

Economic and Social Commission for Western Asia

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

Workshop on Strengthening Legal and Institutional Arrangements for Transboundary Water Cooperation and Data and Information Exchange

Climate change adaptation in transboundary surface and groundwater basins



Shared Prosperity **Dignified Life**



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Climate Change and Natural Resource Sustainability Cluster

To assess the impact of climate change on freshwater resources in the Arab Region through a consultative and integrated regional initiative that seeks to identify the socio-economic and environmental vulnerability caused by climate change impacts on water resources based on regional specificities

RICCAR aims to provide a common platform for assessing, addressing and informing response to climate change impacts on freshwater resources in the Arab region by serving as the basis for dialogue, priority setting and policy formulation on climate change at the regional level

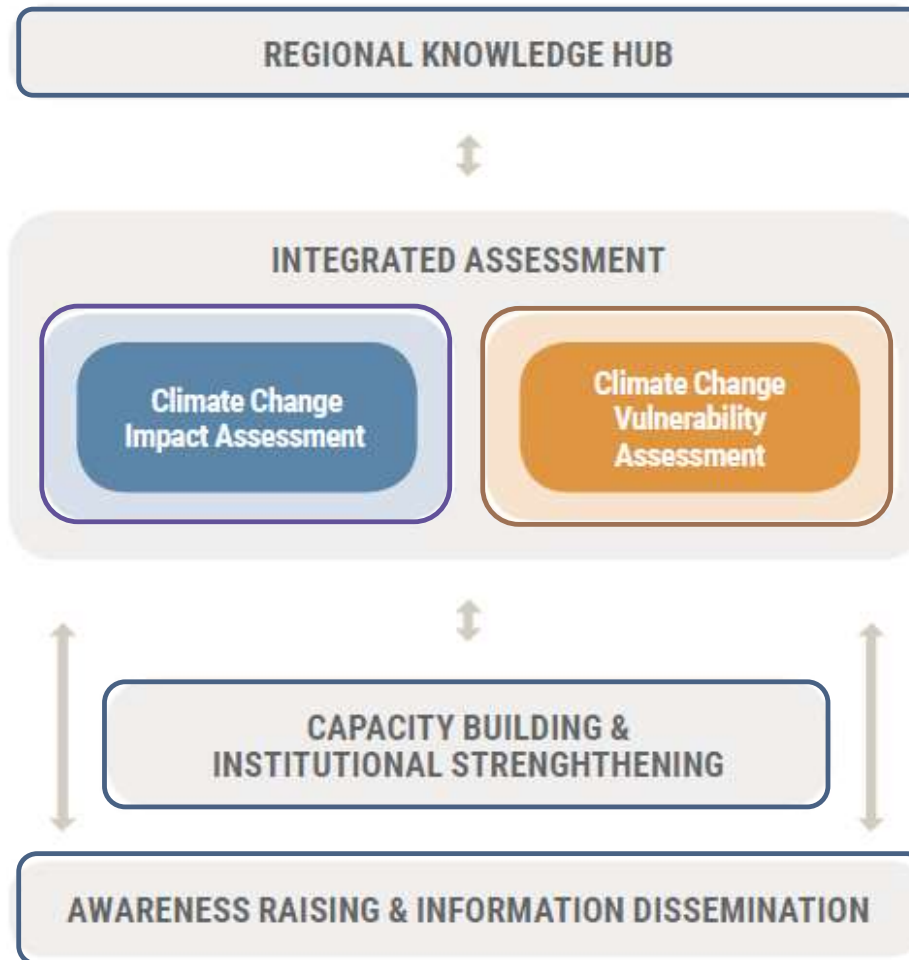
Assessment

Adaptation

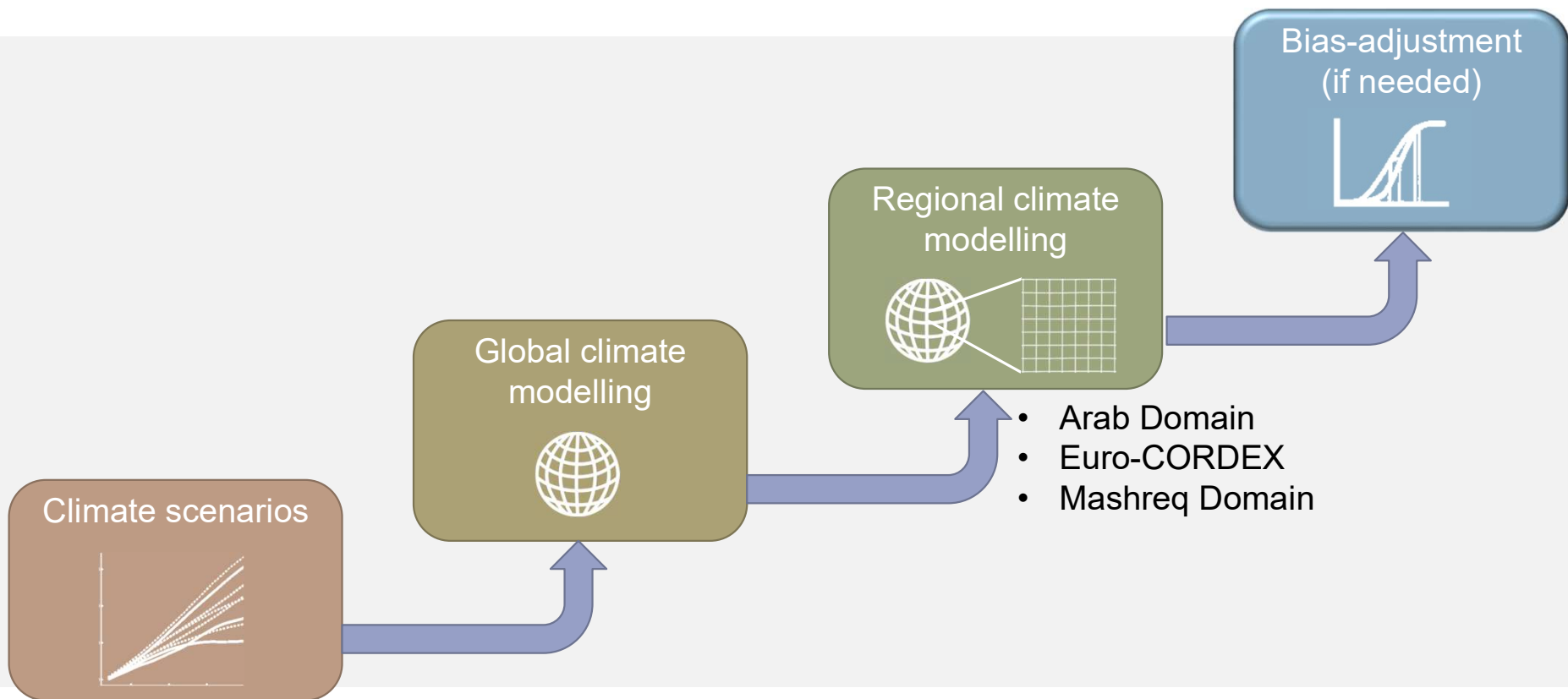
Mitigation

Negotiations

RICCAR Pillars of Work

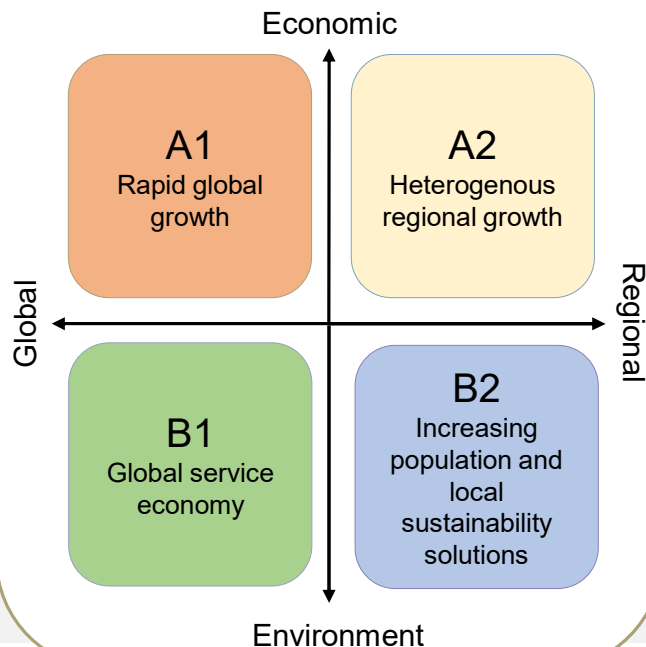


Climate Change Impact Assessment

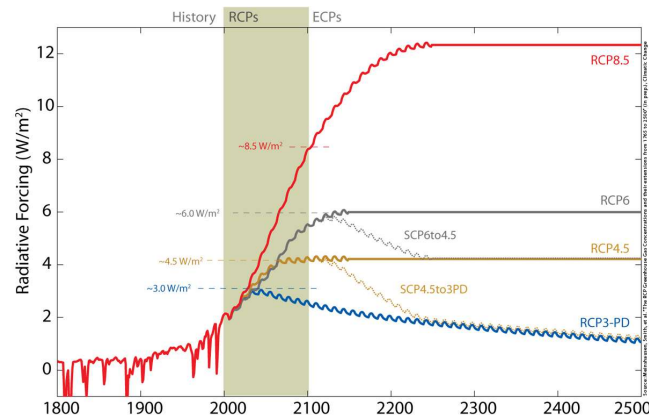


Evolution of IPCC Climate Scenarios

Special Report on Emissions Scenarios CMIP3 – IPCC TAR

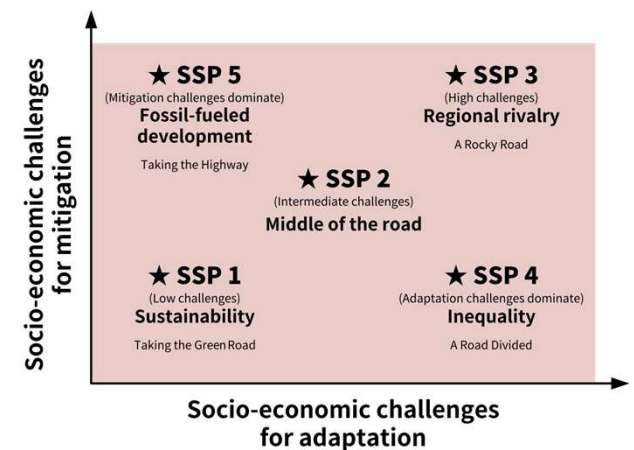


Representative Concentration Pathways (RCPs) CMIP5 – IPCC AR5



Potential GHG concentration trajectories based on radiative forcings in 2100

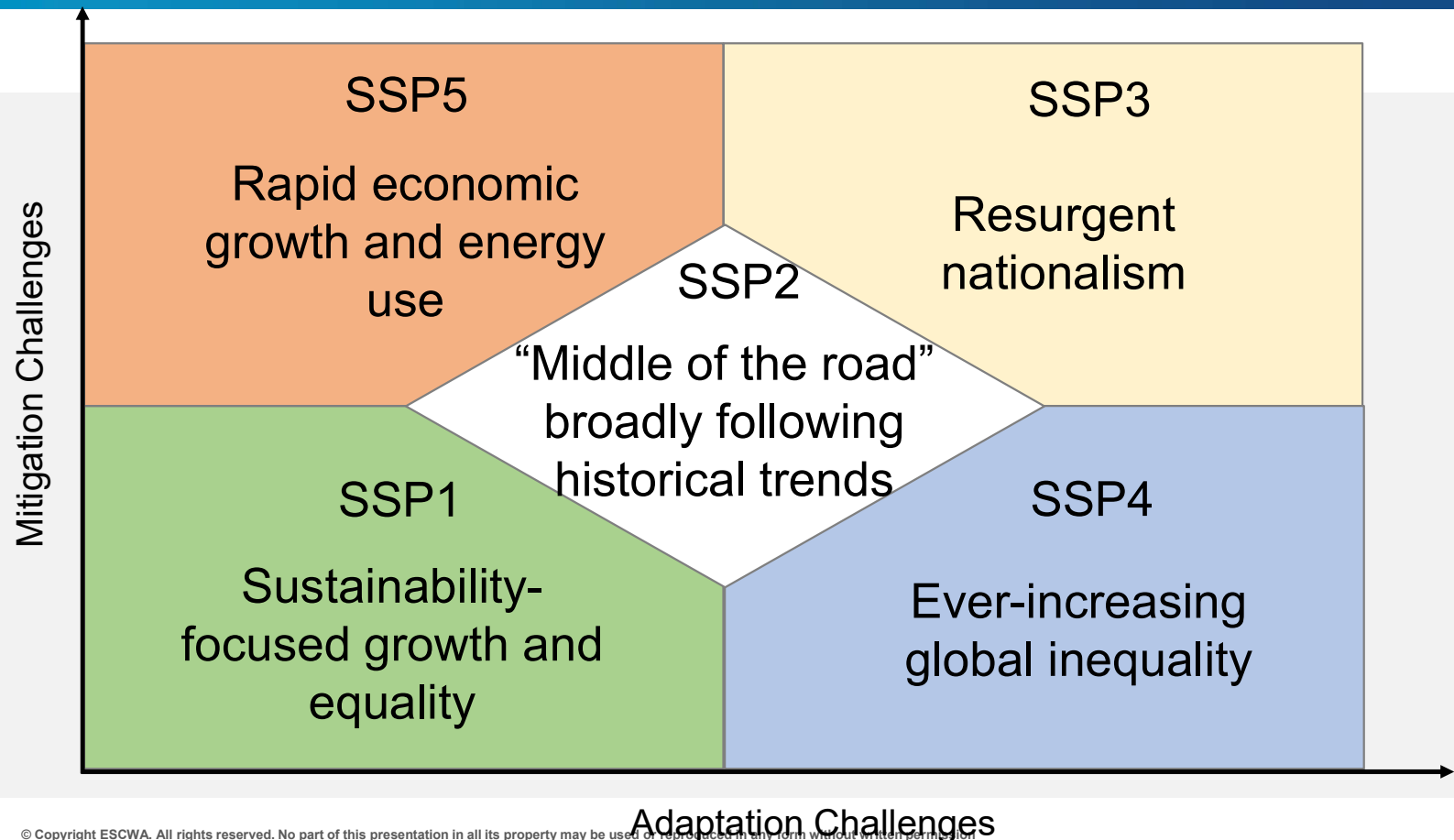
Shared Socioeconomic Pathways (SSPs) CMIP6 – AR6



SSPs are paired with RCPs to compare future climate outcomes with and without mitigation

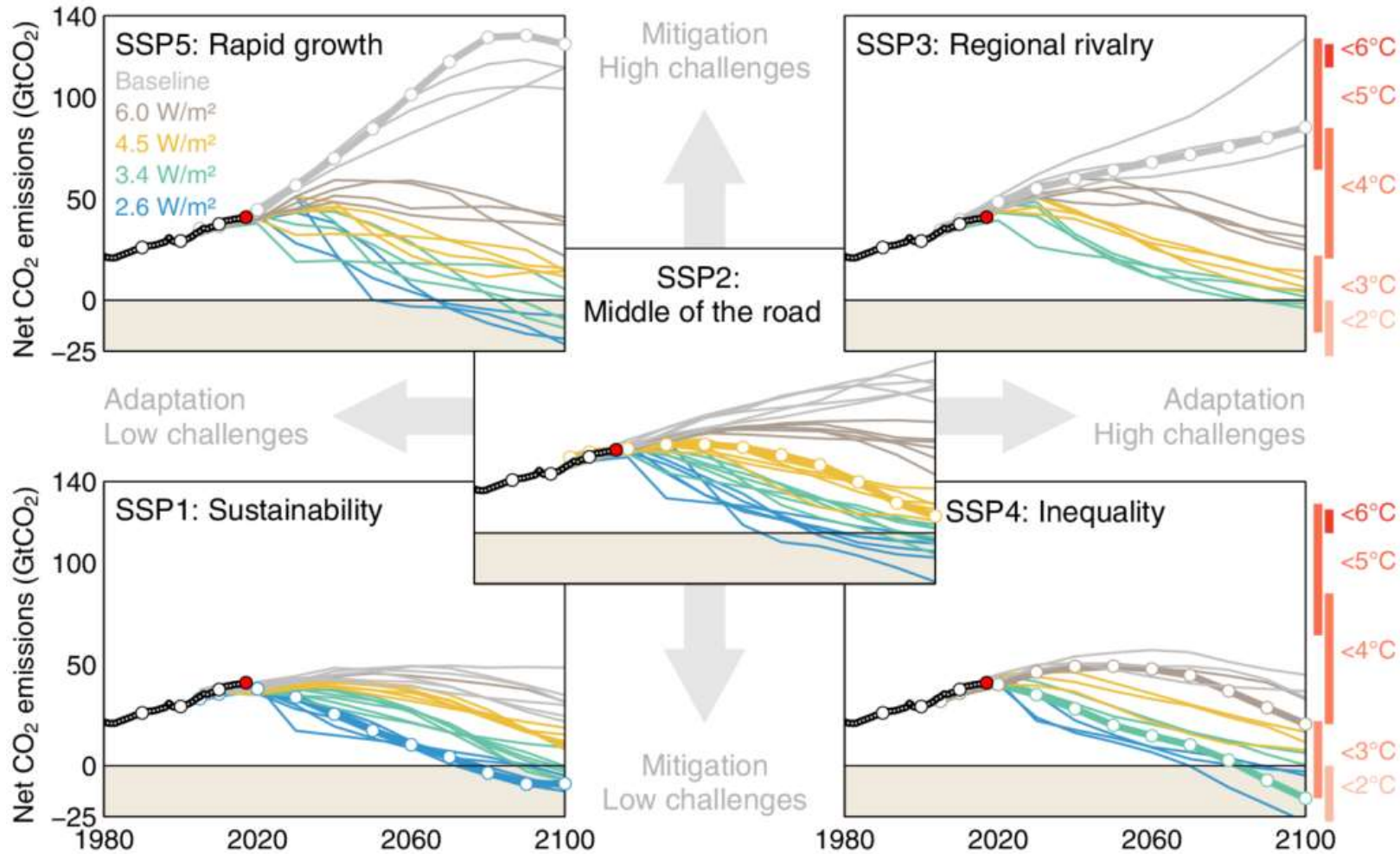
Shared Socioeconomic Pathways (SSPs)

5 narratives to generally describe **potential global** socio-economic futures

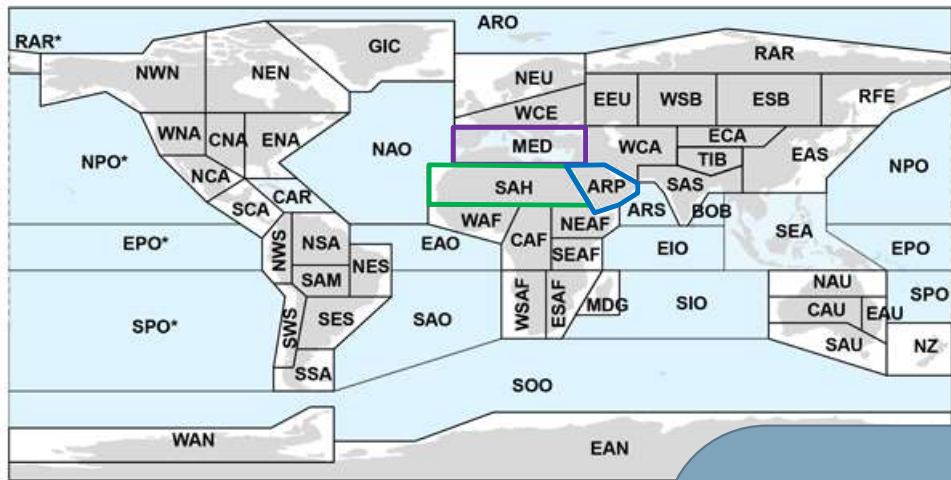


RCP trajectories by SSP

- Shift from RCP8.5 'business-as-usual' baseline scenario to a range of potential futures



IPCC AR6 Regional Findings



Mediterranean (MED):

- Projected decreases in mean precipitation, increases in fire weather conditions and decreases in mean wind speed;
- Observed and projected increases in aridity, meteorological, hydrological and agricultural and ecological droughts

Sahara (SAH):

- Projected increases in heavy precipitation and pluvial flooding

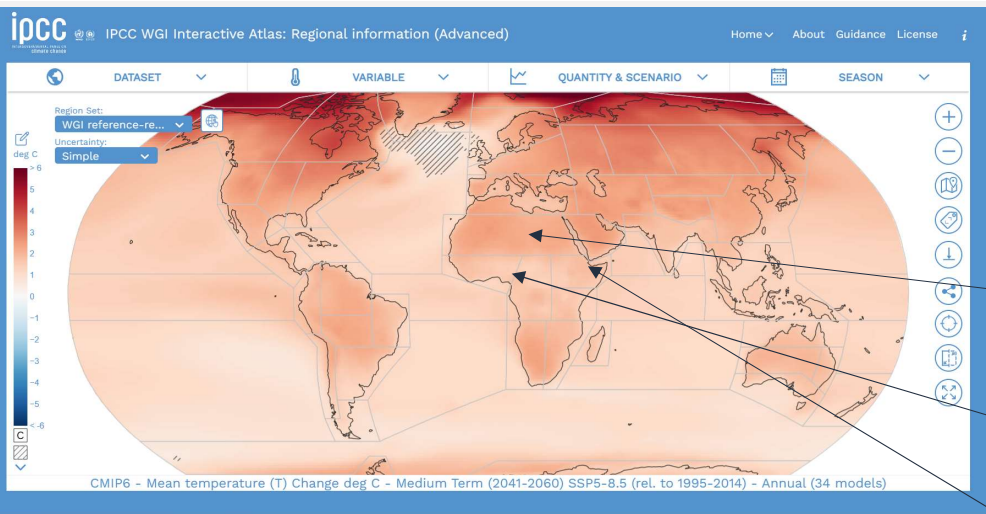
Arabian Peninsula (ARP):

- Anthropogenic warming has amplified droughts since the 1980s (high confidence);
- An increase in extreme precipitation has been observed, mostly in elevated areas;
- Reduction of the annual maximum amount of snow increases with elevation in mountain areas;
 - Annual precipitation totals and intensity and frequency of heavy precipitation are projected to increase with increasing warming levels;
- Strong spatiotemporal differences with overall decreasing precipitation are projected in summer

IPCC Interactive Atlas

Change in temperature
(compared to 1995-2014 reference period)

Based on ensemble of 34 GCMs

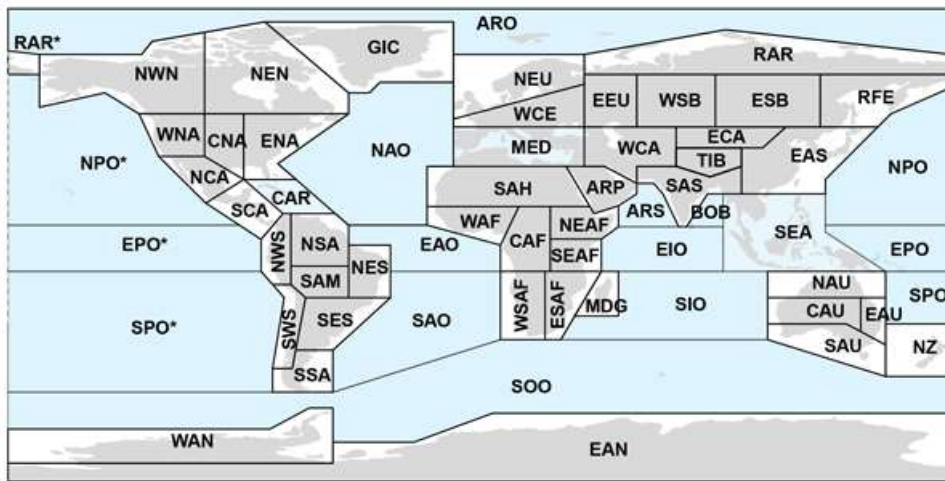


Region	Scenario	Near-term (2021-2040)	Mid-term (2041-2060)	End-term (2081-2100)
MED	SSP2-4.5	+0.9	+1.5	+2.4
	SSP5-8.5	+1.1	+2.0	+4.6
SAH	SSP2-4.5	+0.9	+1.6	+2.5
	SSP5-8.5	+1.1	+2.2	+5.1
ARP	SSP2-4.5	+0.9	+1.6	+2.6
	SSP5-8.5	+1.1	+2.2	+5.2
Global	SSP2-4.5	+0.7	+1.3	+2.1
	SSP5-8.5	+0.8	+1.7	+4.0

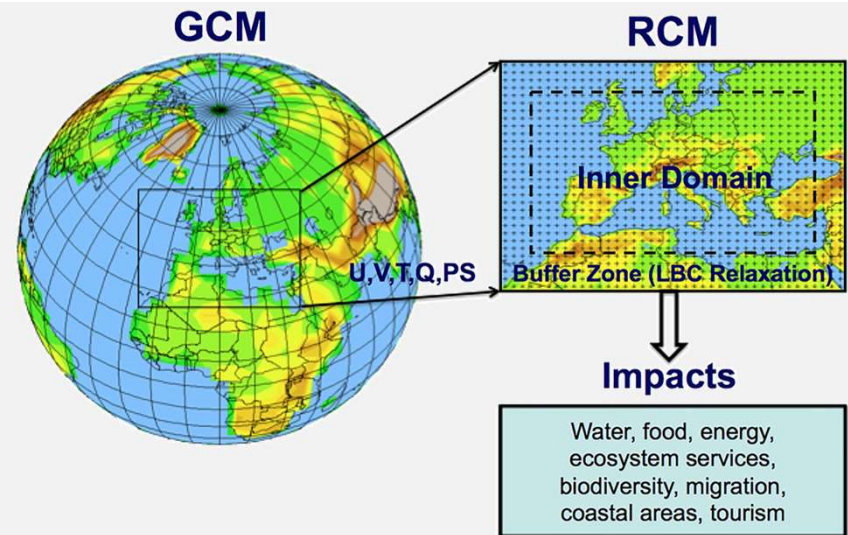
<https://interactive-atlas.ipcc.ch/>

The entire Arab region has projected temperature increases greater than the global mean

From GCMs to Regional Climate Models

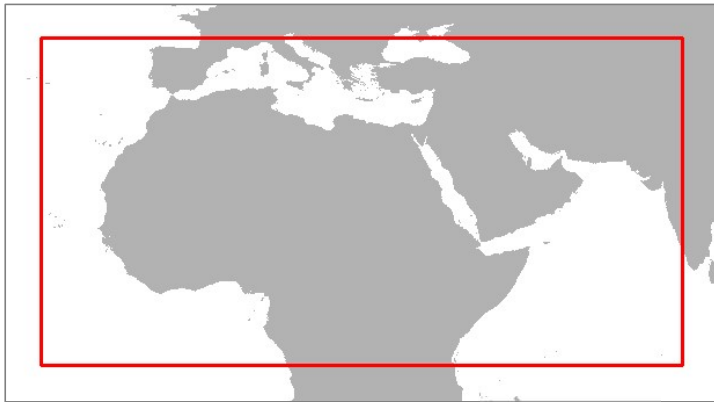


IPCC regional findings based on large scale Global Circulation Models (GCMs)

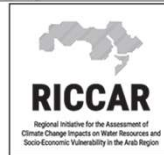


RCMs nested within GCMs to assess climate projections at a regional level

Selected RCM domains



**Arab Domain
(CORDEX MENA)**

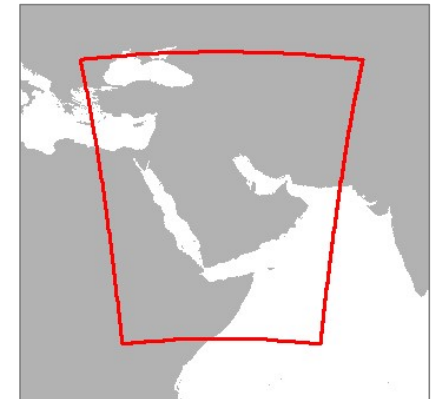


- CMIP5 Models
 - CNRM-CM5
 - EC-EARTH
 - GFDL-ESM2M
- SMHI-RCA4 RCM downscaling
- Bias-adjusted temperature and precipitation
- RCP4.5 and RCP8.5
- 50 km grid resolution



Europe CORDEX

- CMIP5 Models
 - CNRM-CM5
 - EC-EARTH
 - HadGEM2-ES
 - IPSL-CM5A-MR
 - MPI-ESM-LR
 - NorESM1-M
- SMHI-RCA4 RCM downscaling
- Bias-adjusted temperature and precipitation
- RCP4.5 and RCP8.5
- 12.5 km grid resolution



**Mashreq
Domain**



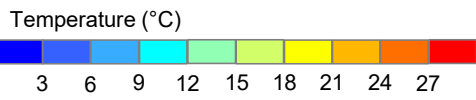
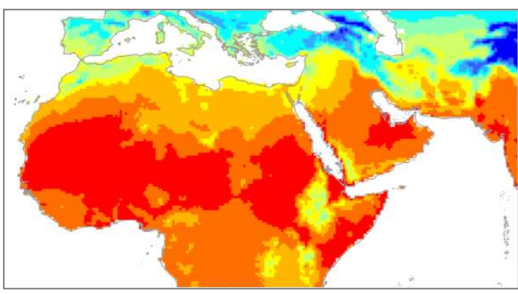
- CMIP6 Models
 - CMCC-CM2-SR5
 - CNRM-ESM2-1
 - EC-Earth3-Veg
 - MPI-ESM1-2-LR
 - MRI-ESM2-0
 - NorESM2-MM
- SMHI HCLIM-ALADIN-38 RCM downscaling
- Bias-adjusted temperature and precipitation
- SSP5-8.5 (SSP2-4.5 in late 2023)
- 10 km grid resolution

Arab Domain

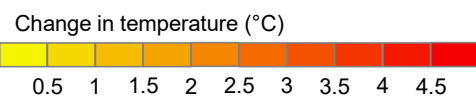
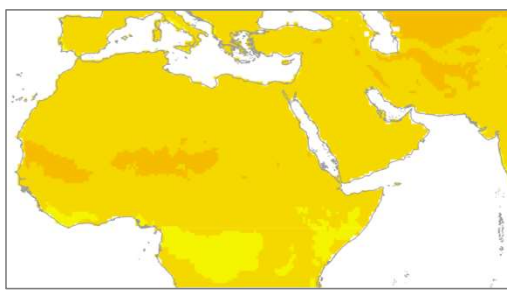
Change in Annual Temperature

RCP4.5

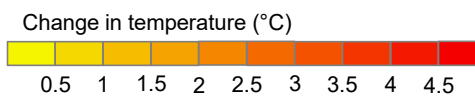
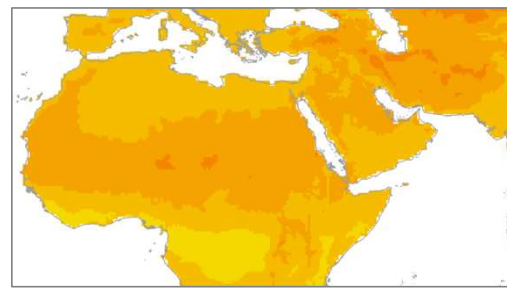
1986 – 2005



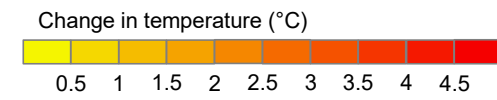
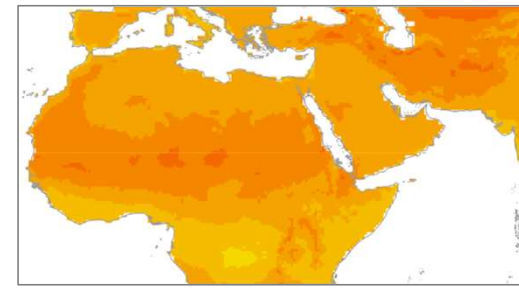
2016 – 2035



2046 – 2065

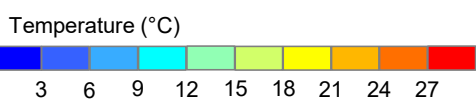
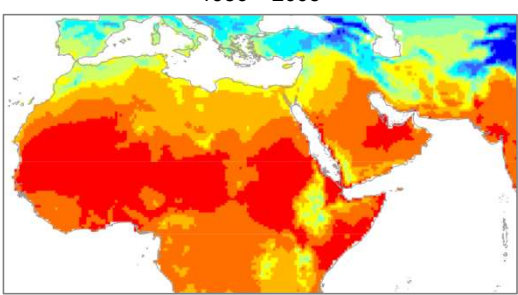


2081 – 2100

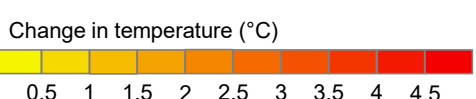
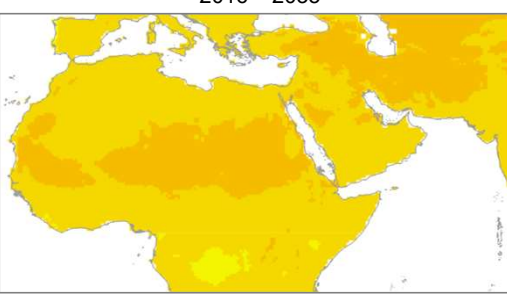


RCP8.5

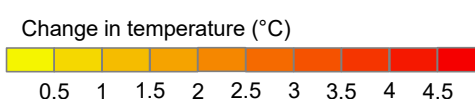
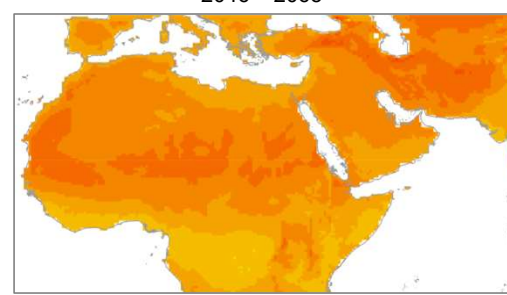
1986 – 2005



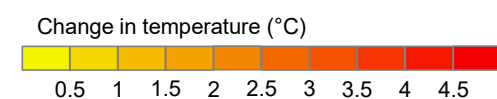
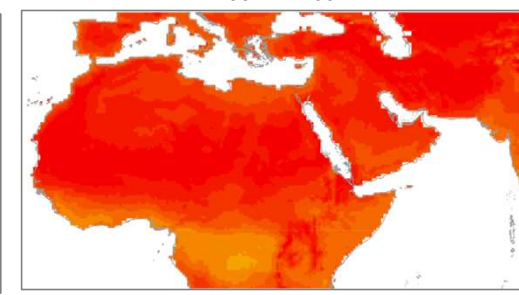
2016 – 2035



2046 – 2065

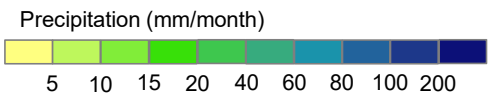
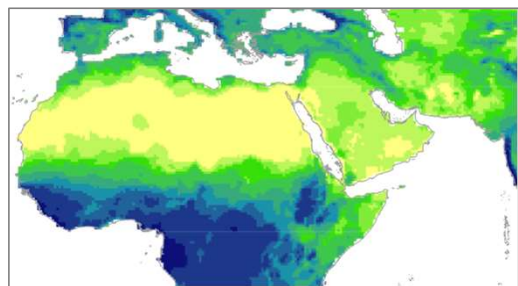


2081 – 2100

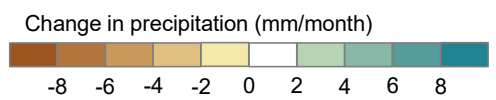
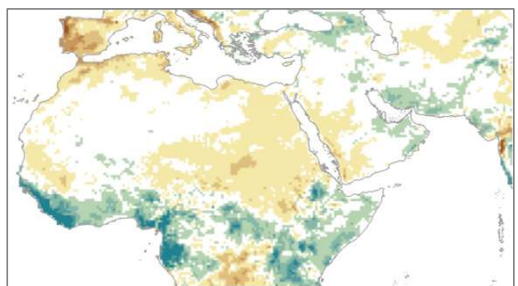


RCP4.5

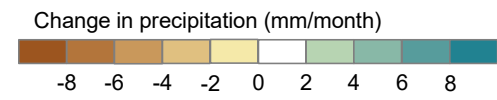
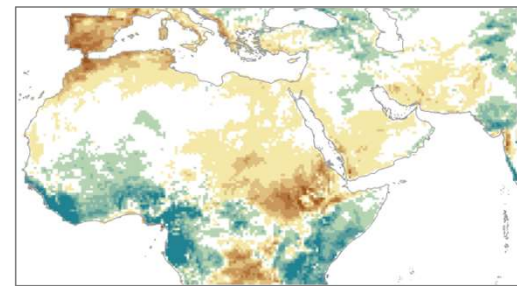
1986 – 2005



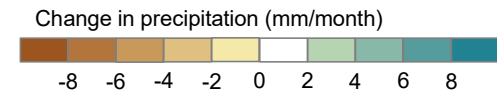
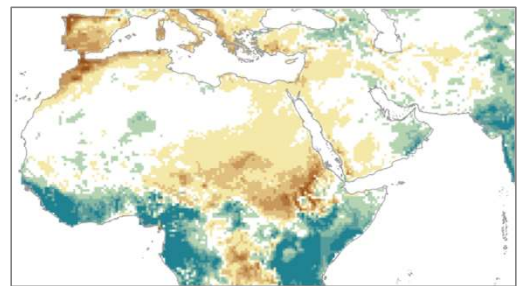
2016 – 2035



2046 – 2065

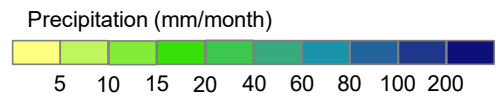
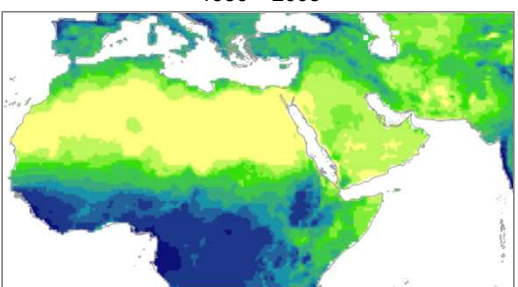


2081 – 2100

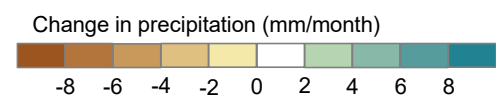
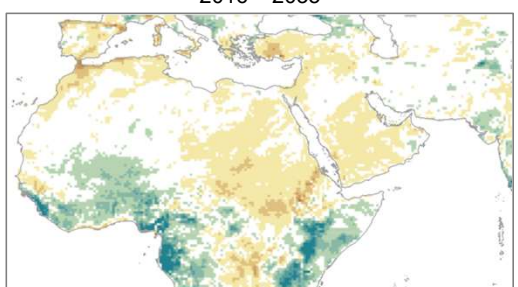


RCP8.5

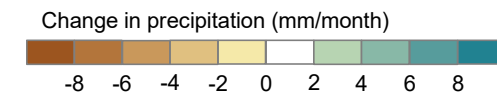
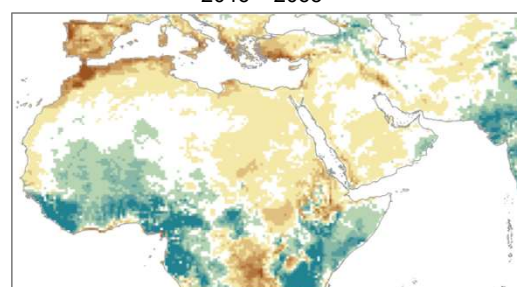
1986 – 2005



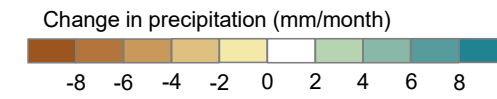
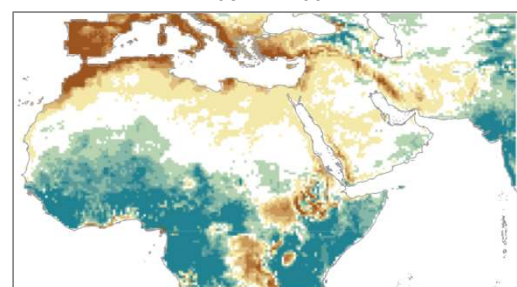
2016 – 2035



2046 – 2065

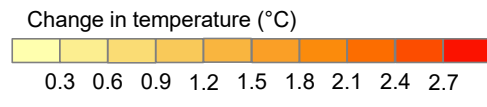
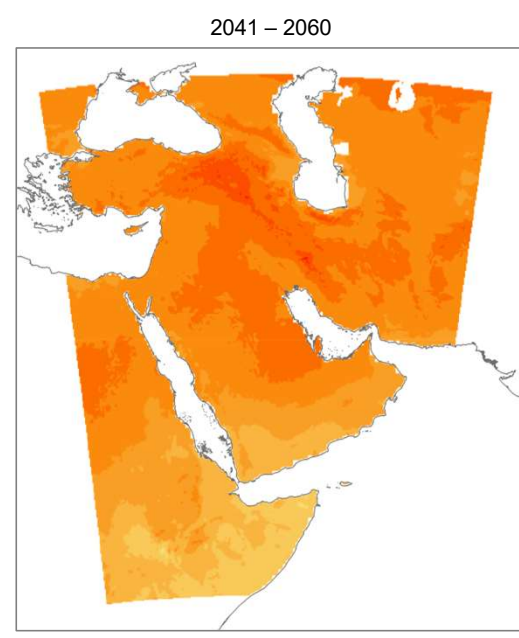
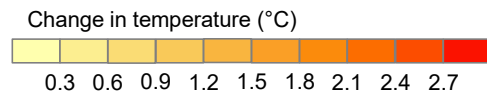
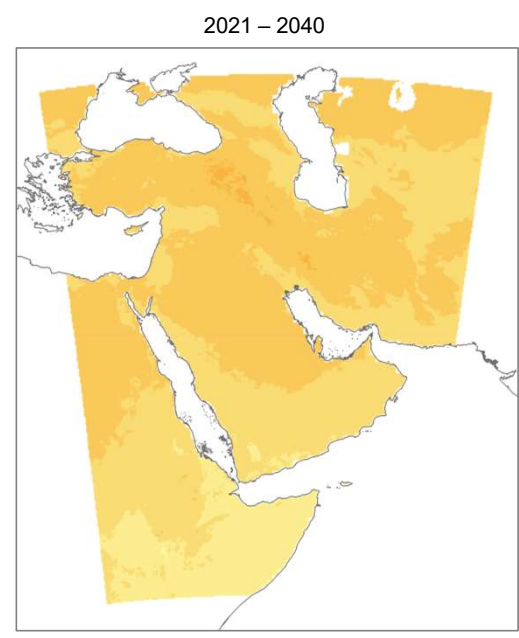
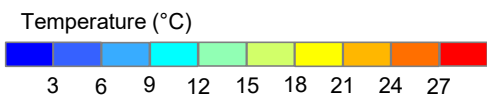
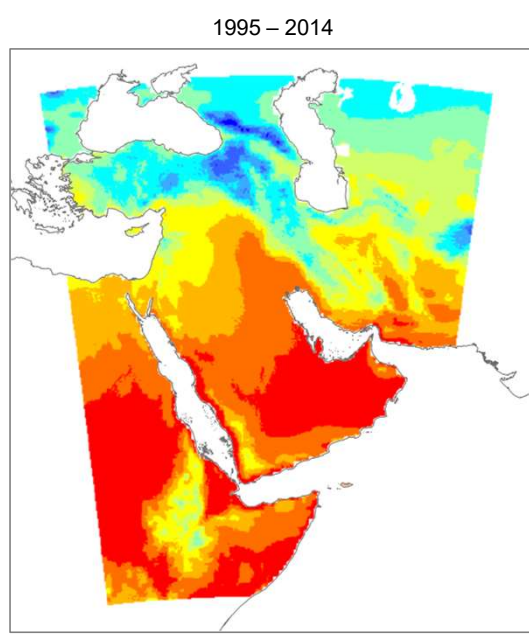


2081 – 2100



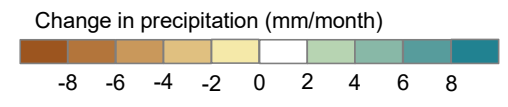
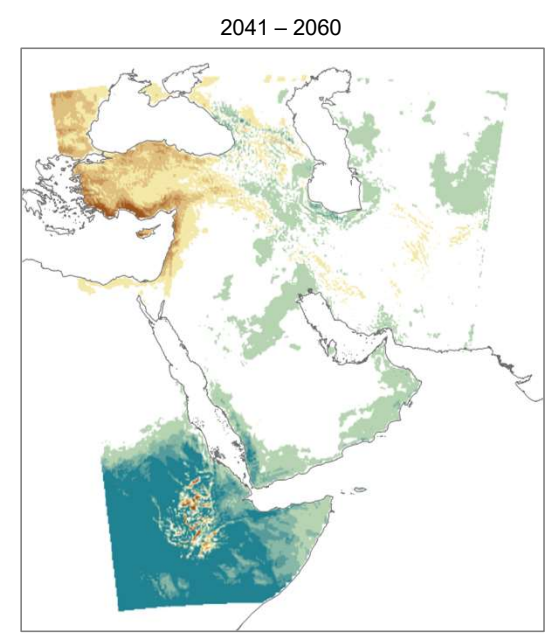
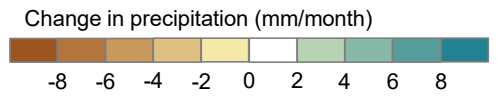
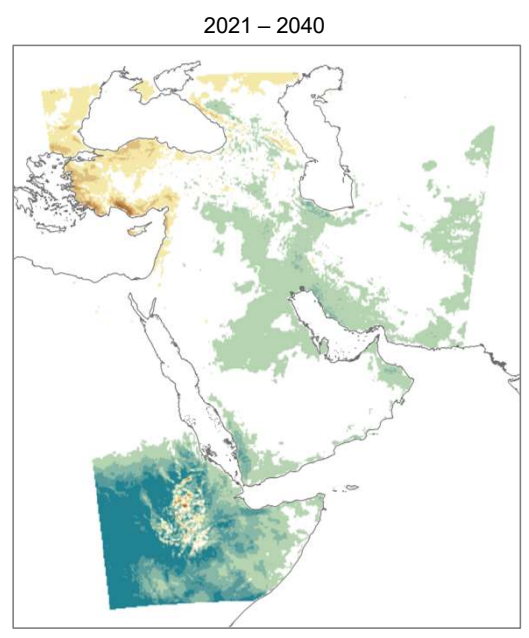
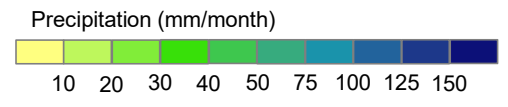
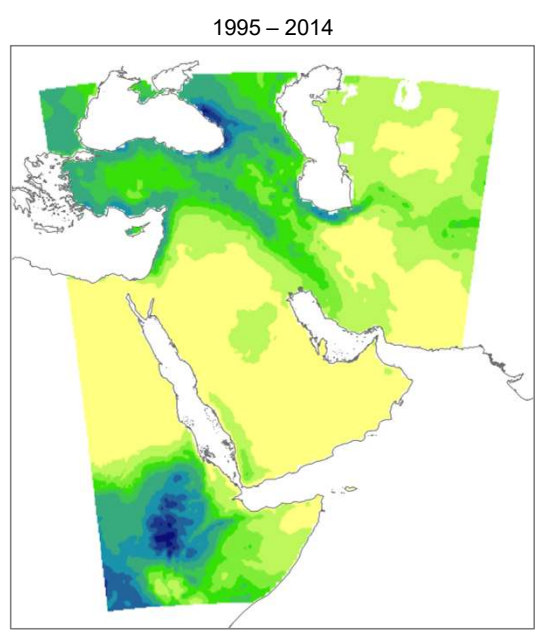
Mashreq Domain Change in Annual Temperature

SSP5-8.5



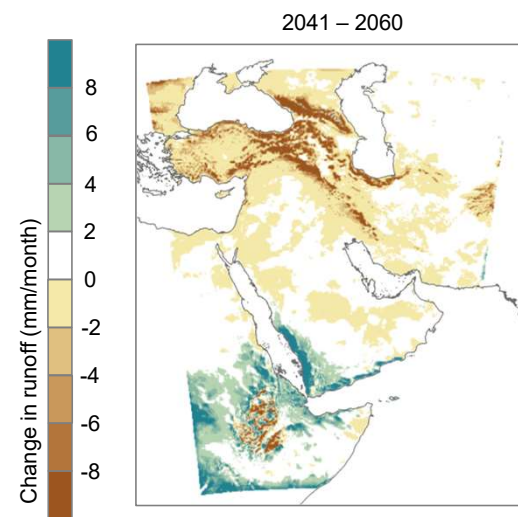
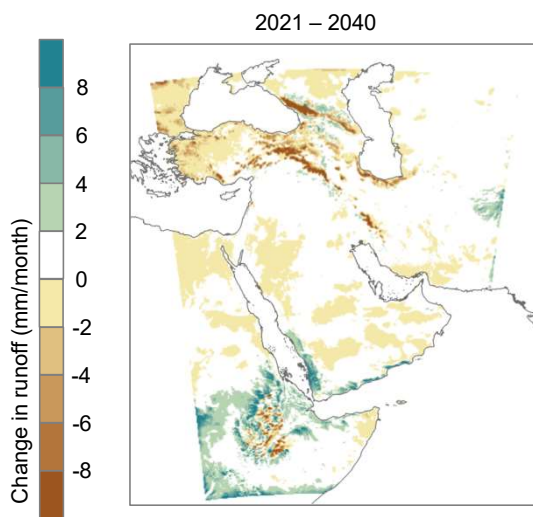
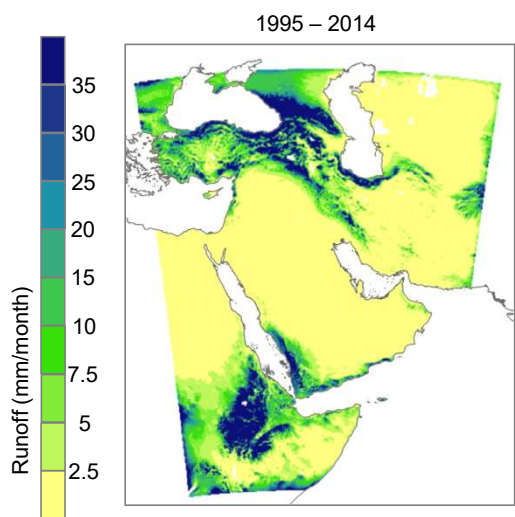
Mashreq Domain Change in Annual Precipitation

SSP5-8.5

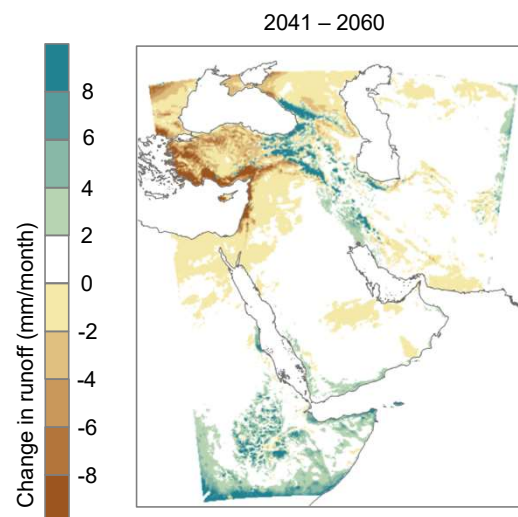
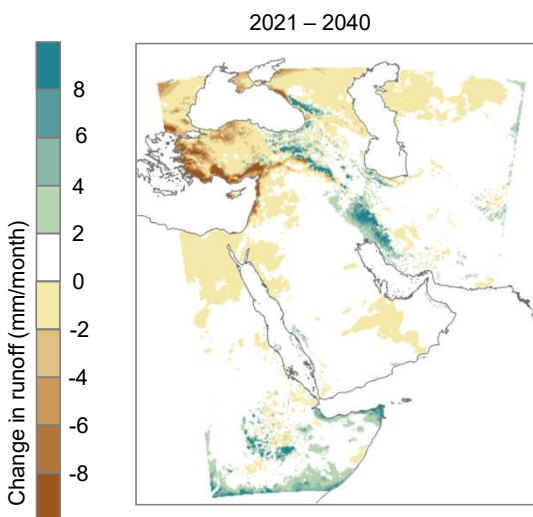
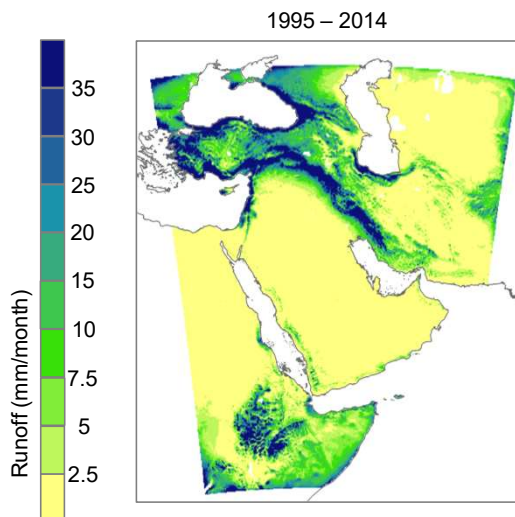


Mashreq Domain: Change in seasonal runoff (SSP5-8.5)

Apr-Sep

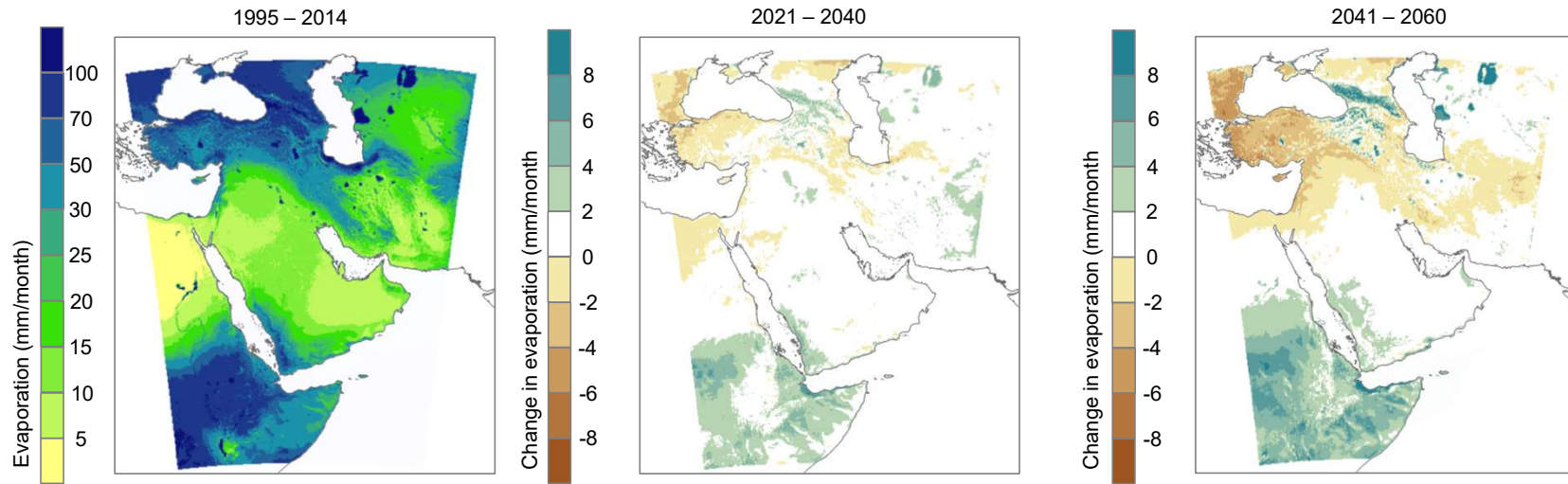


Oct-Mar

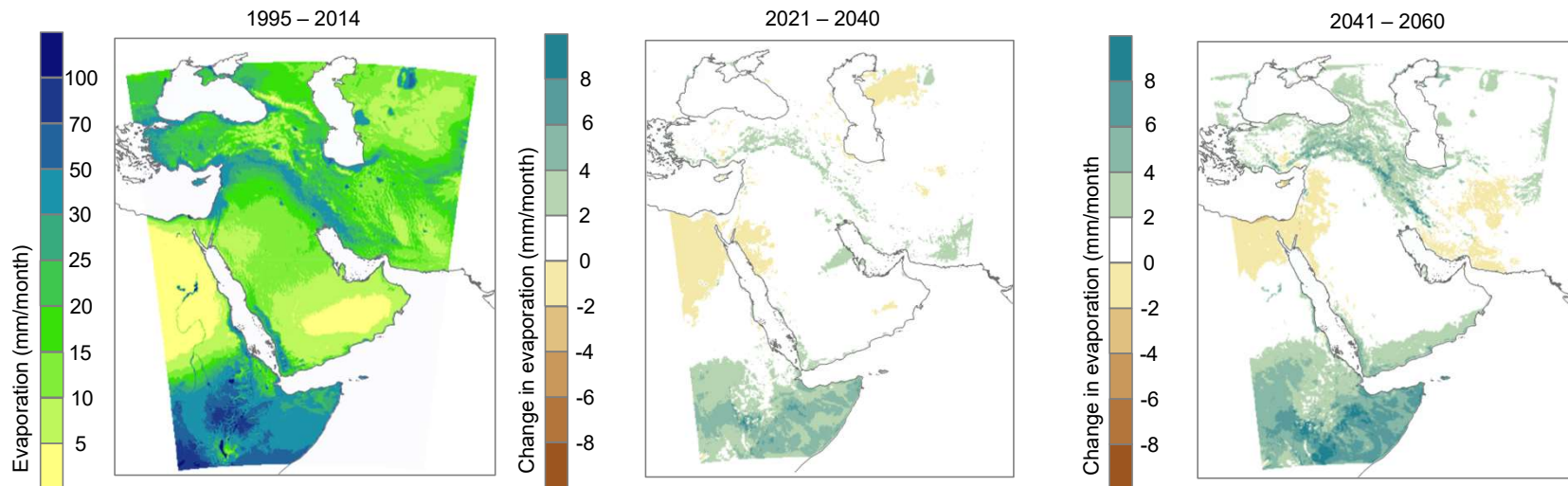


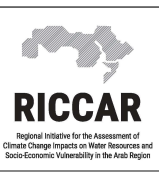
Mashreq Domain: Change in seasonal evaporation (SSP5-8.5)

Apr-Sep



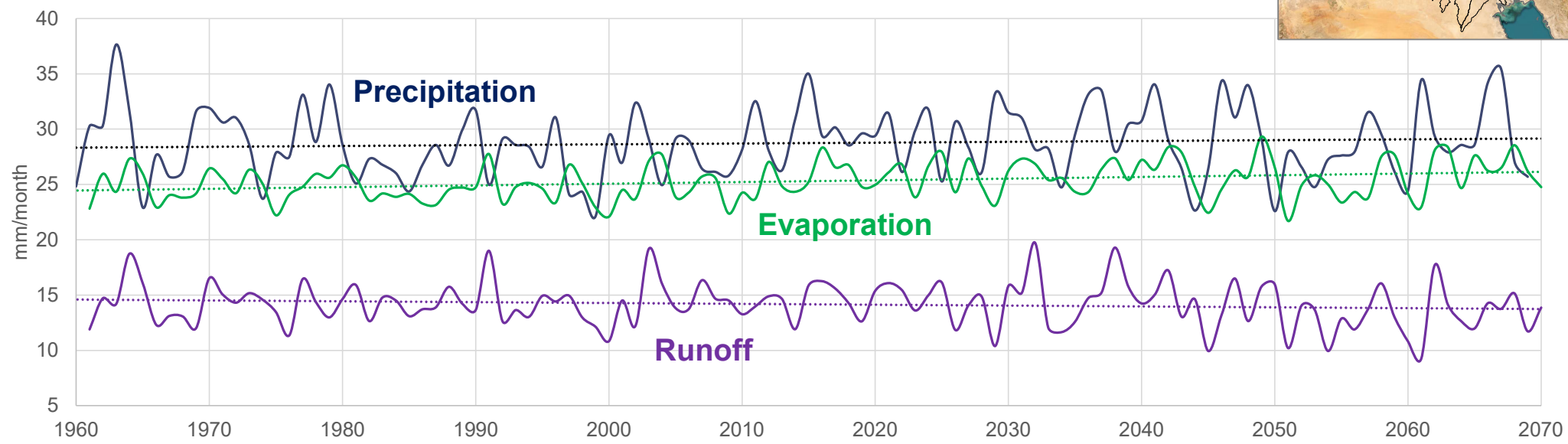
Oct-Mar





Tigris-Euphrates River Basin

Mashreq Domain – SSP5-8.5



Although annual precipitation generally increasing very slightly:

- Precipitation wide interannual variability will continue
- Evaporation projected to increase at slightly greater rate due to increasing temperatures
- Runoff projected to decrease due to less water resources stored as snow

Recent case studies using Mashreq Domain climate datasets



Impact of Climate Change on Groundwater Resources in the Eocene Aquifer System



TECHNICAL REPORT



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



Impact of climate change on shared water resources in the Euphrates basin



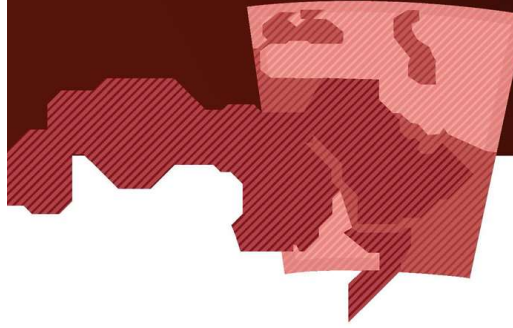
TECHNICAL REPORT



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



Impact of climate change on shared water resources in the Nahr el Kabir el Janoubi basin



TECHNICAL REPORT



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



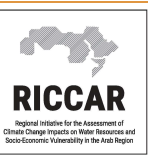
Impact of climate change on groundwater resources in the Dibdibba aquifer system, Iraq



TECHNICAL REPORT



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



RICCAR Regional Knowledge Hub

www.riccar.org



About **Data Portals** Knowledge Resources Meetings & Events Knowledge Nodes Partners



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

KNOWLEDGE RESOURCES

The central aim of this Regional Knowledge Hub is to provide access to information that can facilitate cooperation, coordination, dialogue and exchange among Arab States, organizations

DATA PORTAL

The data portal allows interactive visualization of RICCAR maps and provides access to RICCAR data repository.

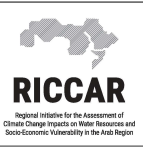


KNOWLEDGE NODES

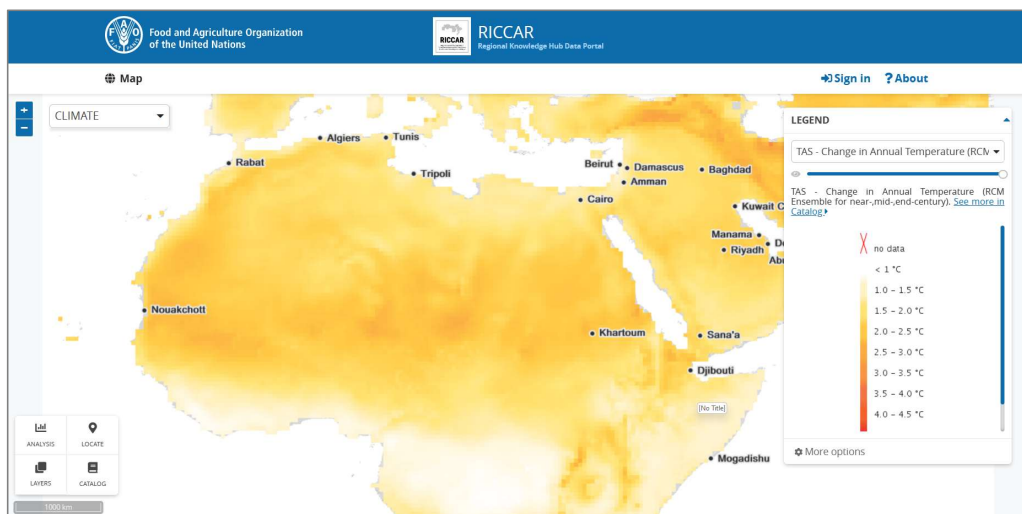
Innovation of National, Regional and International Nodes for the Transfer and Sharing of Knowledge

PARTNERSHIPS

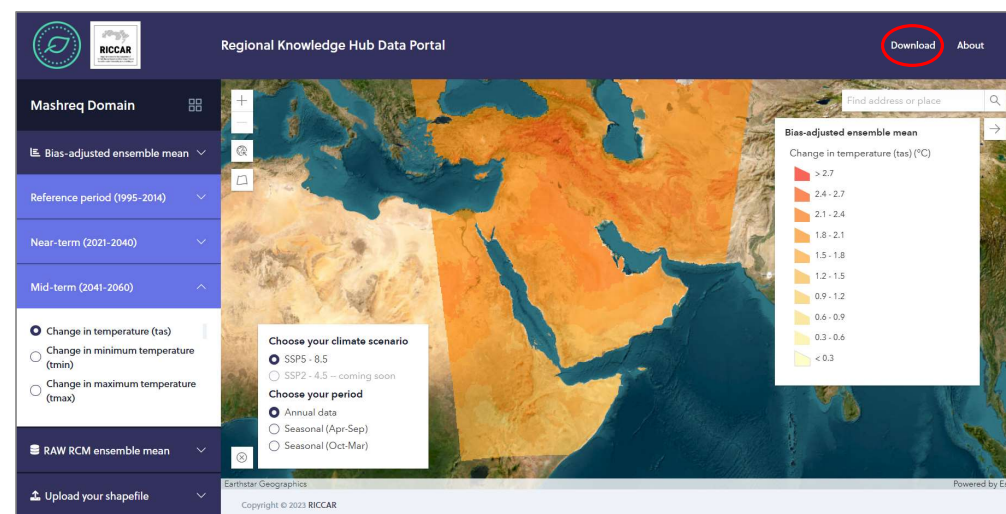
Strategic partnerships for supporting strategic objectives to implement climate change adaptation and mitigation programs at the national and regional levels



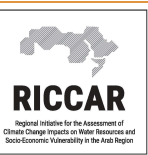
RICCAR Regional Knowledge Hub Data Portals



Arab Domain



Mashreq Domain



RICCAR Regional Knowledge Hub

Download climate datasets (netCDF format)



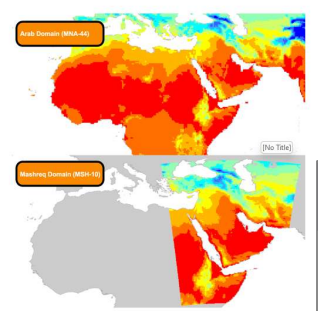
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Download Arab Domain (MNA-44) and Mashreq Domain (MSH-10) datasets


The RICCAR Regional Knowledge Hub is an open source database.

Data citation:

- **Arab Domain:** "RICCAR. 2017. Arab Climate Change Assessment Report. Beirut,E /ESCWA/SDPD/2017/RICCAR/Report"
- **Mashreq Domain:** "Swedish Meteorological and Hydrological Institute (SMHI) and United Nations Economic and Social Commission for Western Asia (ESCWA), 2021. Future Climate Projections for the Mashreq Region: Summary Outcomes. RICCAR Technical Report, Beirut. E/ESCWA/CL1.CCS/2021/RICCAR/TECHNICAL REPORT.7."



EXPERIMENT TYPE	Link
<ul style="list-style-type: none"> • EC-Earth3-Veg (110) • MPI-ESM1-2-LR (110) • MRI-ESM2-0 (110) • NorESM2-MM (110) 	tas_MSH-10_CMCC-CM2-SR5_historical_r1i1p1f1_SMHI-HCLIM-ALADIN-38_v1_month_regrid_19610101-19611231.nc Download
Experiment <ul style="list-style-type: none"> • Historical (324) • SSP5-8.5 (336) 	tas_MSH-10_CMCC-CM2-SR5_historical_r1i1p1f1_SMHI-HCLIM-ALADIN-38_v1_month_regrid_19630101-19631231.nc Download
RCM <ul style="list-style-type: none"> • HCLIM-ALADIN-38 (660) 	tas_MSH-10_CMCC-CM2-SR5_historical_r1i1p1f1_SMHI-HCLIM-ALADIN-38_v1_month_regrid_19640101-19641231.nc Download
Variable (Short Name) <ul style="list-style-type: none"> • evspsbl (5719) • hurs (5940) • prAdjust (6971) • rlds (3849) • steWind (5977) • sund (762) • (-) tas (660) • tasAdjust (6390) • tasmx (2970) • tasmxAdjust (5940) • tcminAdjust (5940) 	tas_MSH-10_CMCC-CM2-SR5_historical_r1i1p1f1_SMHI-HCLIM-ALADIN-38_v1_month_regrid_19650101-19651231.nc Download
	tas_MSH-10_CMCC-CM2-SR5_historical_r1i1p1f1_SMHI-HCLIM-ALADIN-38_v1_month_regrid_19660101-19661231.nc Download
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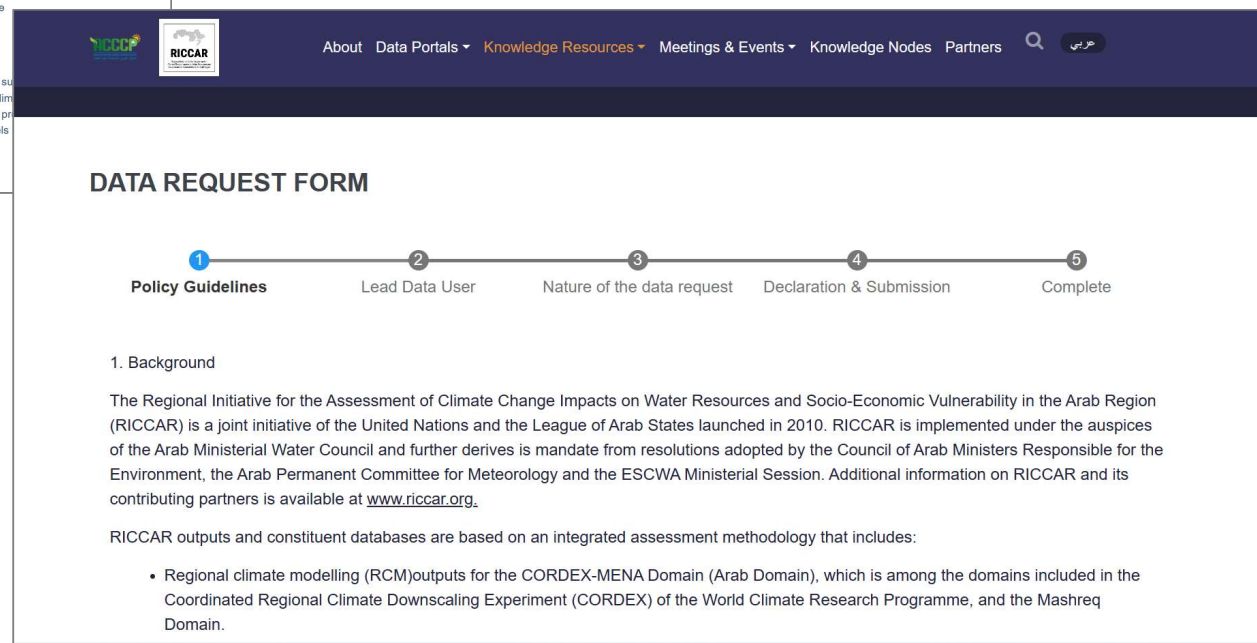
Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region

KNOWLEDGE RESOURCES
The central aim of this Regional Knowledge Hub is to provide access to information that can facilitate cooperation, coordination, dialogue and exchange among Arab States, organizations

KNOWLEDGE NODES
Innovation of National, Regional and International Nodes for the Transfer and Sharing of Knowledge

DATA PORTAL
The data portal allows interactive visualization of RICCAR maps and provides access to RICCAR data repository.

PARTNERSHIPS
Strategic partnerships for su... objectives to implement clim... adaptation and mitigation pr... national and regional levels



DATA REQUEST FORM

- 1 Policy Guidelines
- 2 Lead Data User
- 3 Nature of the data request
- 4 Declaration & Submission
- 5 Complete

1. Background

The Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) is a joint initiative of the United Nations and the League of Arab States launched in 2010. RICCAR is implemented under the auspices of the Arab Ministerial Water Council and further derives its mandate from resolutions adopted by the Council of Arab Ministers Responsible for the Environment, the Arab Permanent Committee for Meteorology and the ESCWA Ministerial Session. Additional information on RICCAR and its contributing partners is available at www.riccar.org.

RICCAR outputs and constituent databases are based on an integrated assessment methodology that includes:

- Regional climate modelling (RCM) outputs for the CORDEX-MENA Domain (Arab Domain), which is among the domains included in the Coordinated Regional Climate Downscaling Experiment (CORDEX) of the World Climate Research Programme, and the Mashreq Domain.



Shared Prosperity Dignified Life



Thank you!

www.riccar.org
www.unescwa.org/acccp

tomaszkiewicz@un.org

