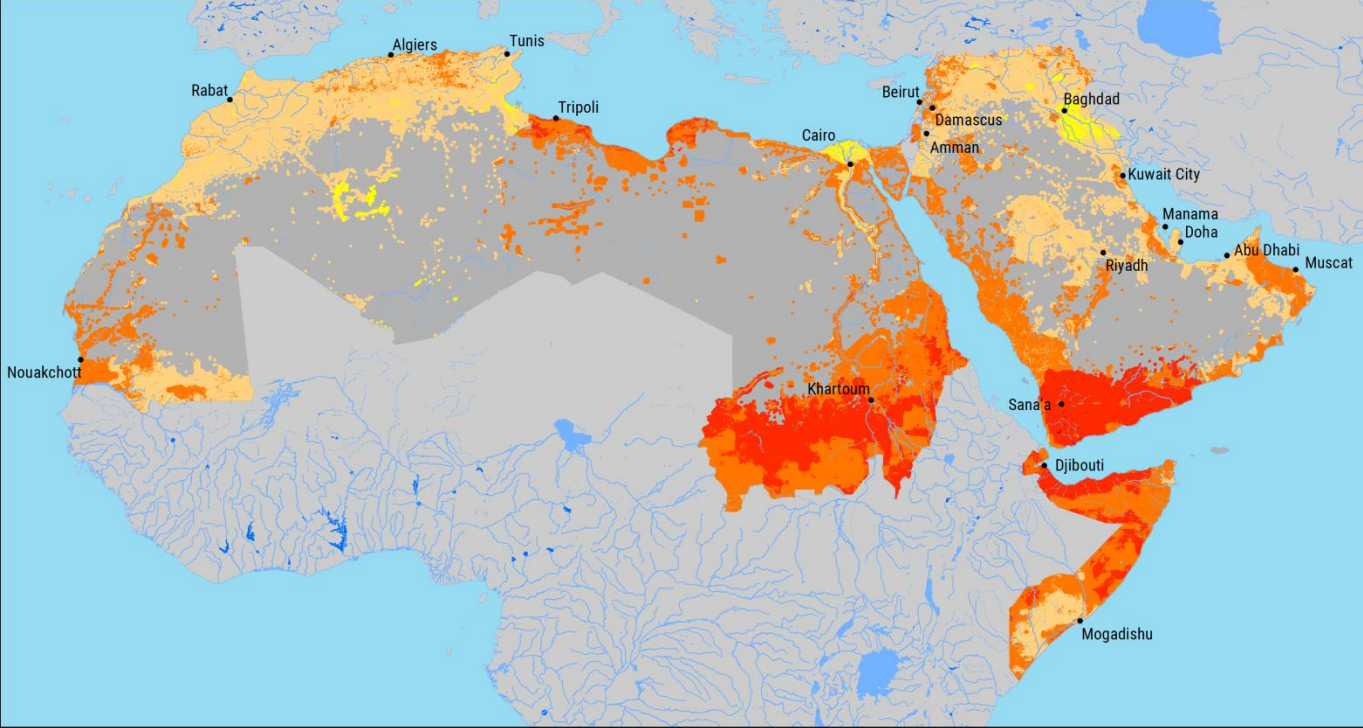


Vulnerability Assessment

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



VA Methodological Note



Areas with highest vulnerability:

- Upper Nile Valley
- SW Arabian Peninsula
- Northern Horn of Africa

Areas with lowest vulnerability:

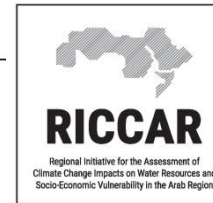
- Tigris-Euphrates Basin
- Lower Nile Valley and Delta

WATER: WATER AVAILABILITY

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

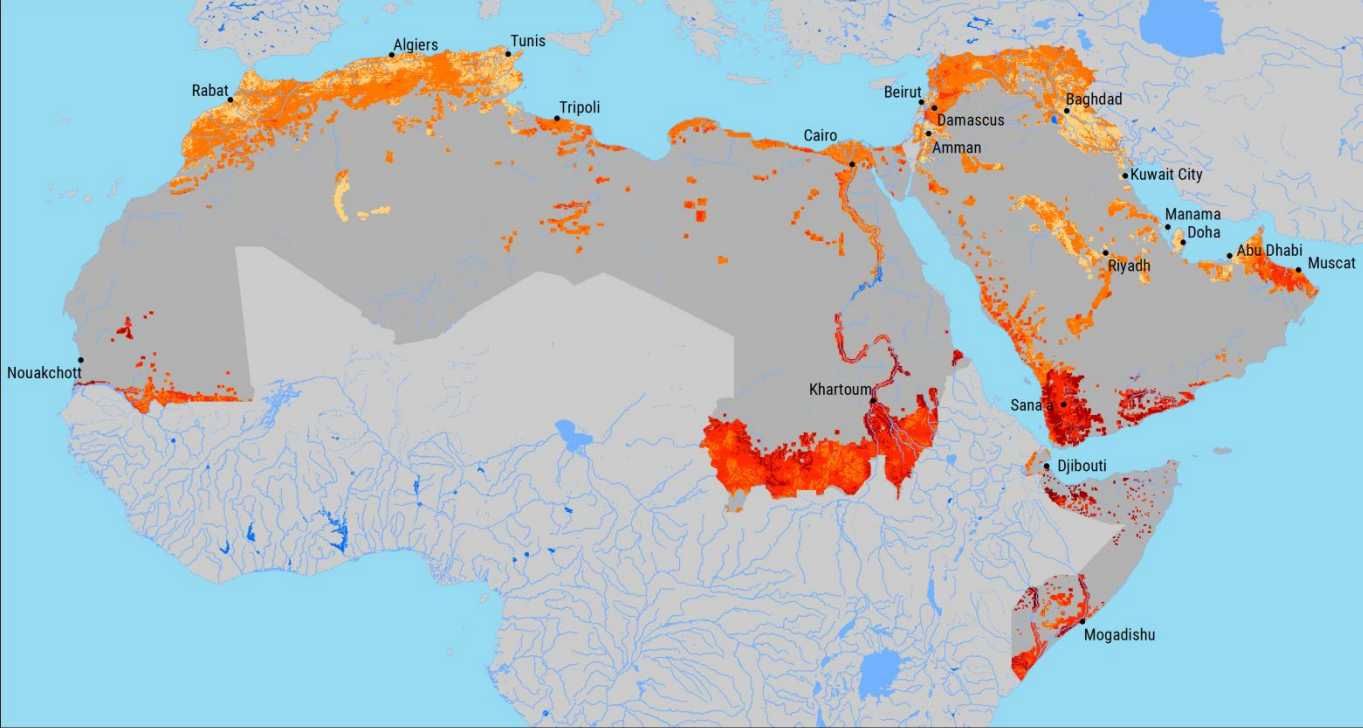
Legend

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



Scenario	Vulnerability (% of study area)		
	Low	Moderate	High
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%

**Water Availability
Vulnerability
(RCP8.5 End-century)**



Areas with highest vulnerability:

- Sub-Saharan Africa
- Horn of Africa
- SW Arabian Peninsula

Areas with lowest vulnerability:

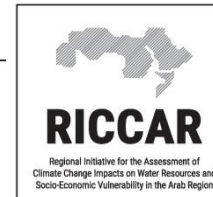
- Mediterranean coast of the Magreb
- Selected areas Levant
- Tigris-Euphrates basin
- Central eastern Arabian Desert

AGRICULTURE: WATER AVAILABLE FOR CROPS

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

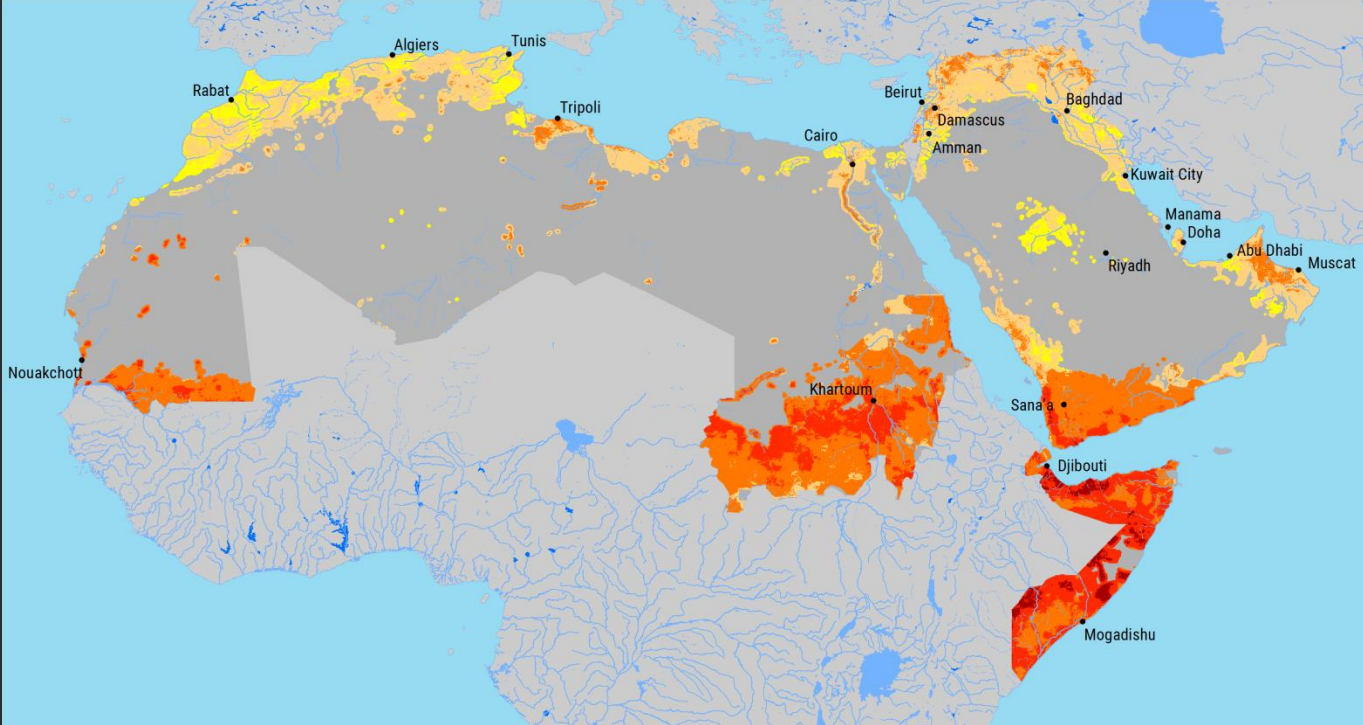
Legend

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



Scenario	Vulnerability (% of study area)		
	Low	Moderate	High
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%

Water Available for Crops Vulnerability (RCP8.5 End-century)



Areas with highest vulnerability:

- Sub-Saharan Africa
- Levant
- Upper Tigris-Euphrates Basin
- Al Hajar Mountains
- Horn of Africa
- SW Arabian Peninsula

Areas with lowest vulnerability:

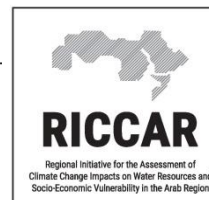
- Atlas Mountains and Plains
- Central Arabian Desert

AGRICULTURE: WATER AVAILABLE FOR LIVESTOCK

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

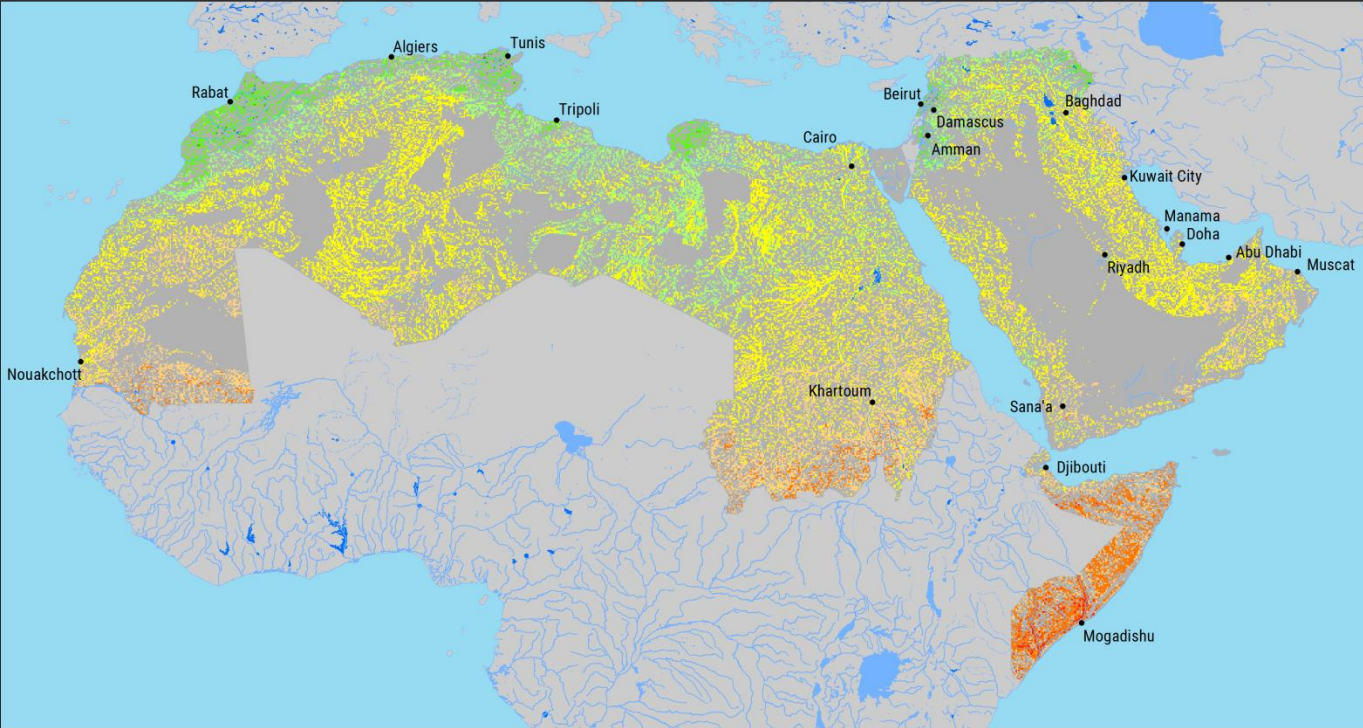
Legend

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



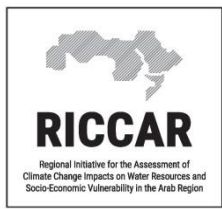
Scenario	Vulnerability (% of study area)		
	Low	Moderate	High
RCP 4.5 Mid-century	0%	67%	33%
RCP 8.5 Mid-century	0%	55%	45%
RCP 4.5 End-century	0%	58%	42%
RCP 8.5 End-century	0%	46%	54%

Water Available for Livestock Vulnerability
(RCP8.5 End-century)




- Areas with highest vulnerability:**
- All coastal areas
- Areas with lowest vulnerability:**
- Sub-Saharan Africa

INFRASTRUCTURE AND HUMAN SETTLEMENTS: INLAND FLOODING AREA
VULNERABILITY: RCP8.5 END-CENTURY (2081-2100)



Scenario	Vulnerability (% of study area)		
	Low	Moderate	High
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%

Inland Flooding Area Vulnerability (RCP8.5 End-century)



Proposed adaptation measures

Using rainwater harvesting measures for flood management



Al-Qaa- Lebanon

Water harvesting for supplementary irrigation and animal drinking



عين البنية - بعلبك - لبنان



اهمج - جبيل - لبنان



بطموش - اللاذقية - سوريا



الشيحة - حماه - سوريا

Water harvesting for rangeland rehabilitation



البادية الاردنية



البادية السورية

New crop varieties

- use **crop varieties** better suited to new climate conditions (e.g. more resilient to heat and drought)



ACSAD developed wheat and barely varieties resilient to heat and drought

-1 :

تمّ في اقسام استنباط العديد من الأصناف، وتطوير الكثير من السلالات من القمح والشعير المتحملة للإجهادات اللاأحيائية (الجفاف، والحرارة المرتفعة، والملوحة، والصقيع)، والمقاومة للإجهادات الأحيائية (الأمراض، والحشرات)، وعالية الإنتاجية.

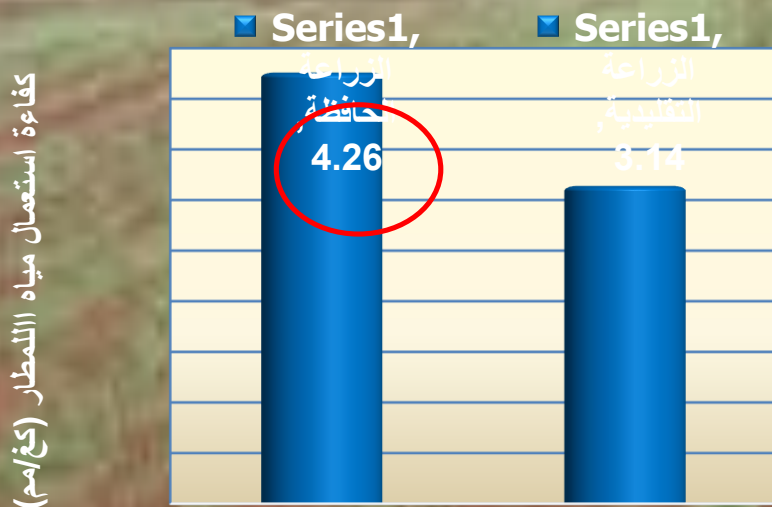


conservation agriculture

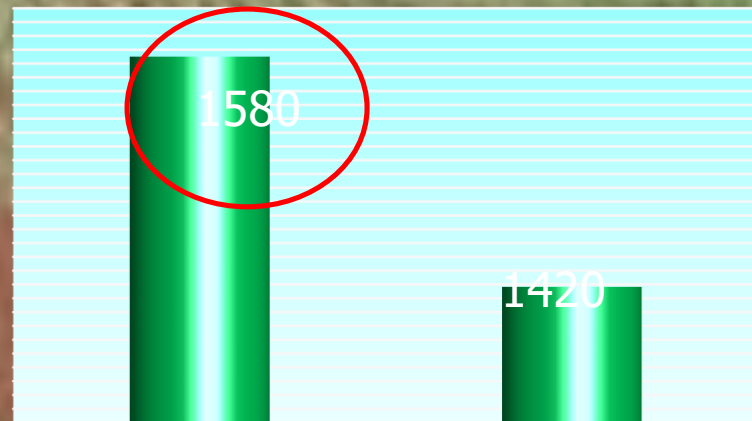
- Apply conservation agriculture:
 - Minimum tillage + land cover + crop rotation
 - CA increase soil moisture and OM content



تم تسجيل زيادة في إنتاج القمح بحوالي (10-30%) بتطبيق الزراعة الحافظة مقارنة مع الزراعة التقليدية، مع زيادة في كفاءة استعمال مياه الأمطار.



متوسط الإنتاجية (كغ/هكتار)

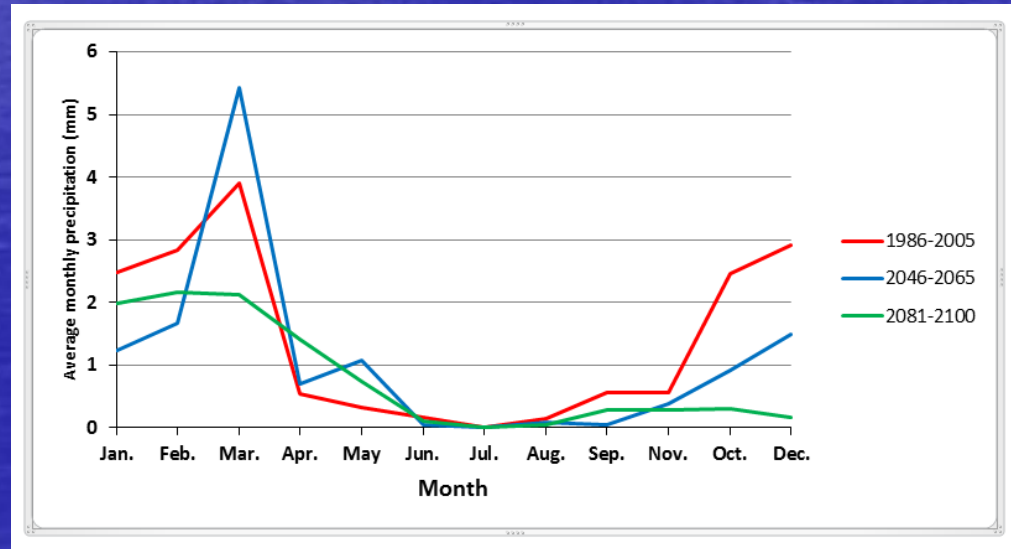


كفاءة استعمال مياه الأمطار في إنتاج القمح في محافظة الحسكة

متوسط إنتاجية محصول القمح في محافظة الحسكة

Proposed adaptation measures

- adjust **sowing dates** according to temperature and rainfall patterns,

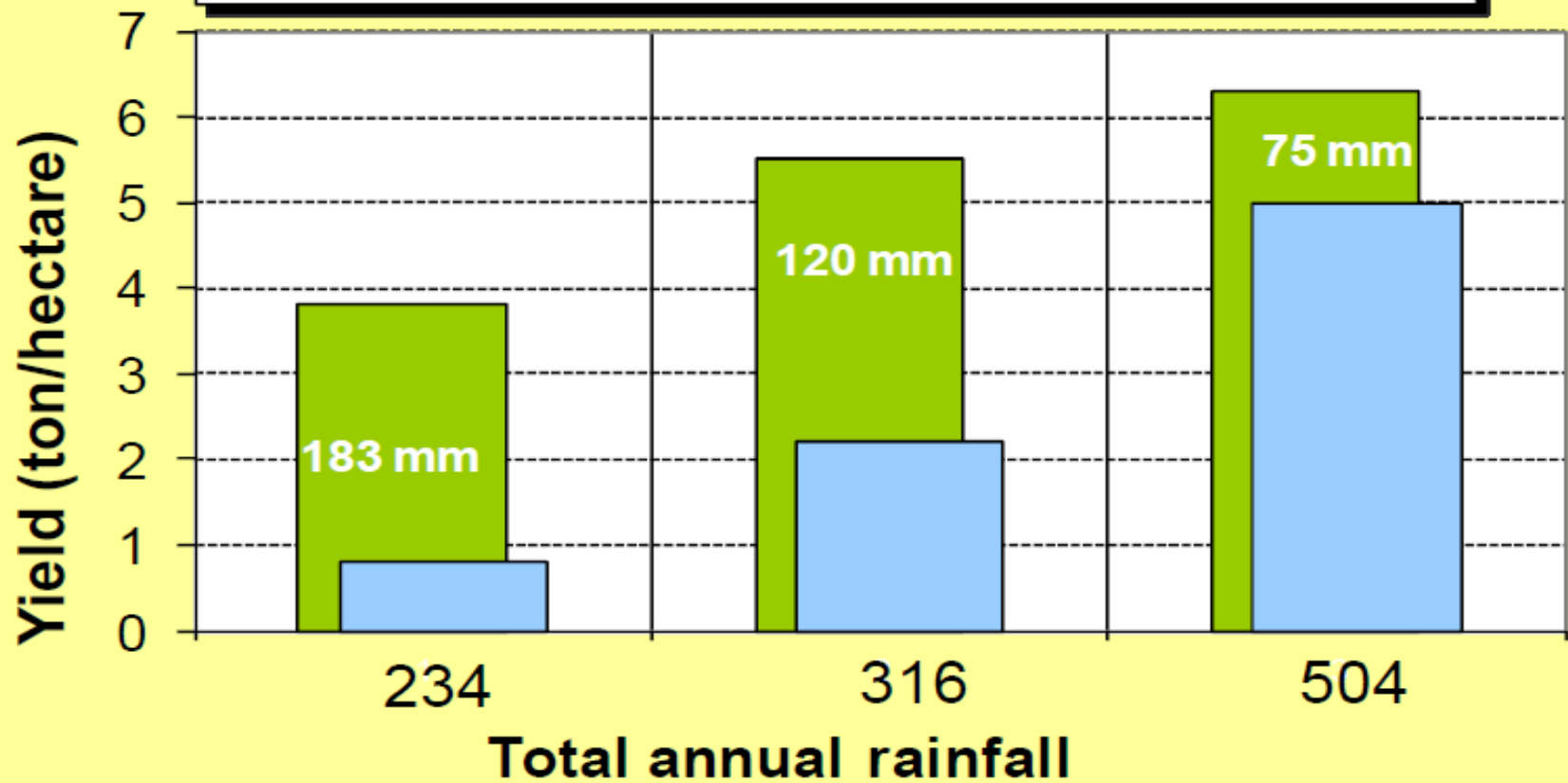


Proposed adaptation measures

- Apply supplementary irrigation



Figure 8. Impact of Supplemental Irrigation on Rainfed Wheat Yield



■ Supplementary Irrigation ■ Rainfall

شكرا لحسن استماعكم
Thanks