Economic and Social Commission for Western Asia

تحصيص المياه لمواجهة ندرة المياه وتغير المناخ

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Shared Prosperity Dignified Life

زياد الخياط
مسؤول الشؤون الاقتصادية
مجموعة تغير المناخ واستدامة الموارد الطبيعية،
الإسكوا khayat@un.org

المبادرة الإقليمية لتقييم أثر تغير المناخ على الموارد المائية وقابلية تأثر القطاعات الاجتماعية والاقتصادية في المنطقة العربية

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

Water

Biodiversity and Ecosystems

Agriculture

Infrastructure and Human Settlements

People

الهدف

تقييم تأثير تغير المناخ على موارد المياه العذبة في المنطقة العربية من خلال مبادرة إقليمية استشارية ومتكاملة تسعى إلى تحديد قابلية التأثر الاجتماعية والاقتصادية والبيئية الناجمة عن آثار تغير المناخ على موارد المياه على أساس الخصائص الإقليمية.

توفر المبادرة منصة مشتركة لتقييم ومعالجة وتحديد التحديات الإقليمية المتعلقة بتغير المناخ، والتي تهدف بدورها إلى إثراء الحوار وتحديد الأولويات وصياغة السياسات وتعزيز الاستجابات المتعلقة بتغير المناخ على المستوى الإقليمي العربي.

التقييم | التكيف | التخفيف من الآثار | المفاوضات | التمويل

RICCAR Founding Partners

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

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THE LEAGUE OF ARAB STATES
THE ARAB CENTER FOR THE STUDIES OF ARID ZONES AND DRY LANDS
ACSAD 1968
أكساد
ACSAD

جامعة الدول العربية
LAS

SMHI

UNESCO
United Nations Educational, Scientific and Cultural Organization
منظمة الأمم المتحدة للتربية والعلم والثقافة
Cairo Office
مكتب القاهرة

UNITED NATIONS UNIVERSITY
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Institute for Water, Environment and Health

FAO
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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

ACCWaM

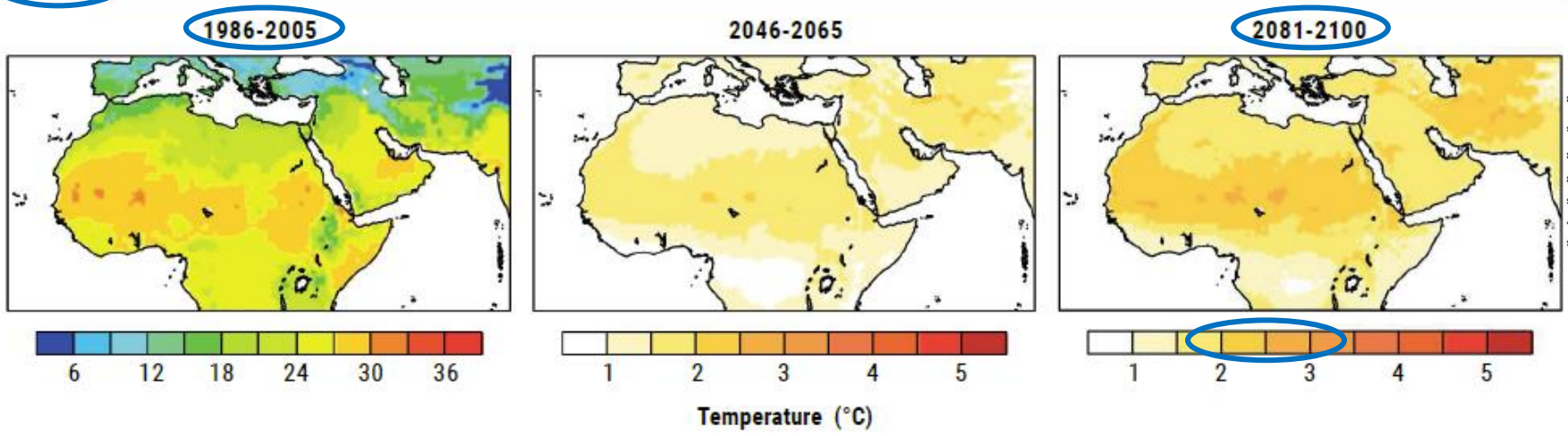
UNDRR
UN Office for Disaster Risk Reduction

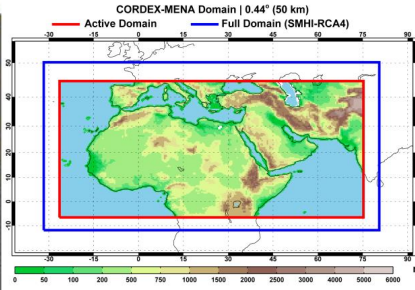
CORDEX-MENA Domain hosted by The Cyprus Institute

Mean Temperature Projected to Increase

Moderate Climate Scenario

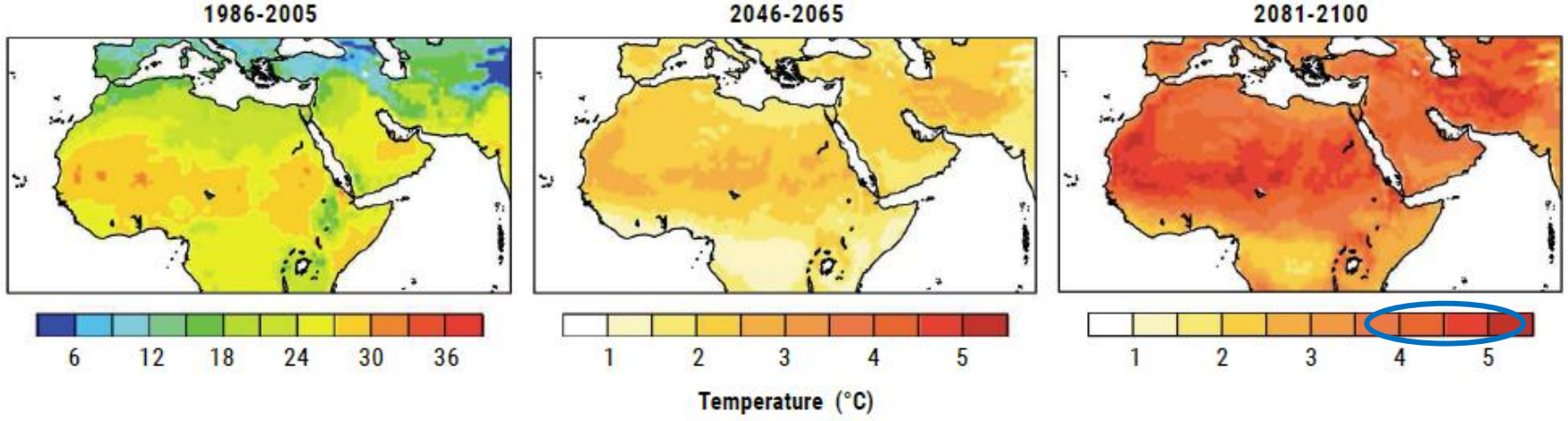
RCP 4.5





Business-as-Usual Climate Scenario

RCP 8.5

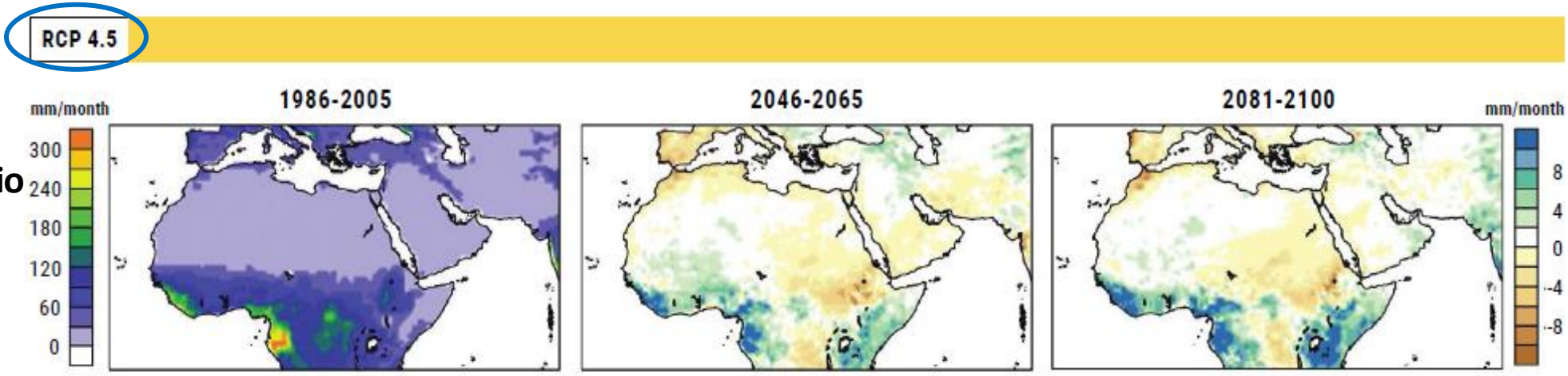


Source: www.riccar.org

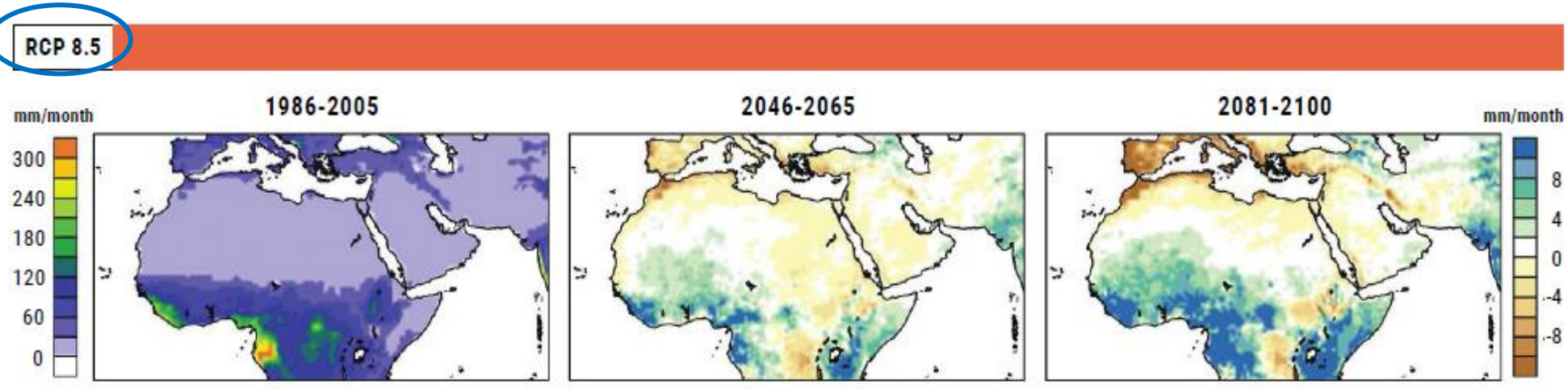
Precipitation Projected to be more Variable

Precipitation trends are largely decreasing across the region, though limited areas expected to exhibit an increase in the intensity and volume of precipitation

Moderate Climate Scenario



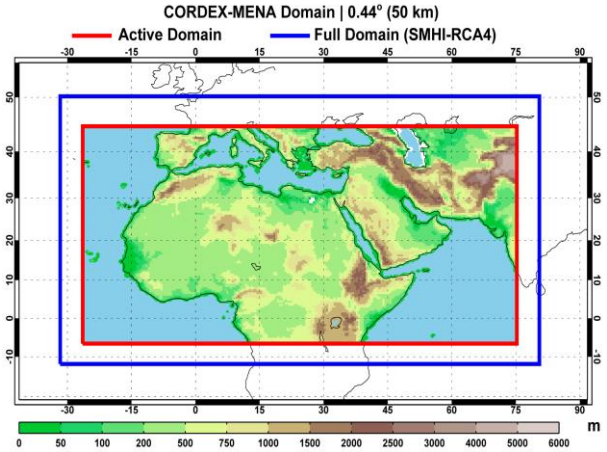
Business-as-Usual Climate Scenario

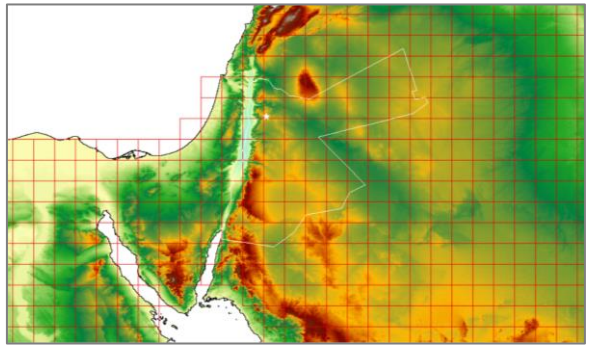


Source: www.riccar.org

Bridging the Science-Policy Interface : Making Science Useful for Policymakers in the Arab Region

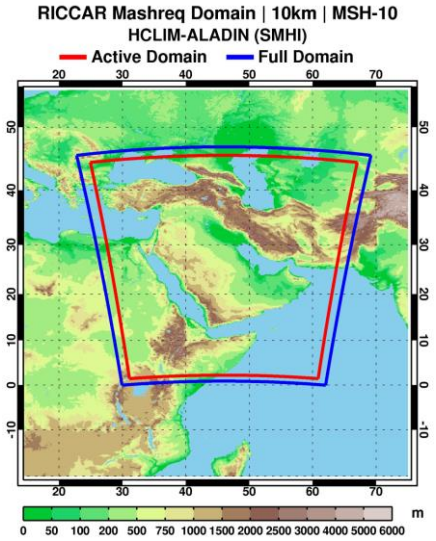
From CMIP5 across the CORDEX-MENA/Arab Domain to support regional cooperation . . .

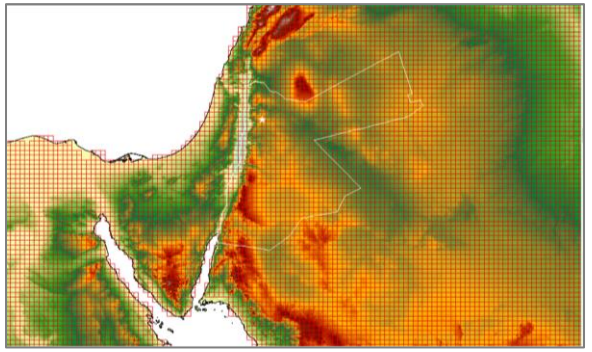




50 km² scale

. . . To CMIP6 within the Mashreq Domain to facilitate more detailed analyses to inform regional action



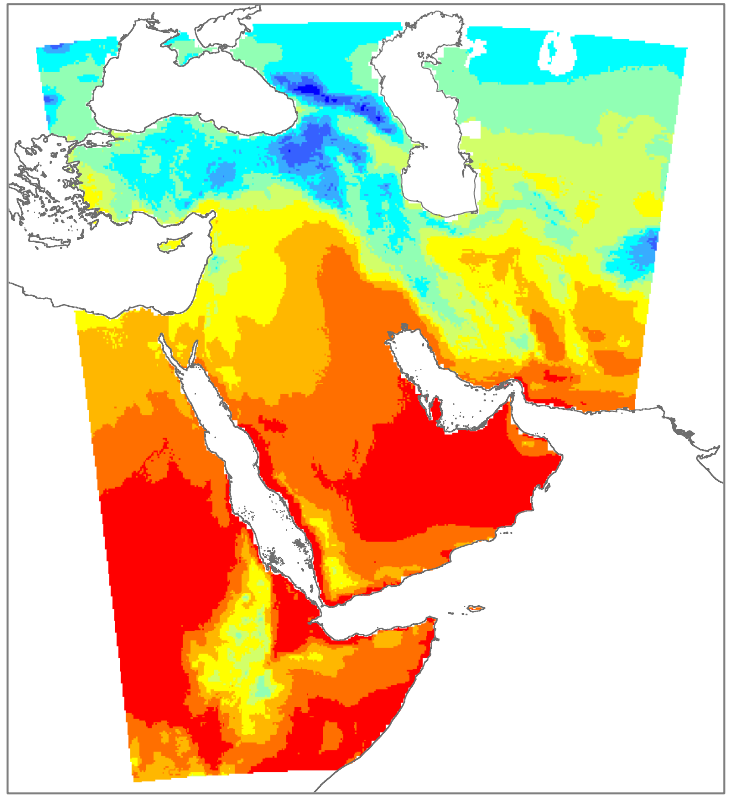


10 km² scale

Change in annual temperature for near term (2021-2040) and mid-term (2041-2060) compared to the reference period (1995-2014), SSP5-8.5 scenario

ريكار
المبادرة الإقليمية لتقييم أثر تغيّر المناخ على الموارد المائية وقابلية تأثر القطاعات الاجتماعية والاقتصادية في المنطقة العربية

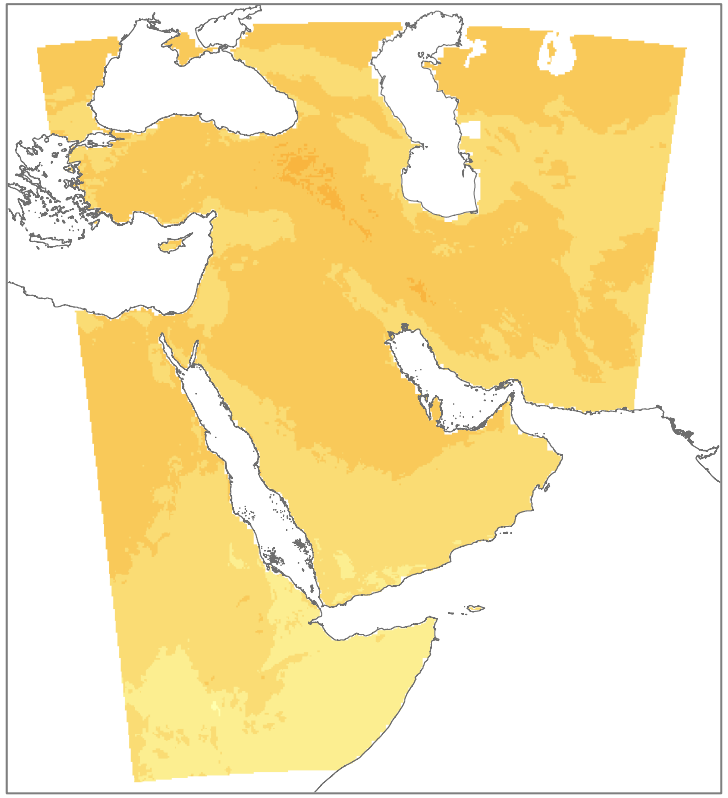
1995 – 2014



Temperature (°C)

3 6 9 12 15 18 21 24 27

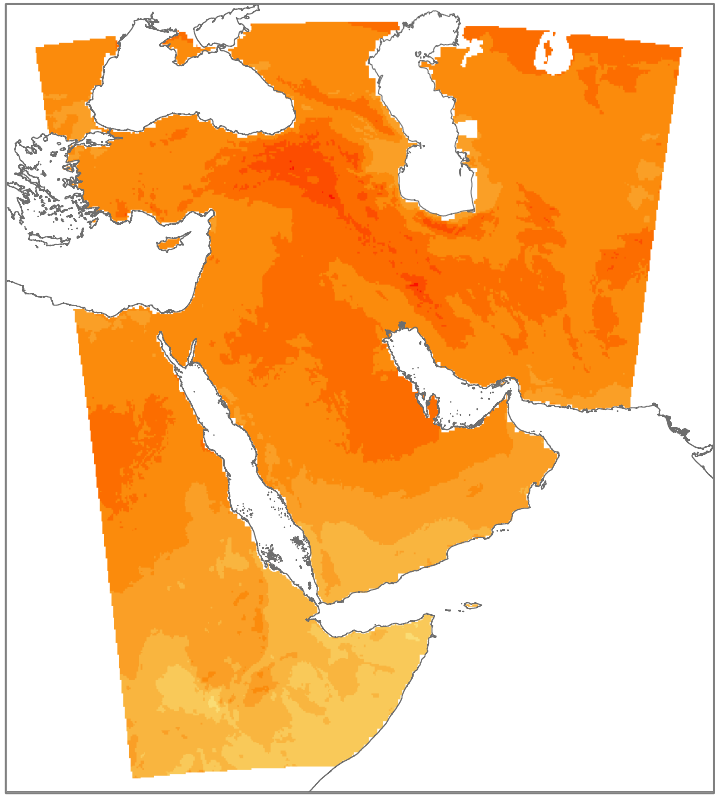
2021 – 2040



Change in temperature (°C)

0.3 0.6 0.9 1.2 1.5 1.8 2.1 2.4 2.7

2041 – 2060



Change in temperature (°C)

0.3 0.6 0.9 1.2 1.5 1.8 2.1 2.4 2.7

By mid-term, Mashreq Domain is increasing as much as 2.7 °C (mean increase 1.8 °C), higher than the global mean (1.7 °C)

Change in annual Tmax (top) and Tmin (bottom) for near term (2021-2040) and mid-term (2041-2060) compared to the reference period (1995-2014), SSP5-8.5 scenario

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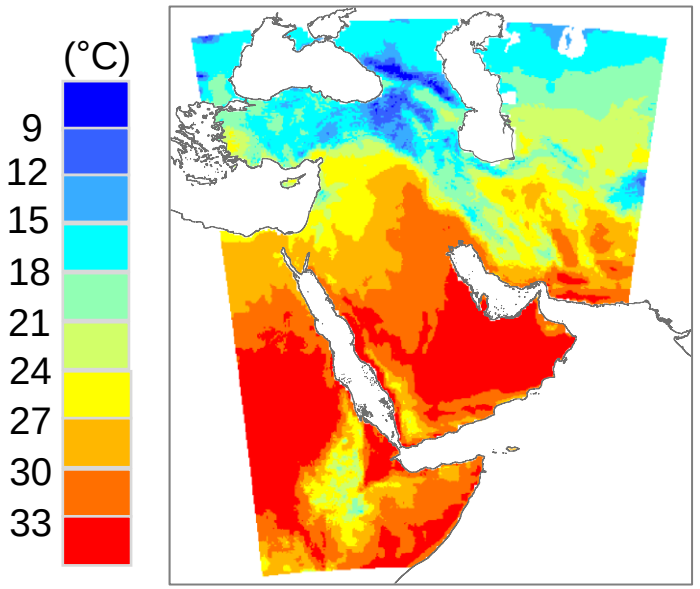
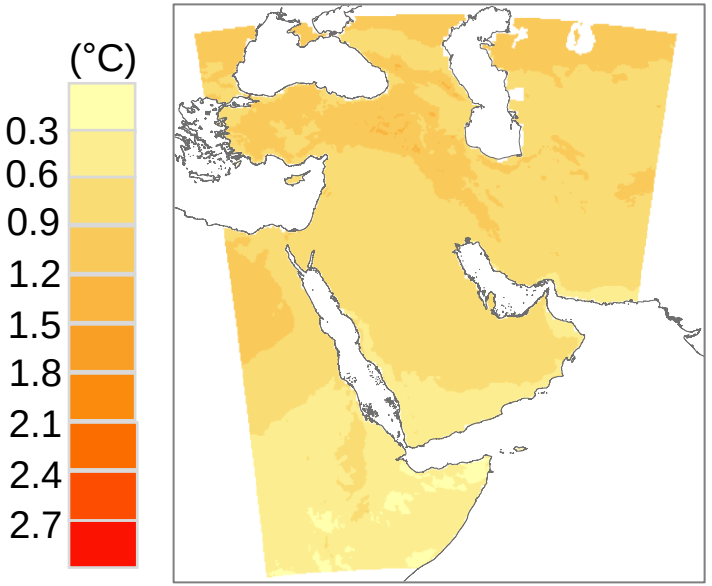
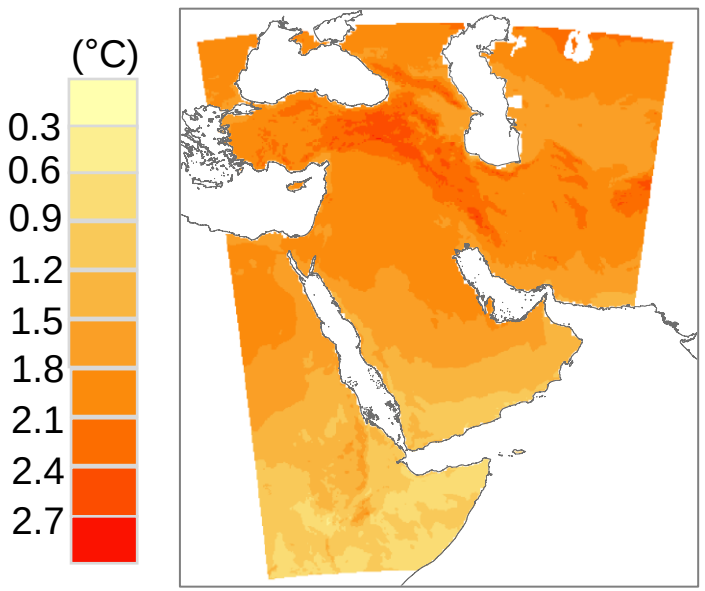
1995 – 2014

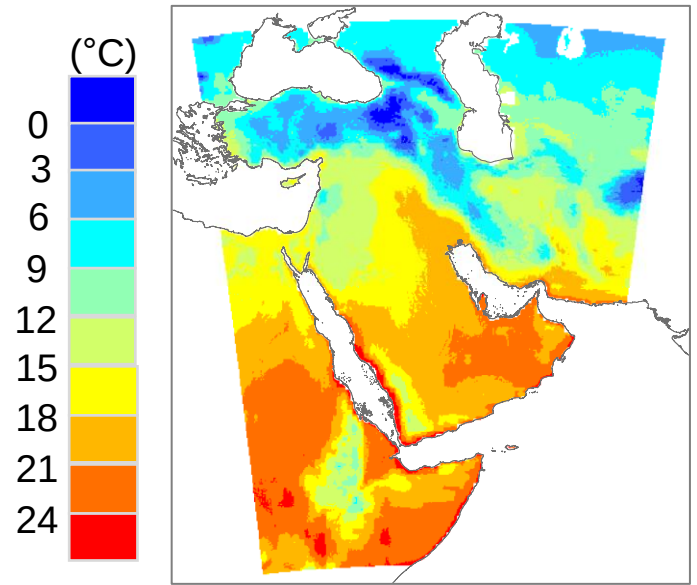


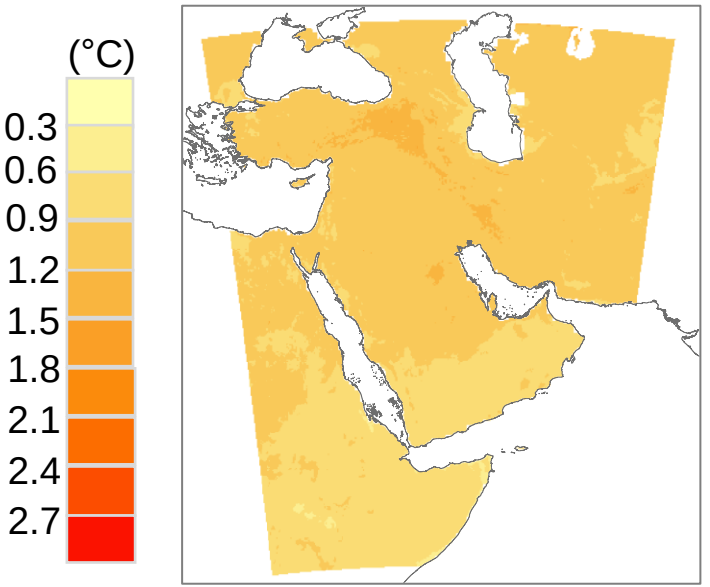
2021 – 2040

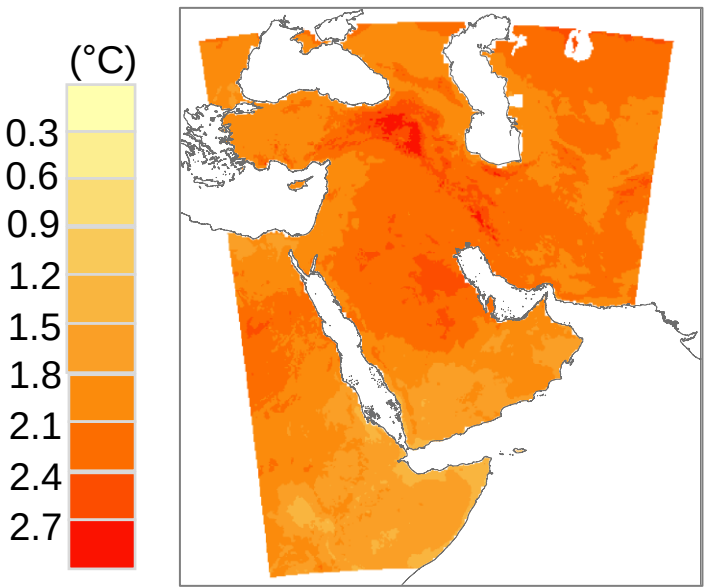


2041 – 2060









Tmin is increasing at a faster rate (+2.0 °C) than Tmax (+1.6 °C) resulting in diurnal temperature reduction (DTR)

*Mean change by mid-term

Change in number of hot days for near term (2021-2040) and mid-term (2041-2060) compared to the reference period (1995-2014), SSP5-8.5 scenario

Days which Tmax > 35 °C

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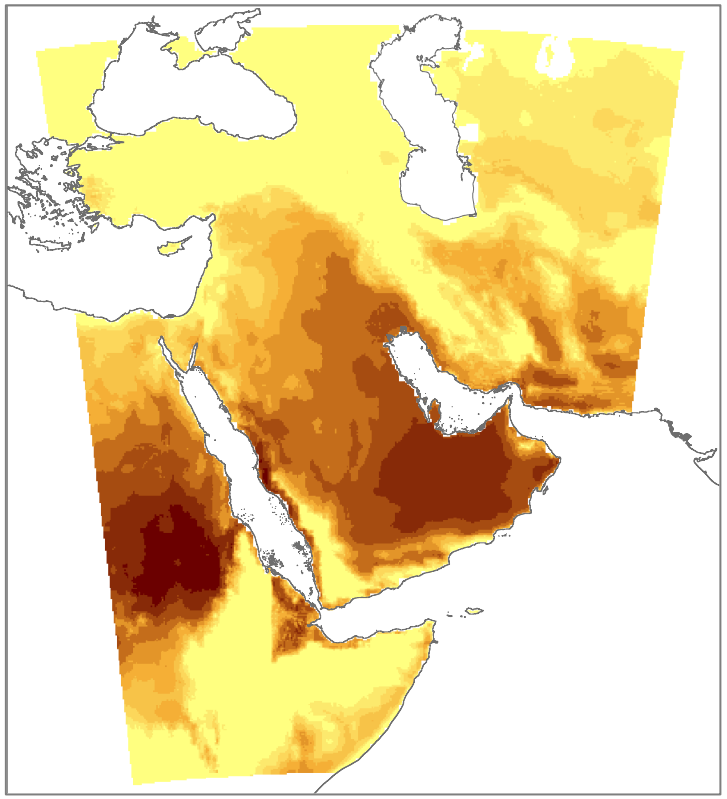
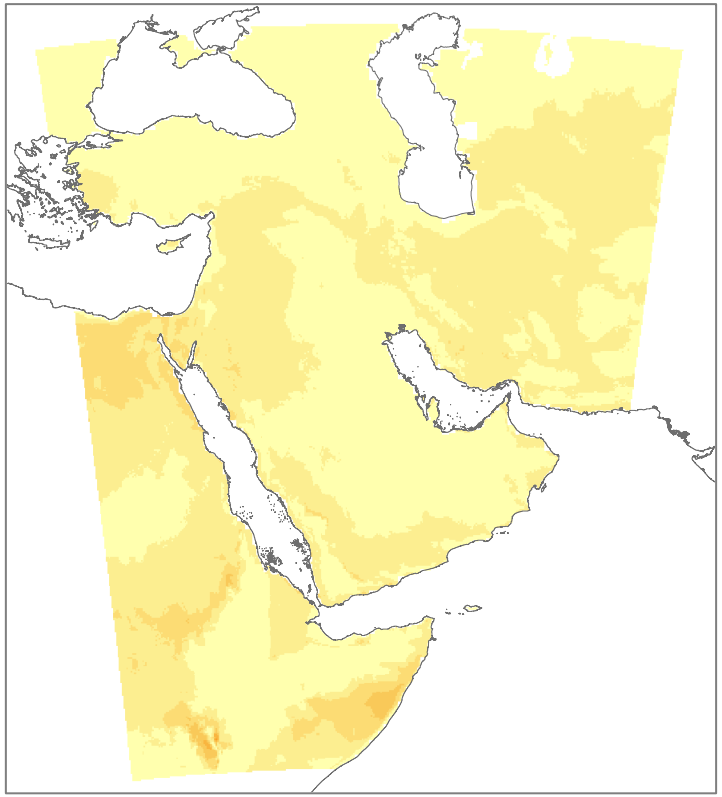
1995 – 2014



SU35 (days/year)

25 50 75 100 125 150 175 200 225

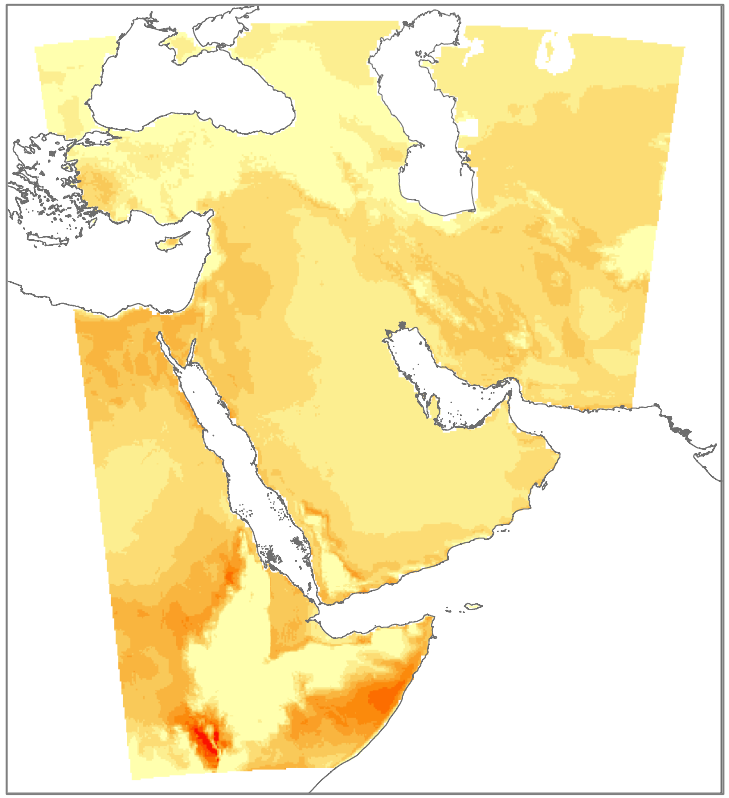
2021 – 2040



Change in SU35 (days/year)

10 20 30 40 50 60 70 80 90

2041 – 2060



Change in SU35 (days/year)

10 20 30 40 50 60 70 80 90

By mid-term, 55% of the Mashreq Domain will experience at least 3 months of temperatures > 35 °C (the threshold which the human body can no longer cool itself) and 23% of the domain will experience at least 6 months which exceed 35 °C – before factoring in humidity effects

Change in annual precipitation for near term (2021-2040) and mid-term (2041-2060) compared to the reference period (1995-2014), SSP5-8.5 scenario

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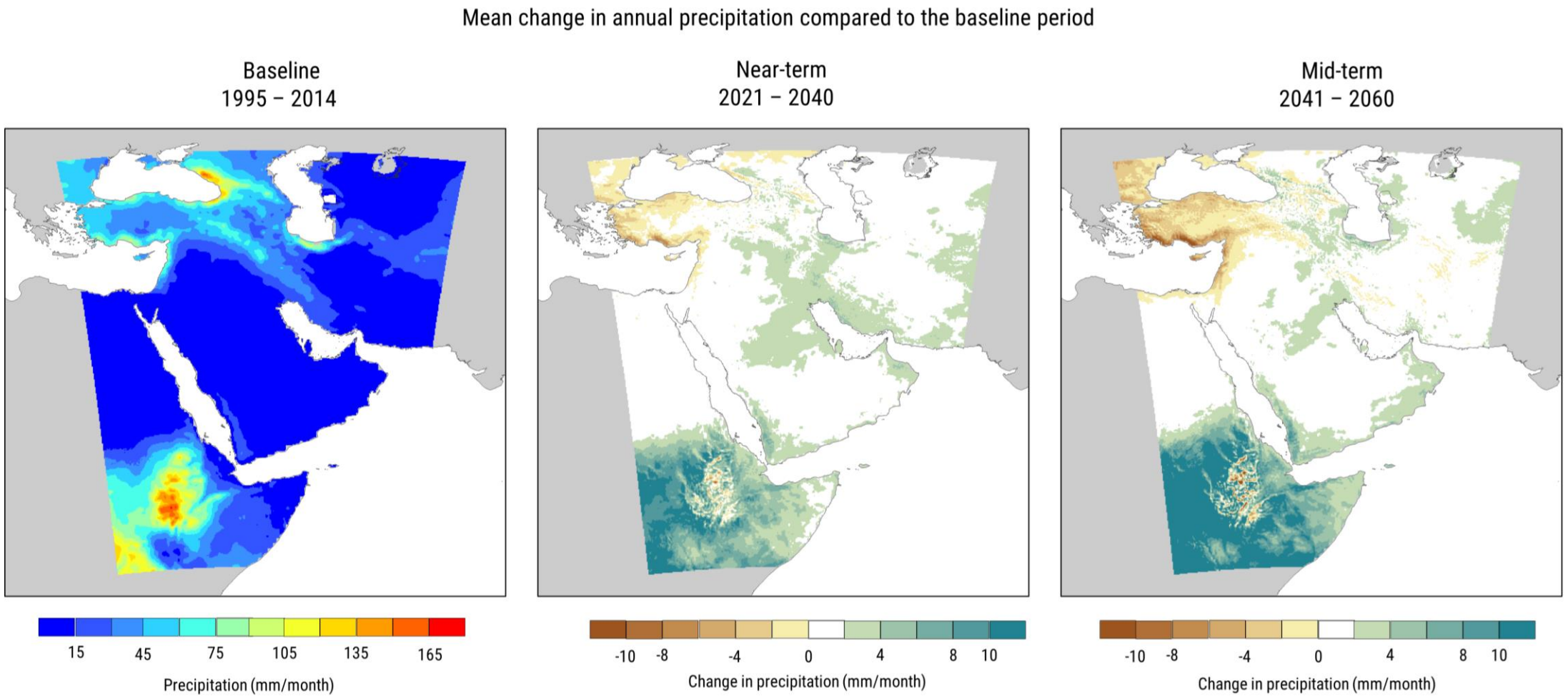

Although overall precipitation volume exhibits little projected change, increased interannual and seasonal variability is expected

Change in seasonal (Oct-Mar) maximum length of dry spell (2021-2040) and mid-term (2041-2060) compared to the reference period (1995-2014), SSP5-8.5 scenario

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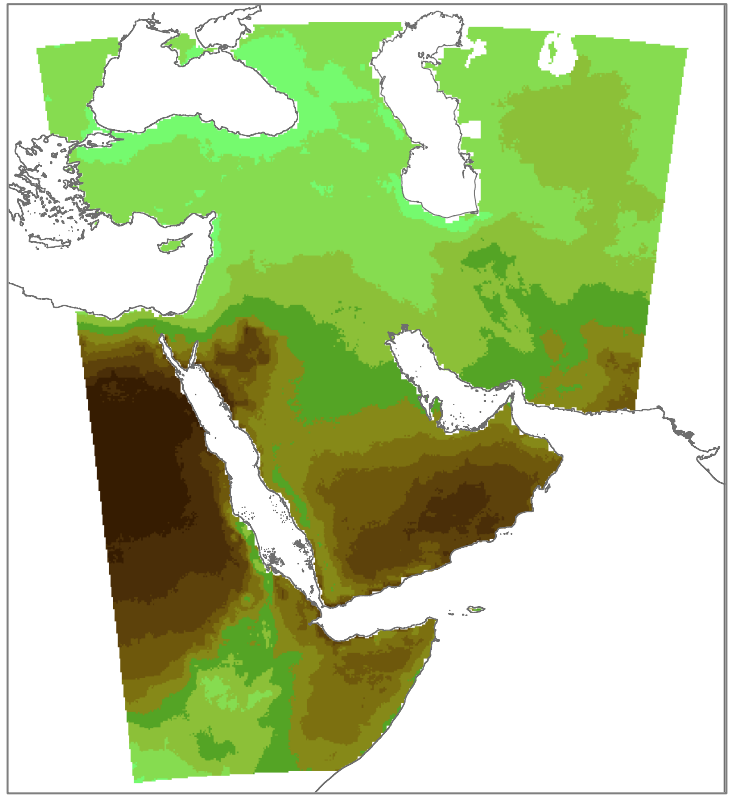
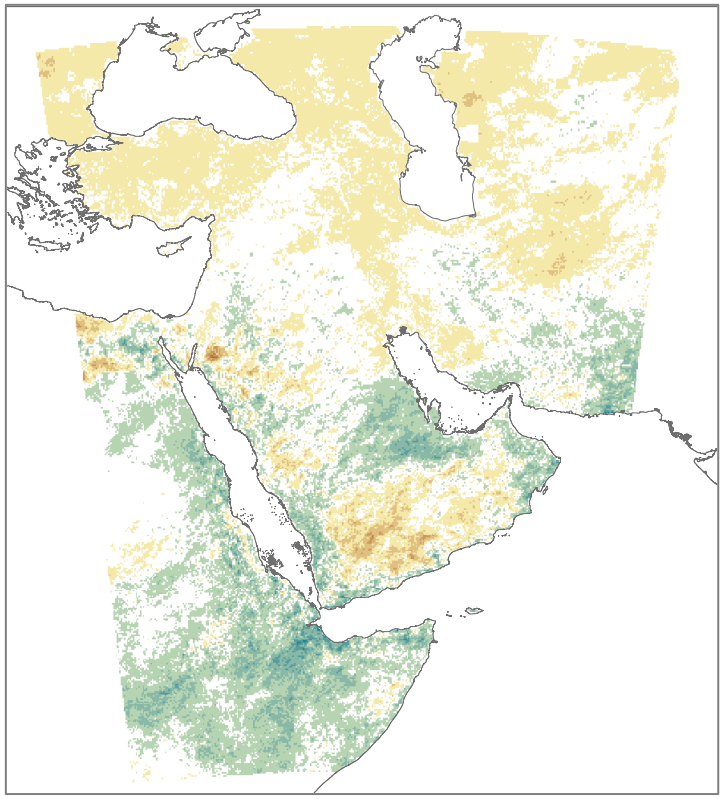
1995 – 2014



CDD (days/season)

20 40 60 80 100 120 140 160 180

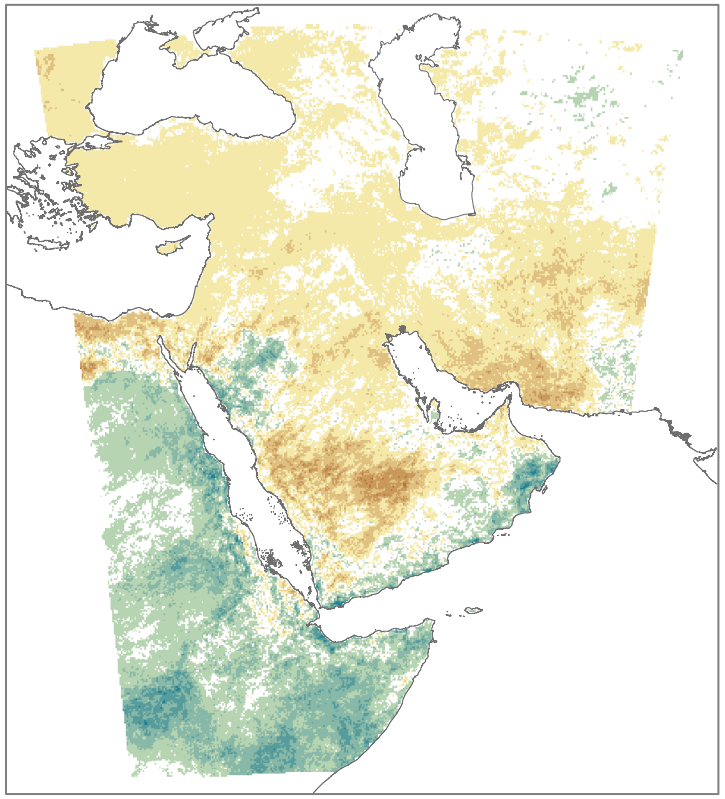
2021 – 2040



Change in CDD (days/season)

-16 -12 -8 -4 0 4 8 12 16

2041 – 2060



Change in CDD (days/season)

-16 -12 -8 -4 0 4 8 12 16

Over 1/3 of the domain (including around the Red Sea and southern Arabian Peninsula) will have at least 3 months (out of 6) of consecutive dry days during the season by mid-term

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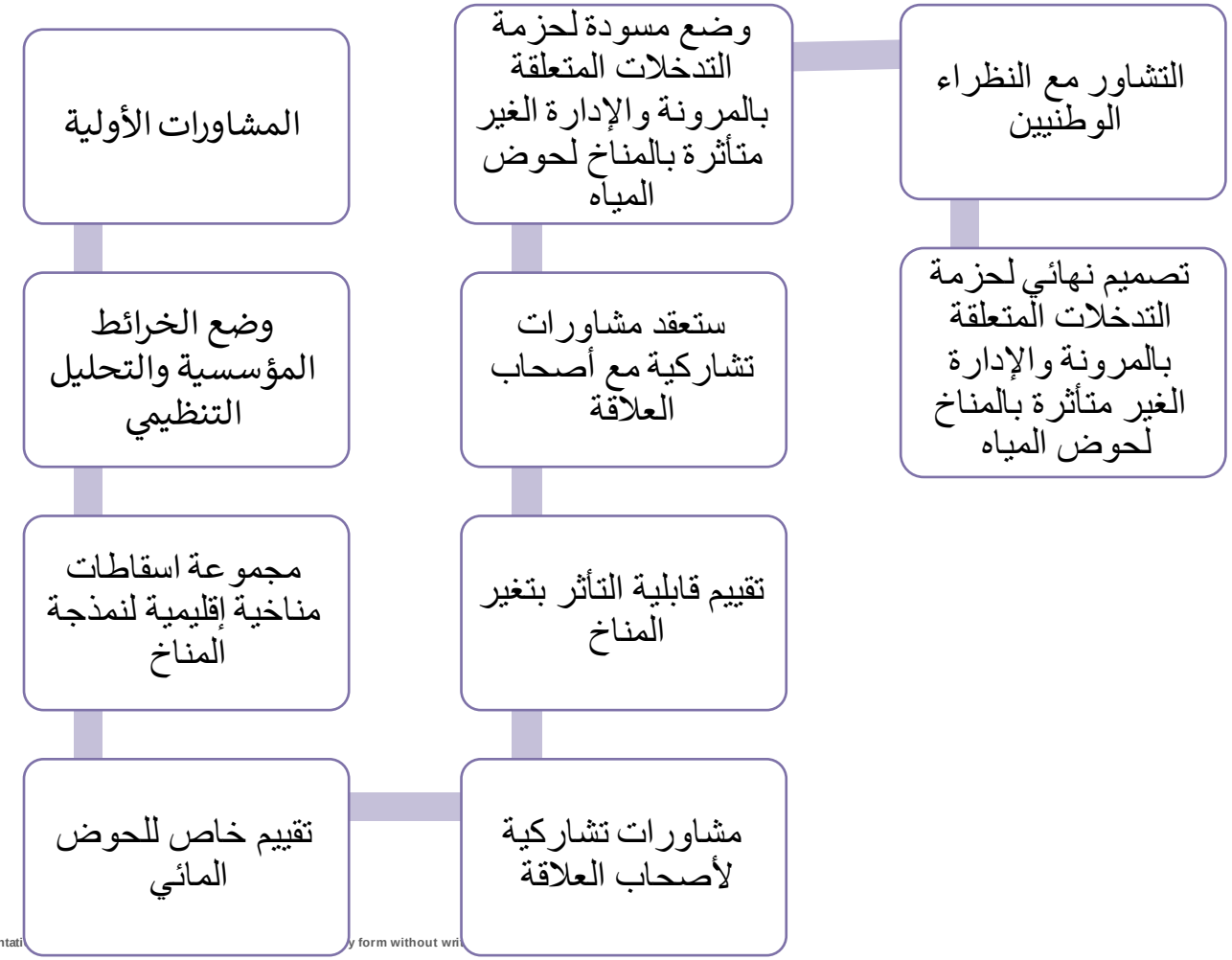
ESCWA Initiatives in Assessing Climate Change Impact on Water Resources and Crop Productivity

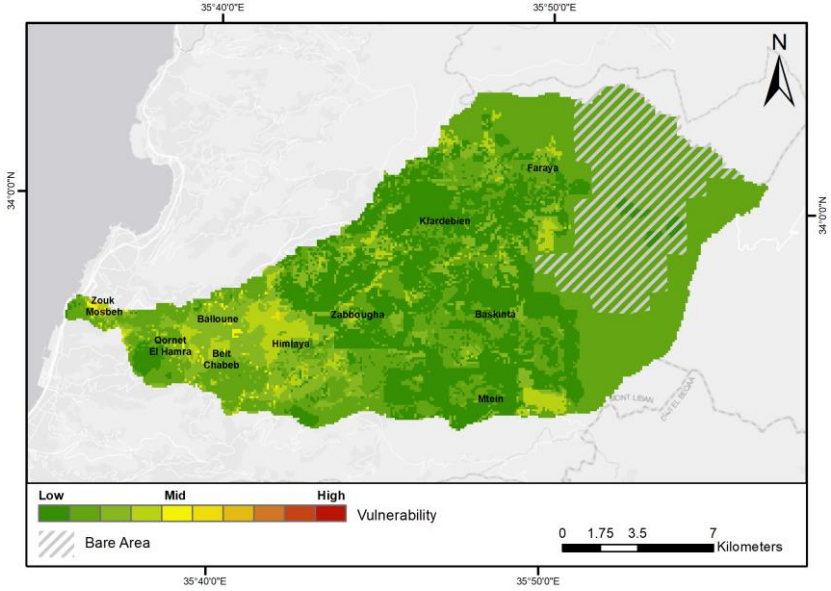
Increasing Watershed Resilience to Climate Change

10-Point Methodology

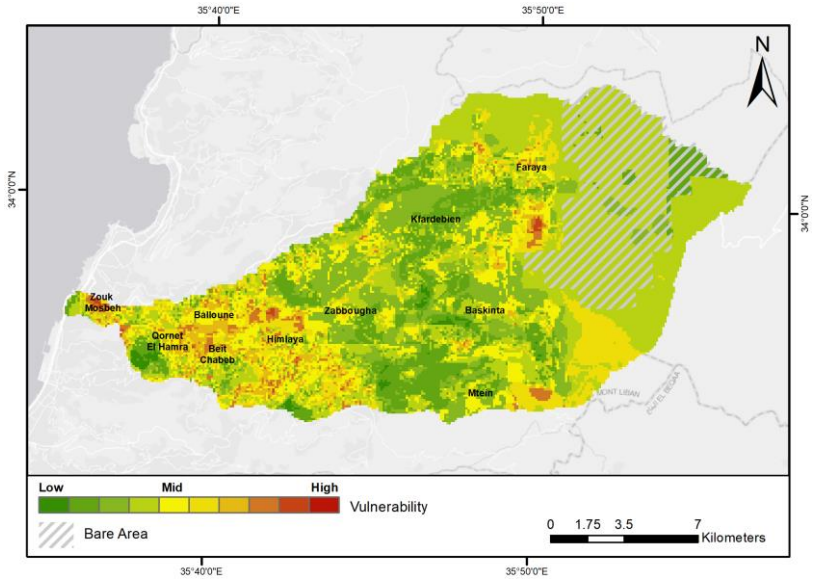


Climate Change Vulnerability Assessment – Nahr el Kalb Watershed, Lebanon

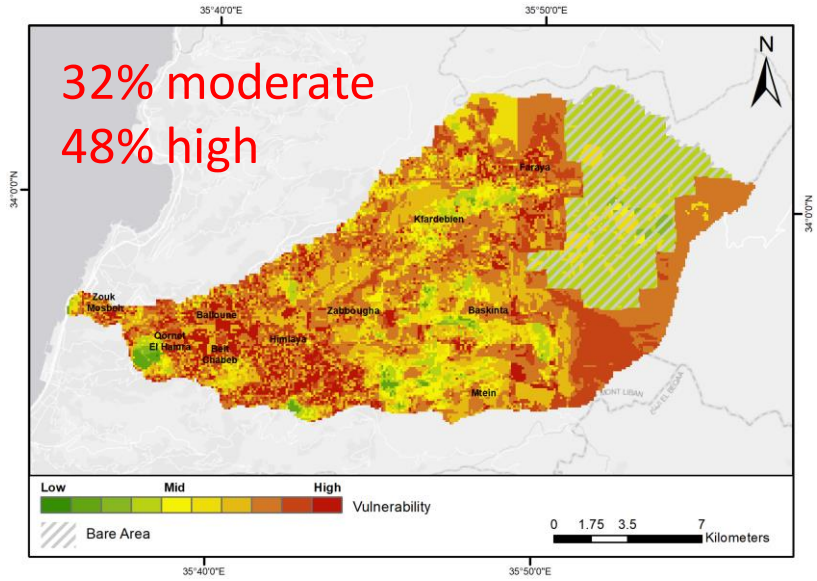
Reference Period (1995-2014)

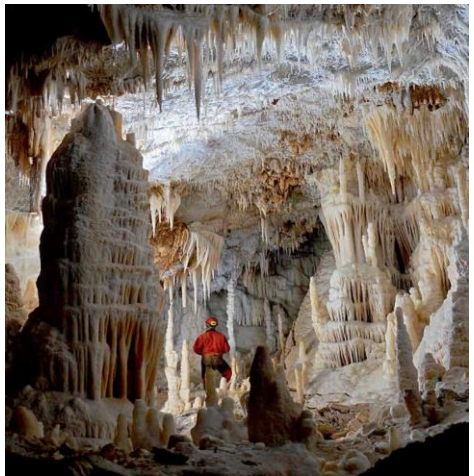


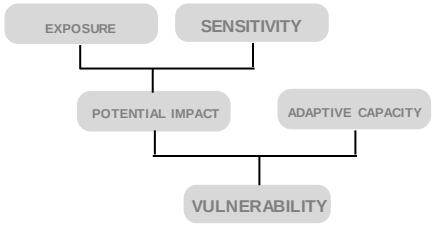
Near term (2021-2040)



Mid-term (2041-2060)







Of total cropped area: 40% moderate, 54% high

Population impacted: 55% will live in high vulnerability area

Climate Change impact on Agricultural Production - Apples

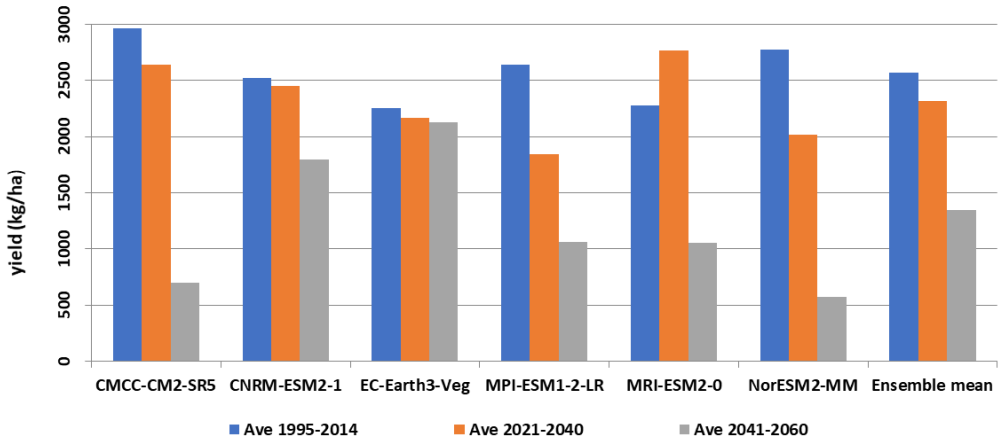
Projections using the **CropSyst** model to assess climate change impacts on apple tree in El Kalb watershed - Lebanon

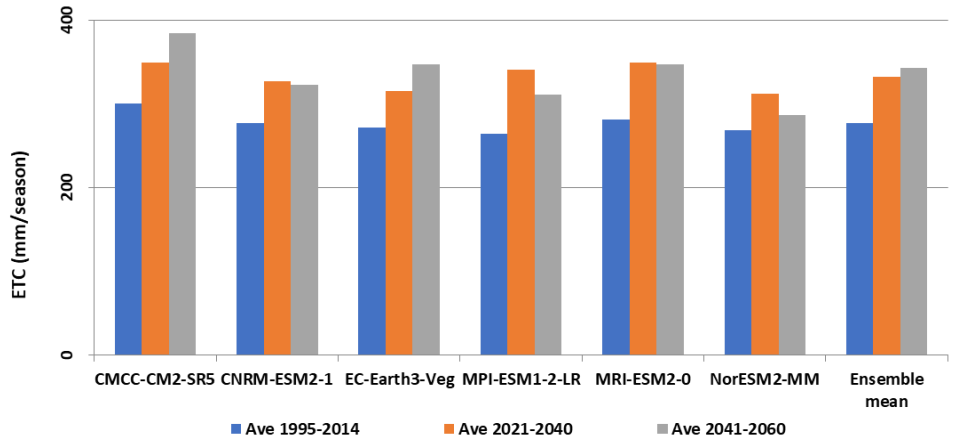
Change in apple tree yield

- With fixed atmospheric CO_2 concentration, apple tree yield is projected to be reduced by up to **48 % in the mid-term** period
- When the effect of elevated CO_2 is added, yield of apple tree is projected to decrease only by 16.4 % during the same period

Change in apple tree water requirement

- Seasonal actual ETC of apple tree is projected to increase due to increase in minimum and maximum temperature
- → Increase in apple tree **water consumption by about 24 %** in the mid-term period

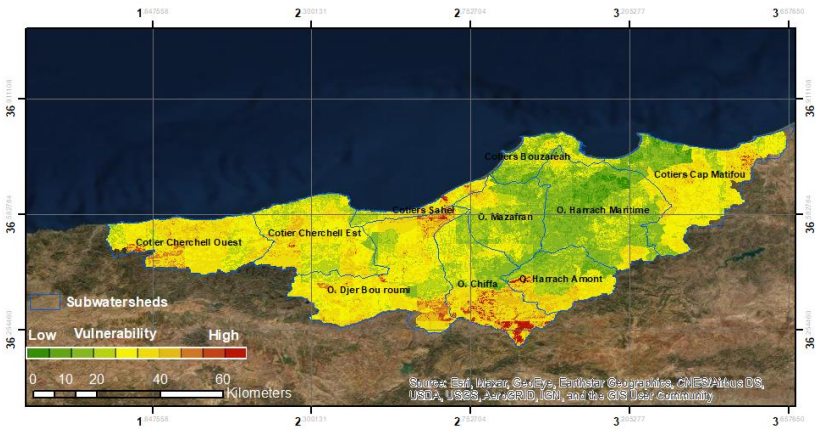




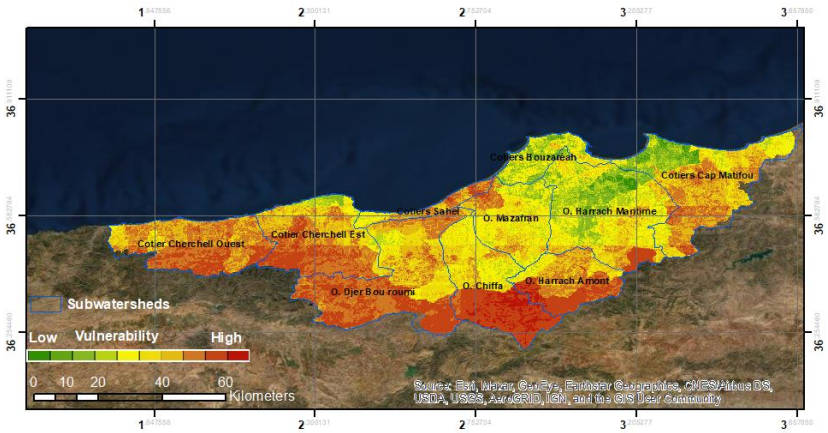
Annual vulnerability of the agricultural sector to climate change- Algerois watershed, Algeria

Due to low adaptative capacity, areas with high vulnerability will significantly increase, from **58%** in the near century to **94%** in the mid - century.

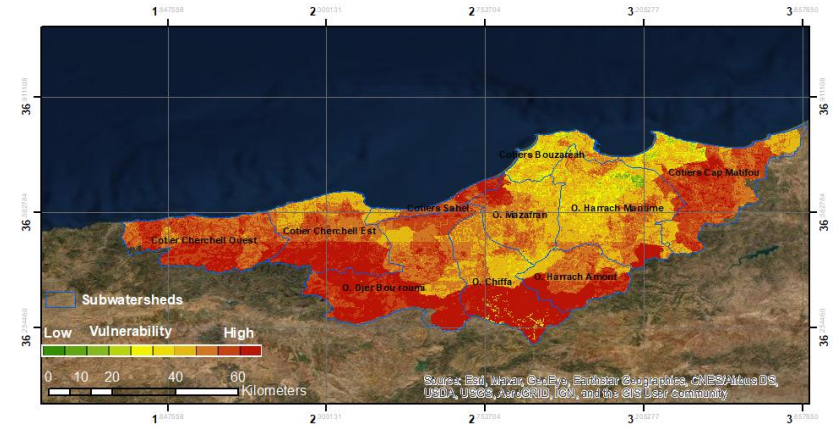
Vulnerability at the reference period
1986-2005



Vulnerability at near-term
2021-2040



Vulnerability at midterm
2041-2060



Change in precipitation

Précipitations (mm/month)	Average change in precipitation (mm/month)	
Reference period (1986 – 2005)	Near-century (2021 – 2040)	Mid-century (2041 – 2060)
54	-4.8	-8.5

Change in temperature

Temperature (°C)	Average temperature change(°C)	
Reference period (1986 – 2005)	Near-century (2021 – 2040)	Mid-century (2041 – 2060)
16.7	0.9	1.8

Climate Change impact on Agricultural Production - Wheat

Projections using the **CropSyst** model to assess climate change impacts on wheat in Algérois watershed - Algeria

Change in wheat yield

- With fixed atmospheric CO_2 concentration, wheat yield is projected to be reduced by **22% in the mid-term** period
- When the effect of elevated CO_2 is added, wheat yield is projected to decrease only by 9.5% during the same period

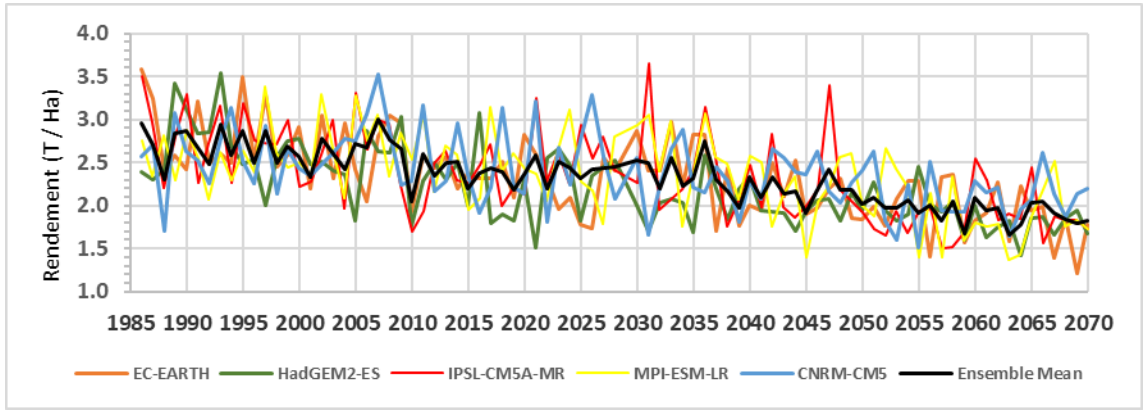
Change in wheat water requirement

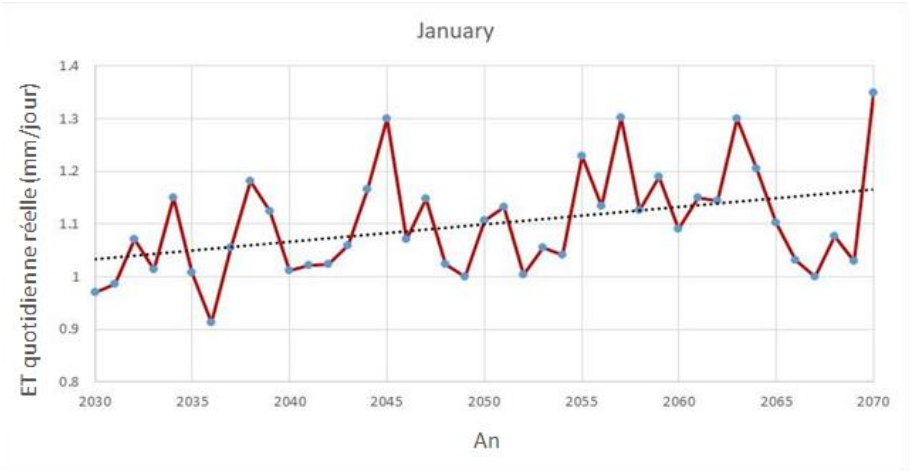
Daily actual evapotranspiration of wheat is projected to increase due to the increase in minimum and maximum temperature

However, the seasonal actual evapotranspiration (ETC) is projected to decrease

- This reduction in ETC could be attributed to the decrease in the length of the growth period.
- The **projected reduction in seasonal ETC for wheat is around 11% and 18%** for the periods (2021-2040) and (2041-2060) respectively

With fixed atmospheric CO_2 concentration





Climate Change impact on Agricultural Production - Citrus

Projections using **multiple regression analysis** to assess climate change impacts on Citrus in Algérois watershed - Algeria

Change in citrus yield

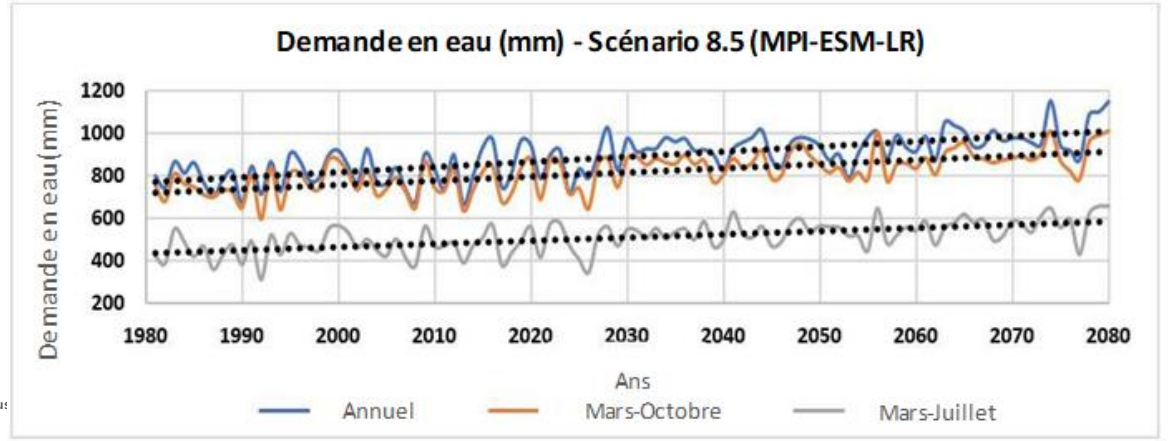
- The analysis based on five climate models **indicates a decline in yields after 2020**
- In the medium term (2041-2060), the **average decline is expected to be around 51%**
  - This drop will be caused by less rain and higher temperatures.
- To ensure a **satisfactory yield** in the short and medium term, **adequate irrigation water must be provided to compensate for rainfall deficits**.

Change in citrus water demand

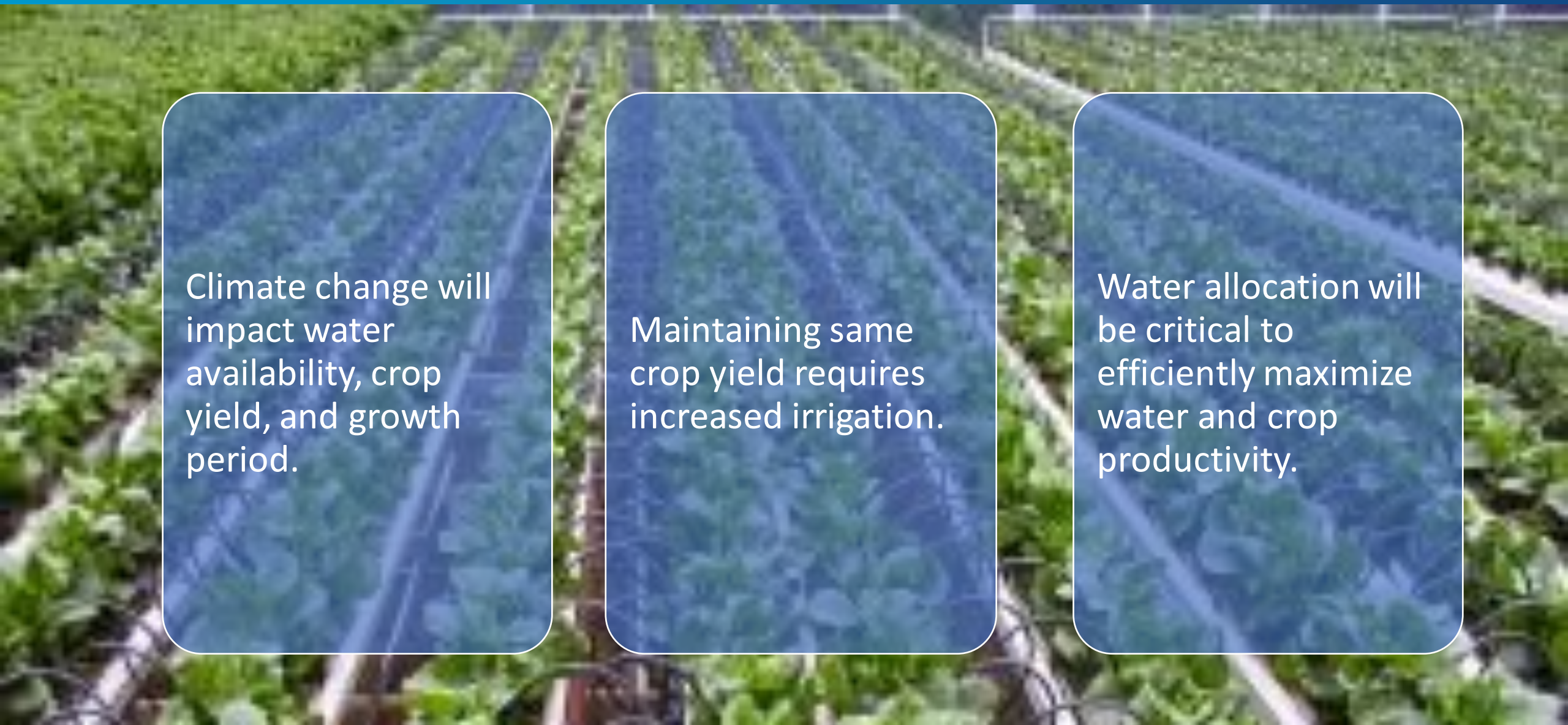
- Projections show that by 2060, average water demand will increase by 13%
  - **This is linked to a decrease in precipitation and higher temperatures, which will increase evapotranspiration.**

Yield trends for the five climate models - Scenario 8.5 in the short term (2021-2040) and in the medium term (2041-2060)

	Model	CNRM-CM5	CE-TERRE	HadGEM2-ES	MPI-ESM-LR	IPSL-CM5A-MR	Average
Yield (Qx /ha)	1983 - 2002	239,0	307,9	265,0	249,8	272,8	266,9
	2021 - 2040	209,6	219,4	208,1	238,8	261,0	227,4
	2041 - 2060	148,2	144,4	100,4	111,4	145,7	130,0
	2021 - 2060	178,9	181,9	154,3	175,1	203,4	178,7
Yield Change (Qx /ha) In %	2021 - 2040	-12,3	-28,7	-21,5	-4,4	-4,3	-14,8
	2041 - 2060	-38,0	-53,1	-62,1	-55,4	-46,6	-51,3
	2021 - 2060	-25,1	-40,9	-41,8	-29,9	-25,5	-33,0



Take Away Messages



Climate change will impact water availability, crop yield, and growth period.

Maintaining same crop yield requires increased irrigation.

Water allocation will be critical to efficiently maximize water and crop productivity.

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Thank You