RICCAR

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

# ARAB CLIMATE CHANGE ASSESSMENT REPORT

## TECHNICAL ANNEX

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

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# ARAB CLIMATE CHANGE ASSESSMENT REPORT

## TECHNICAL ANNEX

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

**RICCAR PARTNERS**

UNITED NATIONS ESCWA

UN environment

FAO FIAT PANIS

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

SMHI

WORLD METEOROLOGICAL ORGANIZATION

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNISDR The United Nations Office for Disaster Risk Reduction

UNESCO United Nations Educational, Scientific and Cultural Organization Cairo Office مكتب القاهرة

UNITED NATIONS UNIVERSITY UNU-INWEH Institute for Water, Environment and Health

**DONORS**

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E/ESCWA/SDPD/2017/RICCAR/Report/Annex

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Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
League of Arab States
Swedish Meteorological and Hydrological Institute (SMHI)
United Nations Environment Programme (UN Environment)
United Nations Educational, Scientific and Cultural Organization (UNESCO) Office in Cairo
United Nations Office for Disaster Risk Reduction (UNISDR)
United Nations University Institute for Water, Environment and Health (UNU-INWEH)
World Meteorological Organization (WMO)



Layout: Ghazal Lababidi
Marilynn Dagher

# PREFACE

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 through a collaborative partnership involving 11 regional and specialized organizations, namely United Nations Economic and Social Commission for Western Asia (ESCWA), the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), Food and Agriculture Organization of the United Nations (FAO), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the League of Arab States, Swedish Meteorological and Hydrological Institute (SMHI), United Nations Environment Programme (UN Environment), United Nations Educational, Scientific and Cultural Organization (UNESCO) Office in Cairo, United Nations Office for Disaster Risk Reduction (UNISDR), United Nations University Institute for Water, Environment and Health (UNU-INWEH), and World Meteorological Organization (WMO). ESCWA coordinates the regional initiative. Funding for RICCAR is provided by the Government of Sweden and the Government of the Federal Republic of Germany.

RICCAR is implemented under the auspices of the Arab Ministerial Water Council and derives its mandate from resolutions adopted by this council as well as the Council of Arab Ministers Responsible for the Environment, the Arab Permanent Committee for Meteorology and the 25th ESCWA Ministerial Session.

Funding for the preparation of this technical annex was provided by the Swedish Government through the Swedish International Development Cooperation Agency.

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## PART II
## INTEGRATED VULNERABILITY ASSESSMENT

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **abs.diff** | absolute difference |
| **Apr-Sept** | April–September |
| **CDD** | maximum length of dry spell |
| **CNRM-CM5** | Centre National de Recherches Météorologiques-Climate Model 5 |
| **CWD** | maximum length of wet spell |
| **EC-EARTH** | ECMWF-based Earth-system model |
| **ESCWA** | United Nations Economic and Social Commission for Western Asia |
| **GCM** | Global Climate Model or General Circulation Model |
| **GDP** | gross domestic product |
| **GFDL-ESM2M** | Geophysical Fluid Dynamics Laboratory- Earth System Model 2 |
| **HYPE** | Hydrological Predictions for the Environment (hydrological model) |
| **km** | kilometres |
| **mm** | millimetres |
| **MNA22** | 25 km resolution (MENA domain 0.22 degrees) |
| **MNA44** | 50 km resolution (MENA domain 0.44 degrees) |
| **no.** | number |
| **Oct-Mar** | October–March |
| **ODA** | official development assistance |
| **RCM** | Regional Climate Model |
| **RCP** | representative concentration pathway |
| **RHM** | Regional Hydrological Model |
| **RICCAR** | Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region |
| **R10** | Annual count of 10 mm precipitation days |
| **R20** | Annual count of 20 mm precipitation days |
| **SU** | number of summer days |
| **SU35** | number of hot days |
| **SU40** | number of very hot days |
| **TR** | tropical nights |
| **VA** | vulnerability assessment |
| **VIC** | Variable Infiltration Capacity (hydrological model) |
| **ºC** | degree Celsius |
| **%** | per cent |
| **&** | and |

# PART I

# IMPACT ASSESSMENT

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## CHAPTER 5
NILE RIVER:
BLUE NILE HEADWATERS

## CHAPTER 6

TIGRIS RIVER:
UPPER TIGRIS

## CHAPTER 8
MEDJERDA RIVER

## CHAPTER 9
JORDAN RIVER

# **Impact Assessment**
# Explanatory Note

This note aims to provide clarifications on the figures pertaining to the impact assessment outputs presented in the following sections.

The available outputs from Regional Climate Modelling (RCM) are temperature, precipitation, and selected extreme events indices expressed in terms of change from the reference period. They were generated using RCA4 nested in three driving Global Climate Models (GCMs), namely EC-Earth, CNRM and GFDL-ESM combined as an ensemble for the RCP 4.5 and RCP 8.5 emission scenarios through the end of this century at a 50km scale. Results are presented as maps for the entire Arab Domain, and as plotted time series showing area means summarized over specified sub-domains, namely the Moroccan Highlands and the Mediterranean Coast, as well as sub-domains related to shared river basins.

Outputs pertaining to Regional Hydrological Modelling (RHM) using the VIC and/or HYPE hydrological models include runoff, evapotranspiration and mean discharge, and are based on bias corrected results for temperature and precipitation generated by the RCMs. These were modelled until the year 2100 considering RCP 4.5 and RCP 8.5 emission scenarios at a 50km resolution. Comparisons with results of 25km resolution are presented for changes in runoff and discharge for the RCP 8.5 projections, noting that at this resolution only two projections were available and were thus not combined as an ensemble. Analysis for them consisted primarily of comparisons against the respective 50km projections driven by the same Global Climate Model (EC-Earth, GFDL-ESM2M).

The different RCM and RHM outputs are presented for the Arab Domain (Figures 1 through 15); Arab Region (Figures 16 through 31) two selected subdomains (Figures 32 through 79) and for shared river basins (Figures 80 through 259).

All outputs from RCMs and RHMs are expressed in terms of changes from the reference period (1986-2005) and presented as projections for mid-century (2046-2065) and end-century (2081-2100). Results are also provided for two seasonal periods for selected parameters; namely April-September and October-March in order to assess how climate in the Arab region varies between seasons. The figures presented in this annex at the seasonal level are only indicative, noting that the full set of results at this temporal scale for the different parameters will be made available on the Regional Knowledge Hub, providing access to datasets which can be independently studied at more detailed temporal levels (e.g. inter-seasonal, monthly, etc.).

In addition, some figures on ensemble member agreements are presented in this annex for the Arab Domain or the Arab Region such as precipitation (Figures 3, 6 and 7), runoff (Figures 18-19 and 24 to 27) and evapotranspiration (Figures 30 and 31).

Finally, it is important to note that assumptions, further considerations and detailed observations specific to each parameter and output are mentioned in the main report, and it is therefore advised to refer to it consistently while reading through this annex.

# CHAPTER 1

## REGIONAL CLIMATE MODELLING: ARAB DOMAIN

1.1. GENERAL PARAMETERS – **1.1.1. TEMPERATURE**

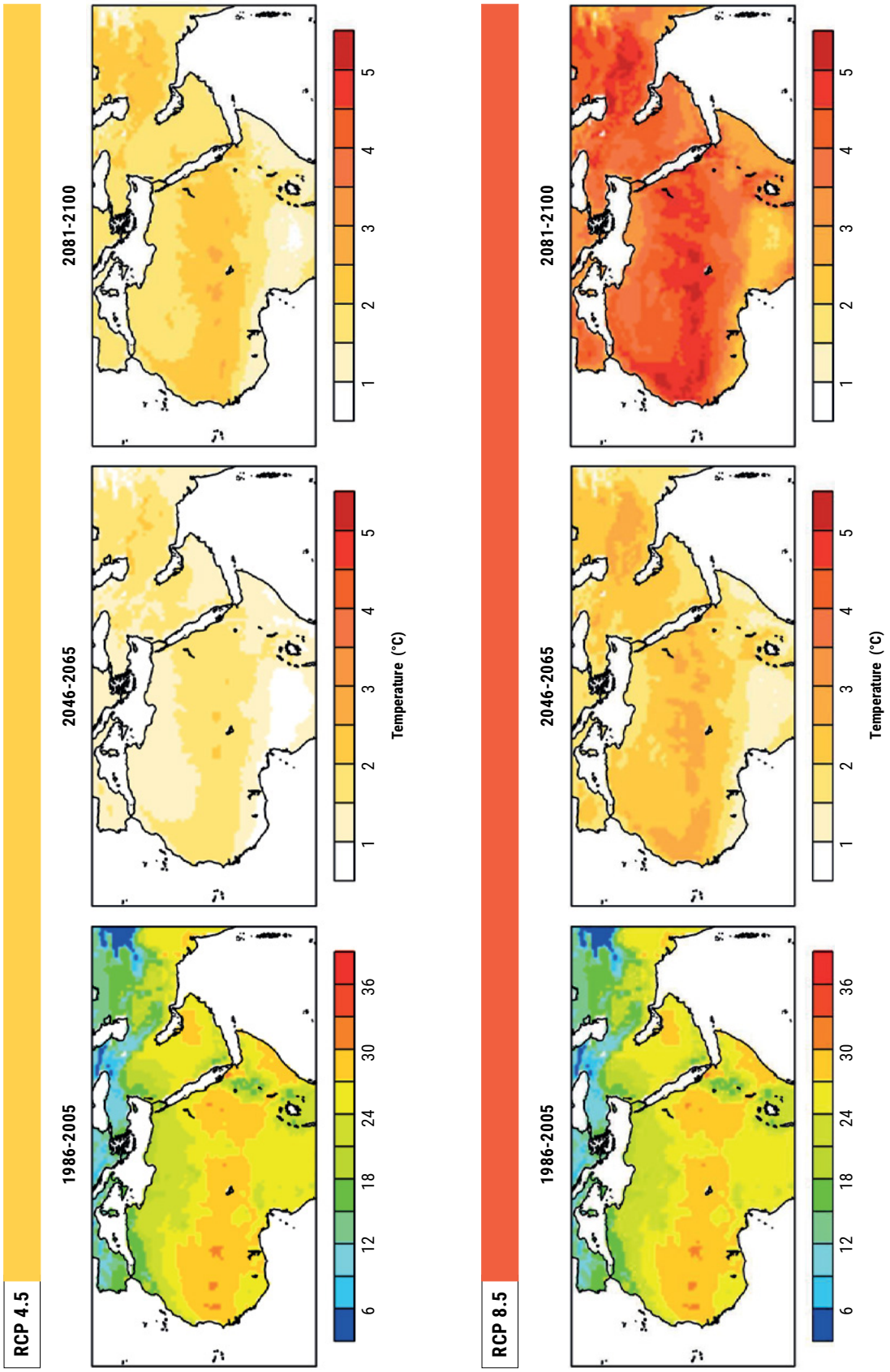



**FIGURE 1**
Mean change in annual temperature for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

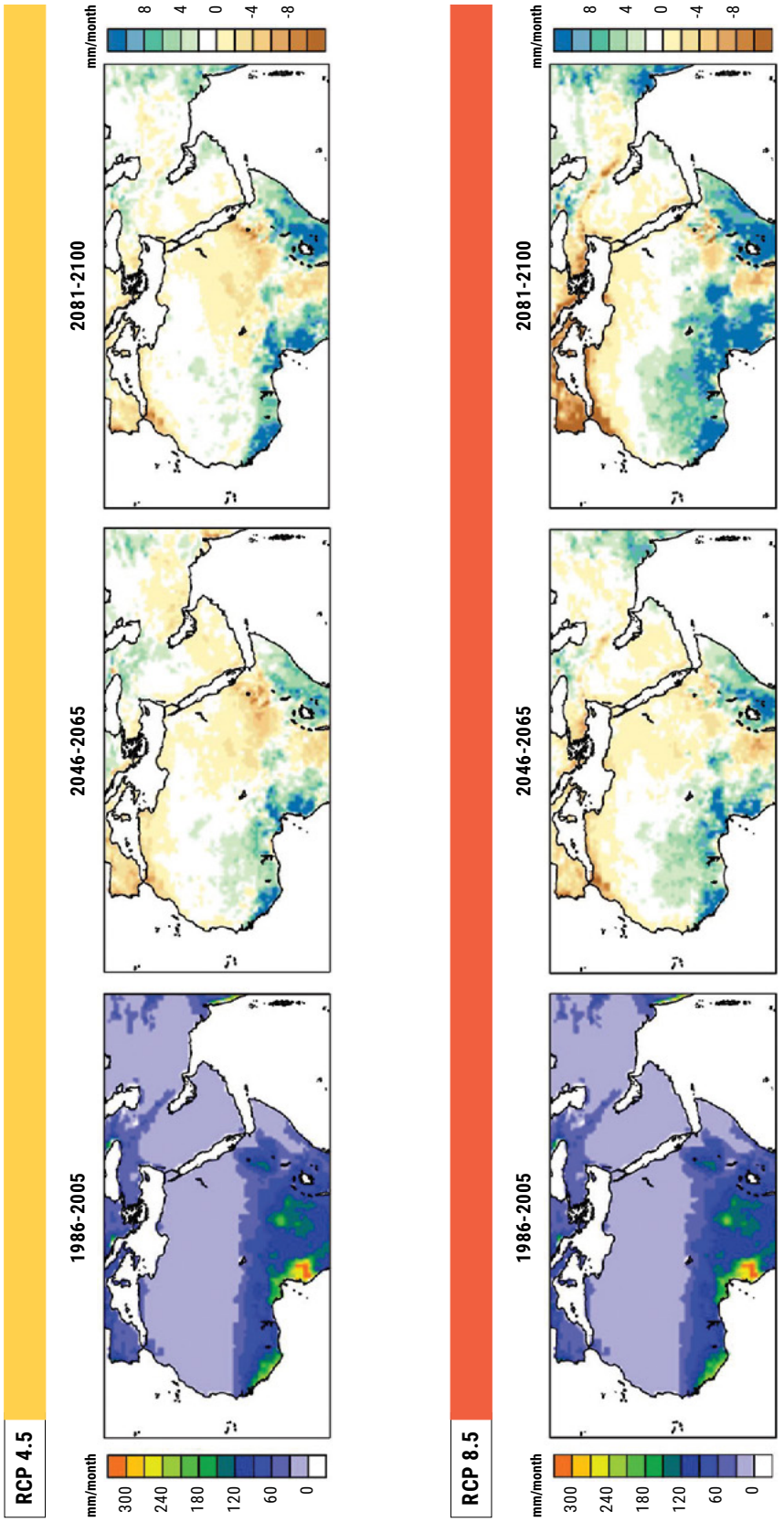



**FIGURE 2**
Mean change in annual precipitation for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

1.1. GENERAL PARAMETERS – **1.1.2. PRECIPITATION**

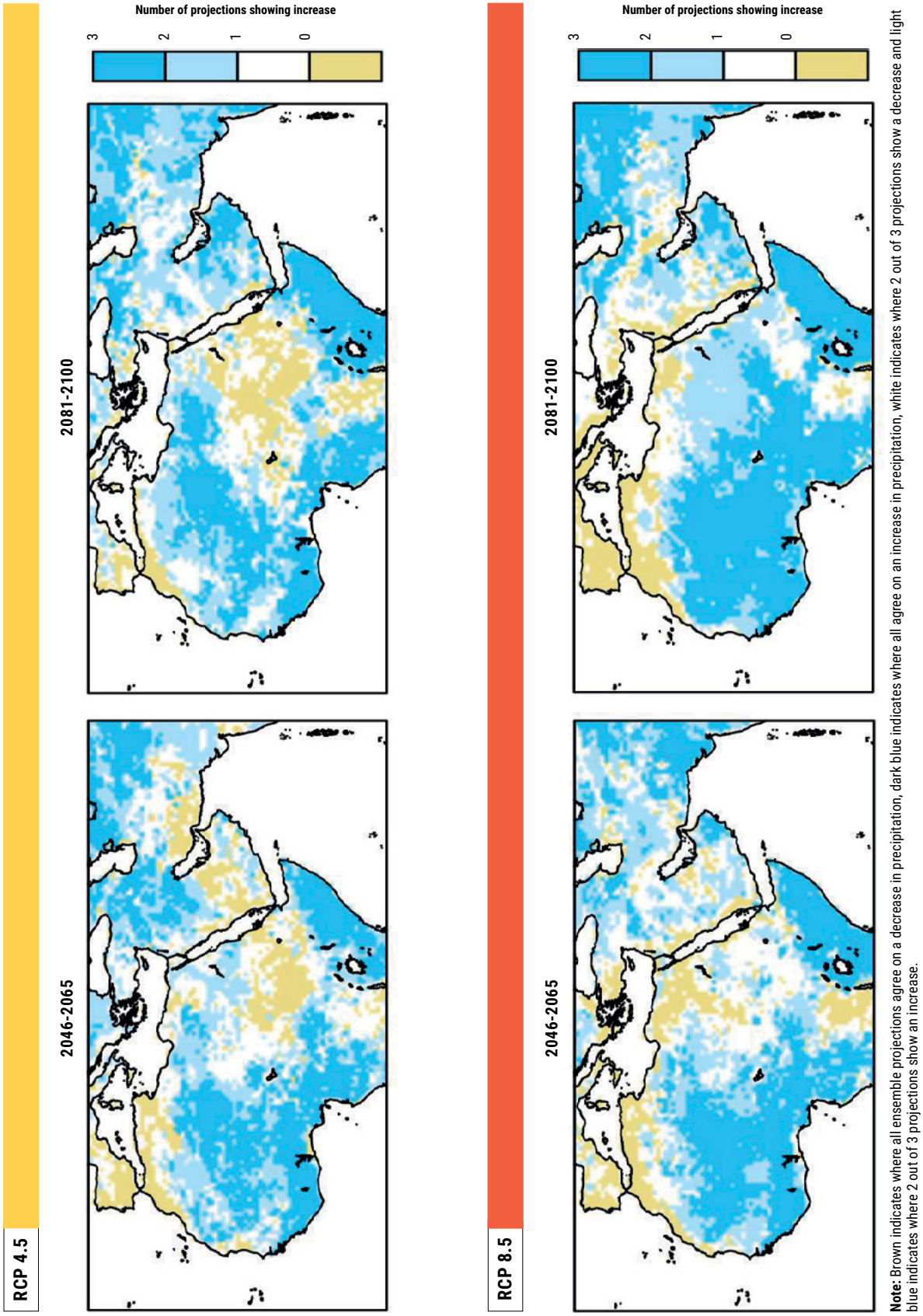



**FIGURE 3**
Agreement on mean change in annual precipitation from the reference period between the ensemble of three RCP 4.5 and RCP 8.5 projections for mid-century and end-century

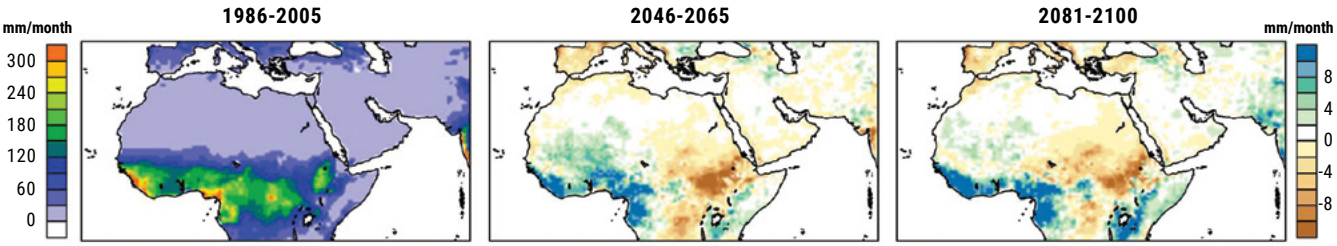
**Note:** Brown indicates where all ensemble projections agree on a decrease in precipitation, dark blue indicates where all agree on an increase in precipitation, white indicates where 2 out of 3 projections show a decrease and light blue indicates where 2 out of 3 projections show an increase.

1.1. GENERAL PARAMETERS – 1.1.2. PRECIPITATION

**FIGURE 4**
Mean change in seasonal precipitation for mid-century and end-century for ensemble of three RCP 4.5 projections compared to the reference period

**RCP 4.5**

APR-SEP




OCT-MAR

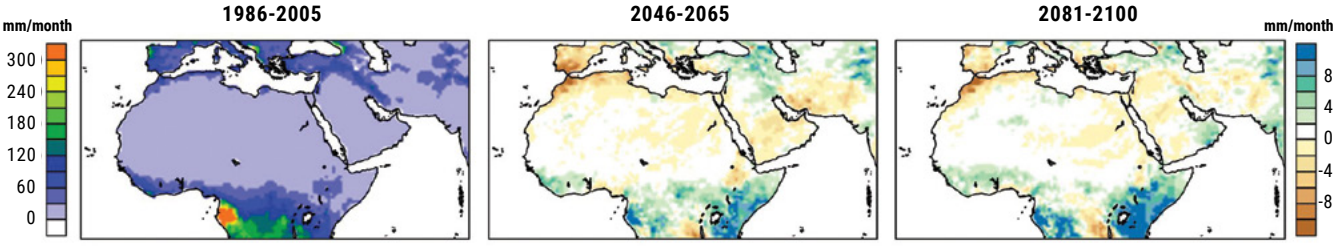
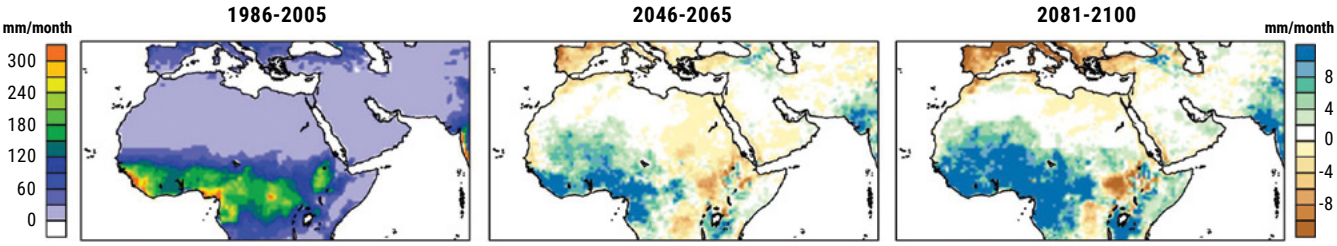


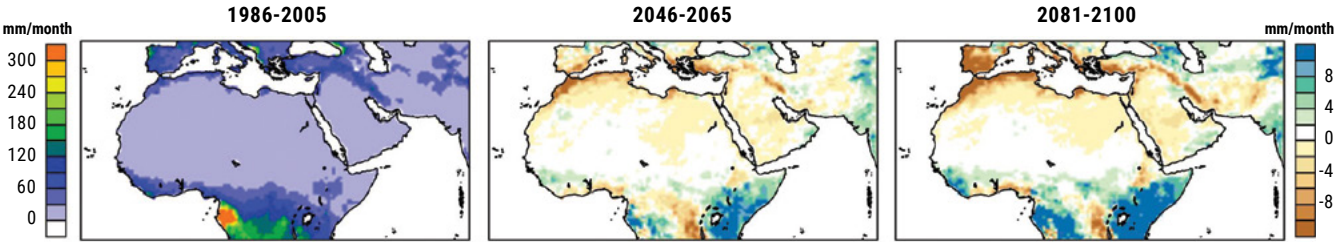

**FIGURE 5**
Mean change in seasonal precipitation for mid-century and end-century for ensemble of three RCP 8.5 projections compared to the reference period

**RCP 8.5**

APR-SEP




OCT-MAR



1.1. GENERAL PARAMETERS – **1.1.2. PRECIPITATION**

**FIGURE 6**
Agreement on mean change in seasonal precipitation from the reference period between the ensemble of three RCP 4.5 projections for mid-century and end-century

**RCP 4.5**

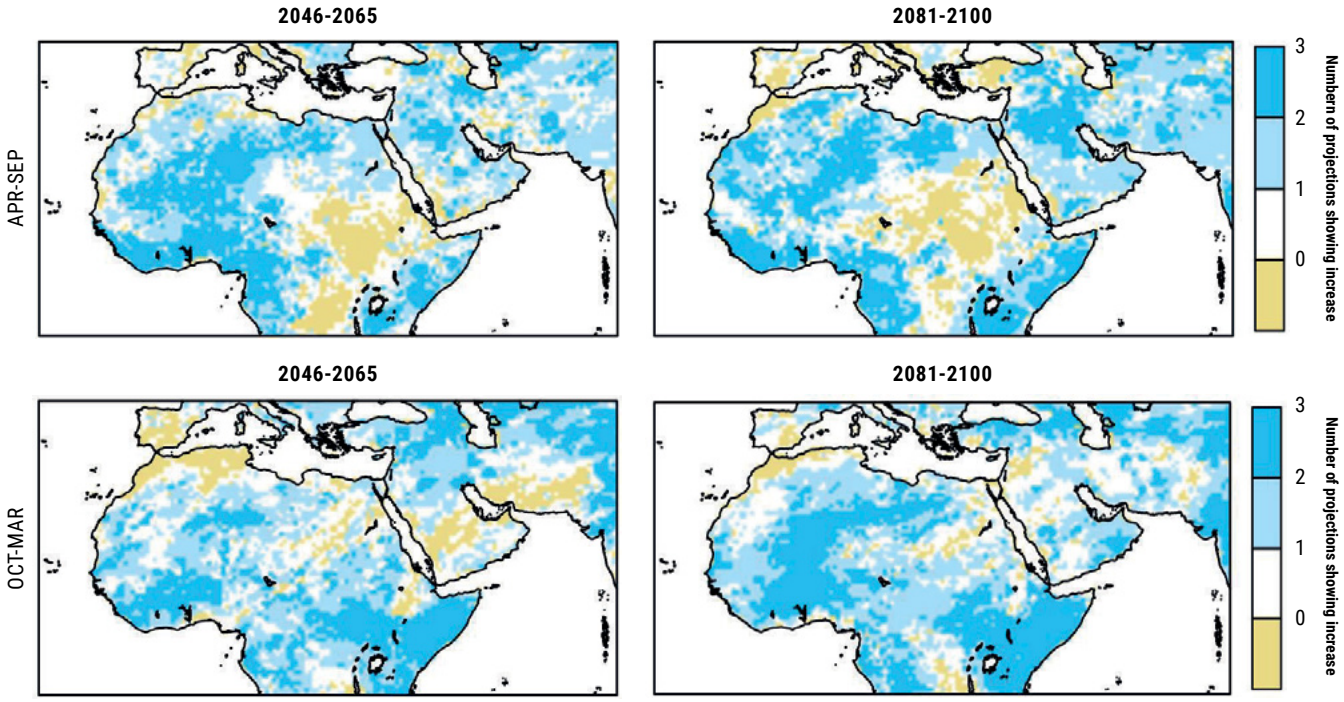
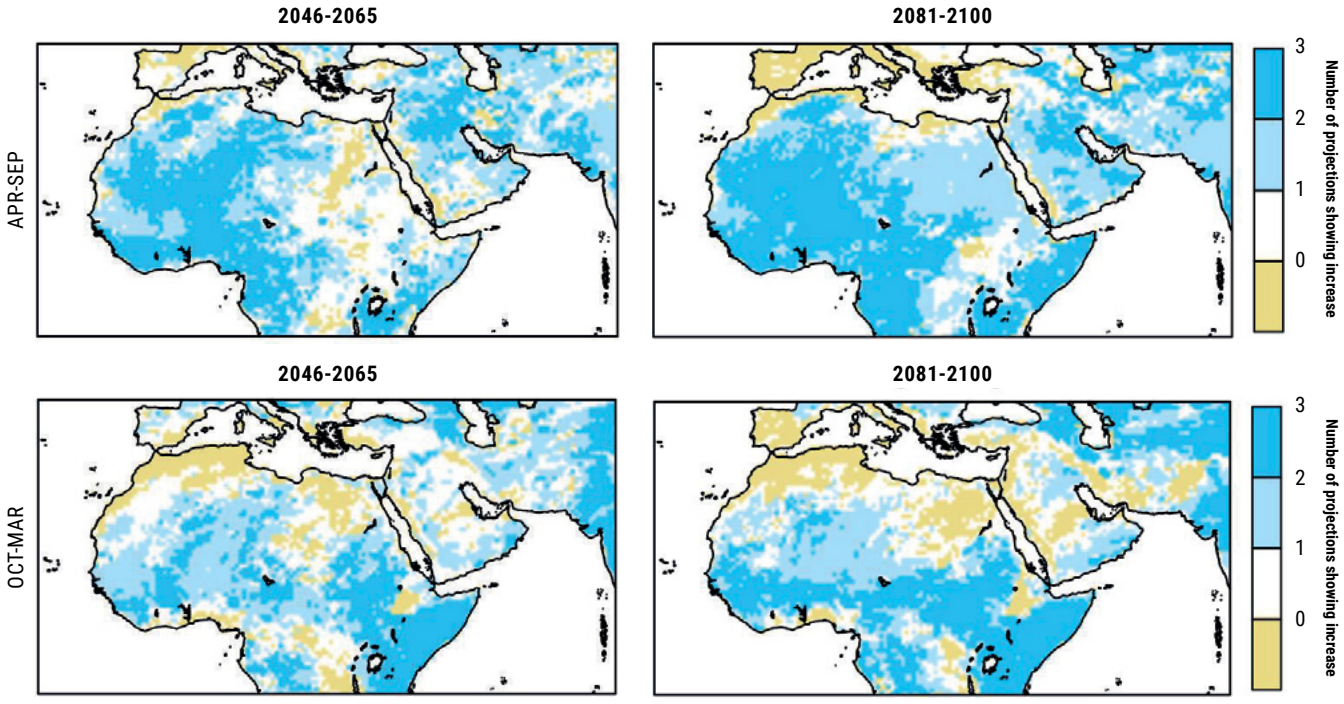



**FIGURE 7**
Agreement on mean change in seasonal precipitation from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century

**RCP 8.5**




**Note:** Brown indicates where all ensemble projections agree on a decrease in precipitation, dark blue indicates where all agree on an increase in precipitation, white indicates where 2 out of 3 projections show a decrease and light blue indicates where 2 out of 3 projections show an increase.

1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

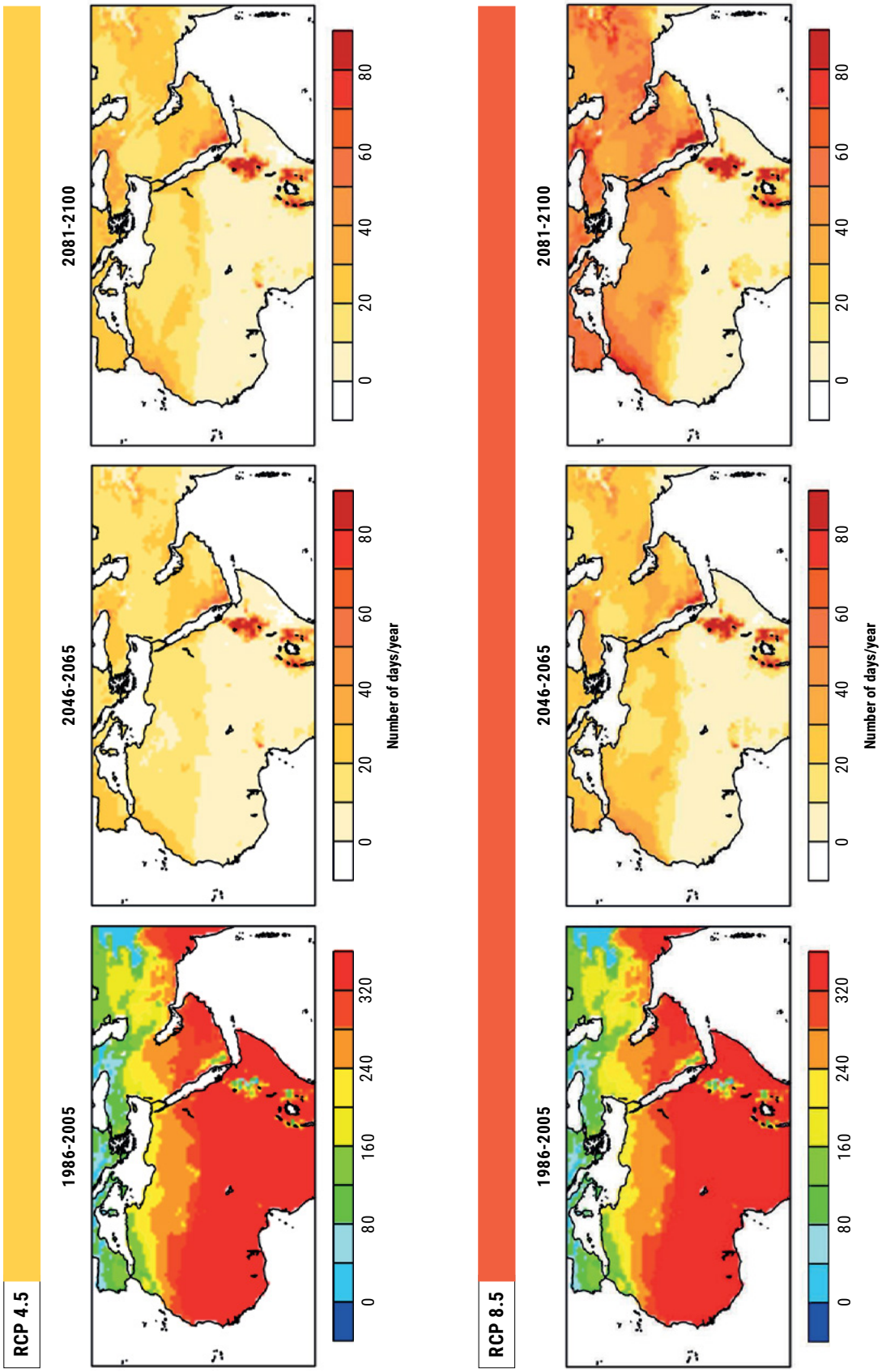



**FIGURE 8**
Mean change in SU for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

1.2. EXTREME EVENTS – **1.2.1. CHANGES IN EXTREME TEMPERATURE**

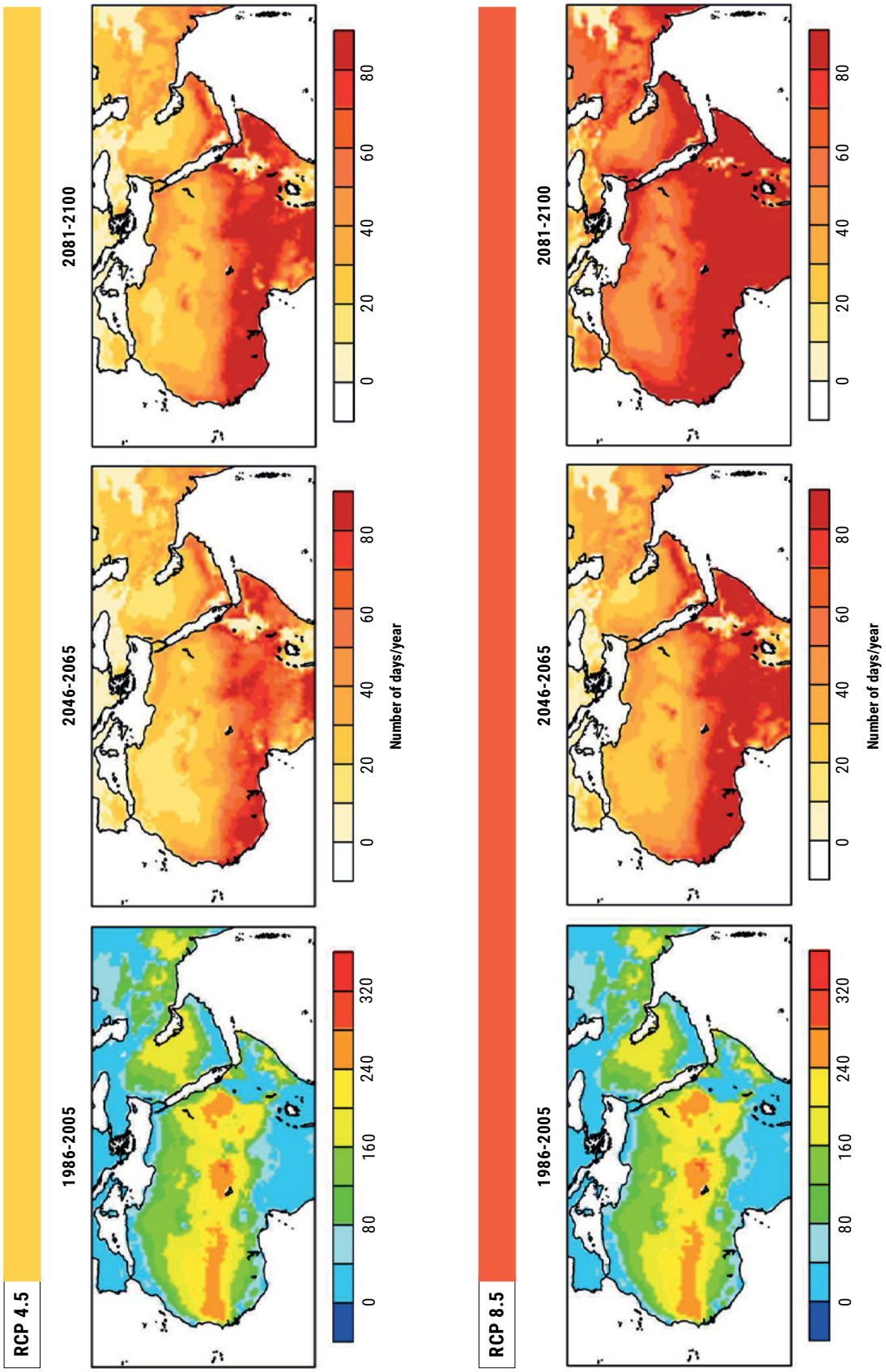



**FIGURE 9**
Mean change in SU35 for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

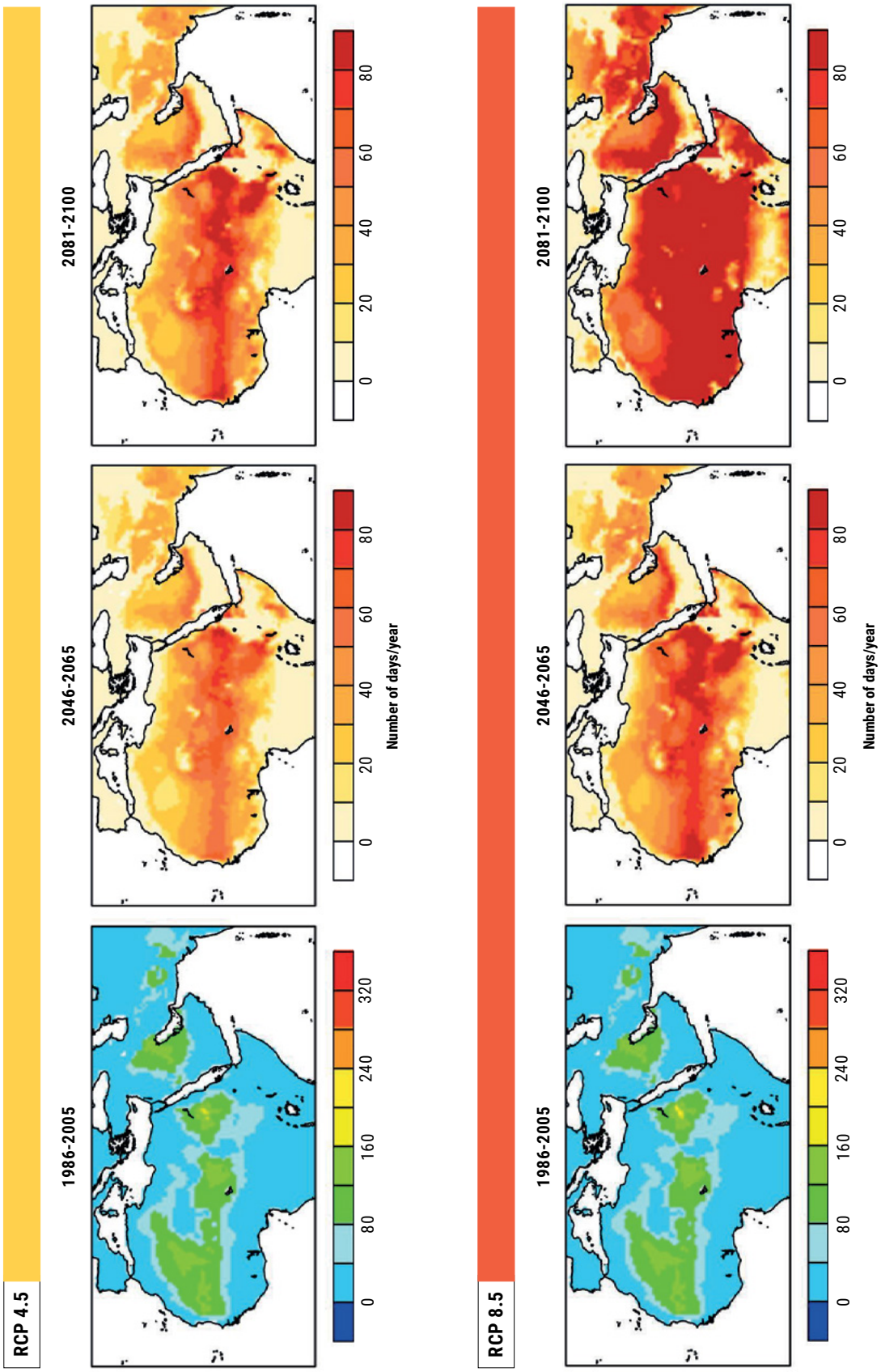



FIGURE 10
Mean change in SU40 for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

1.2. EXTREME EVENTS – **1.2.1. CHANGES IN EXTREME TEMPERATURE**

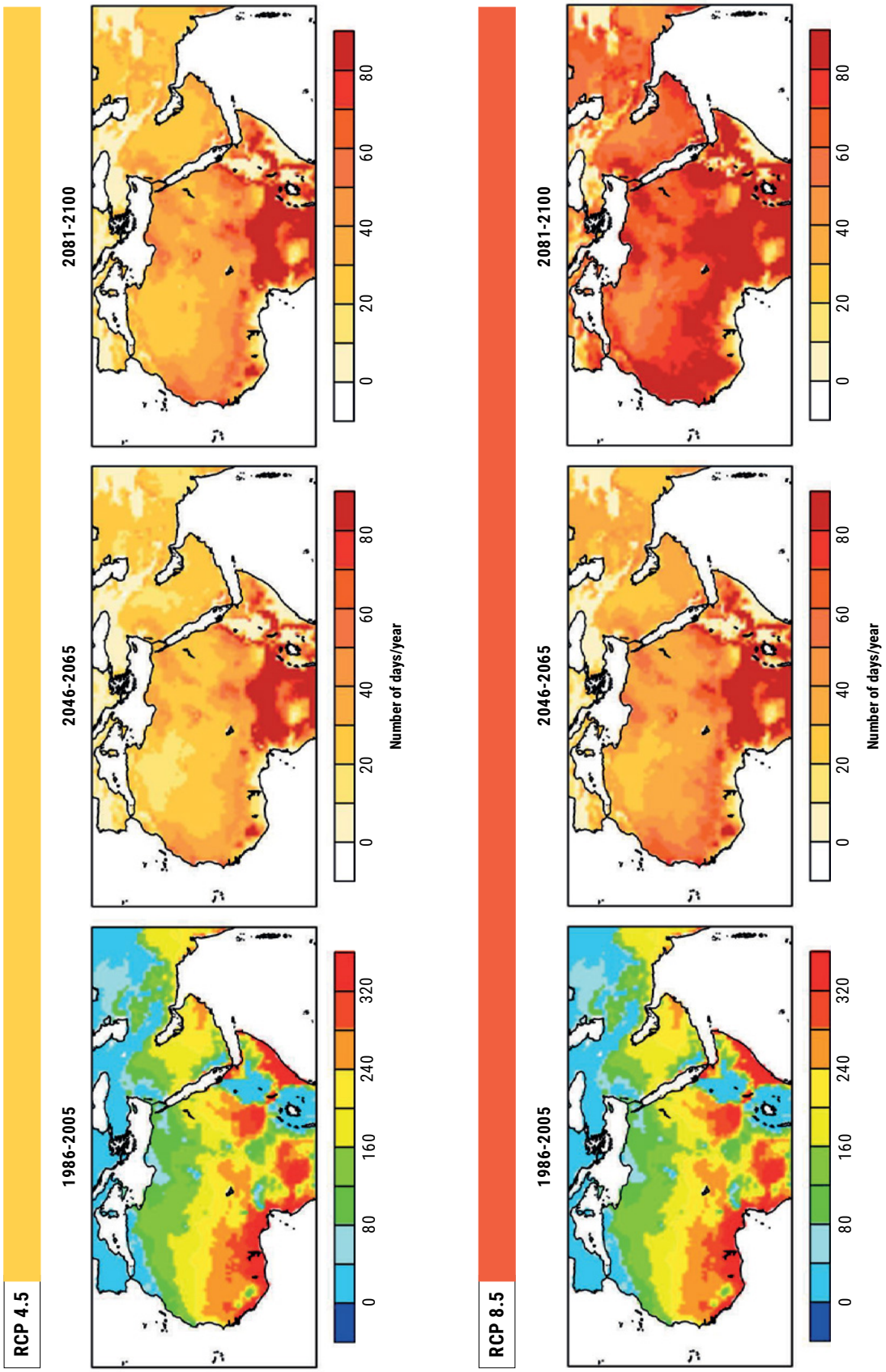



**FIGURE 11**
Mean change in TR for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

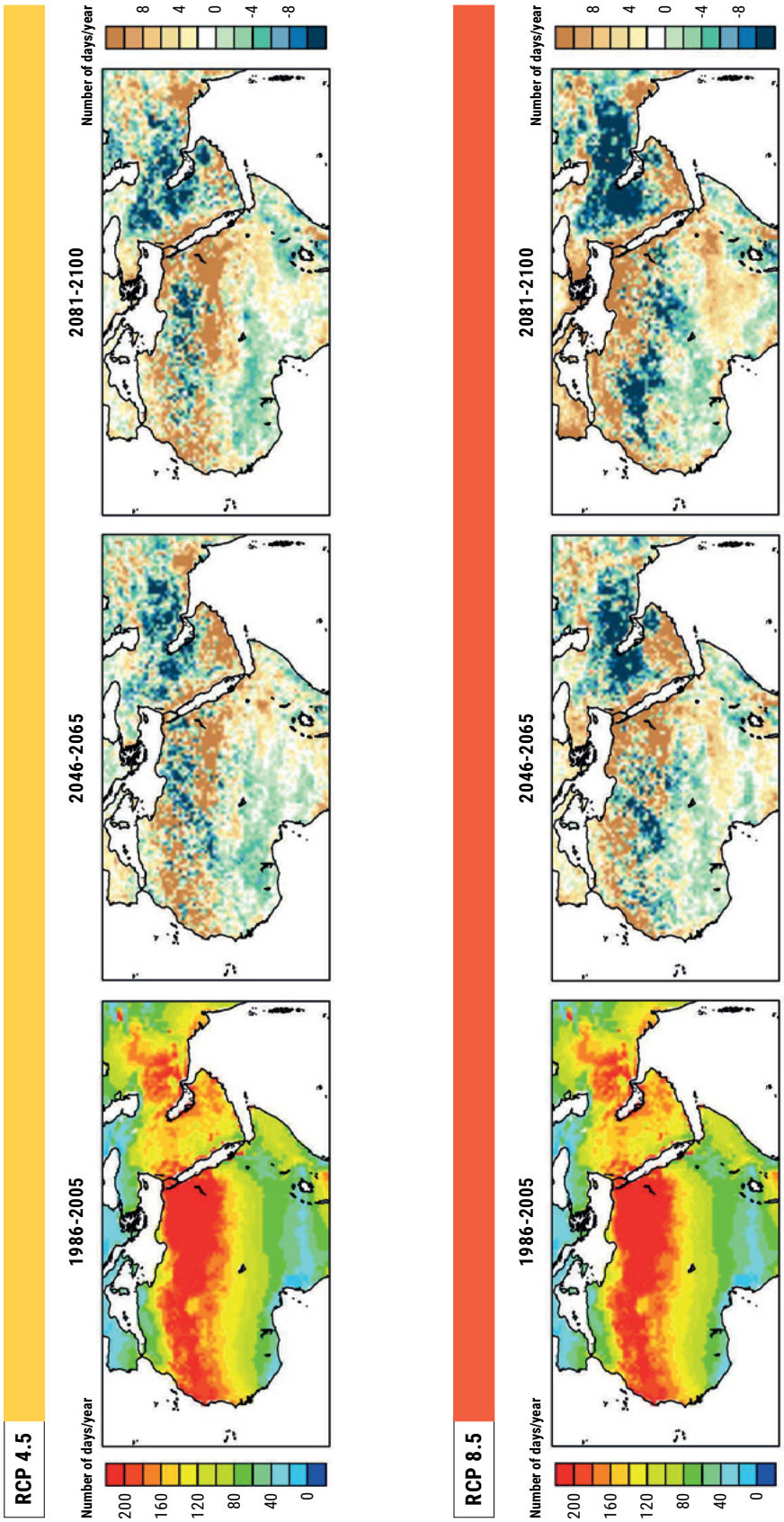



**FIGURE 12**
Mean change in CDD for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

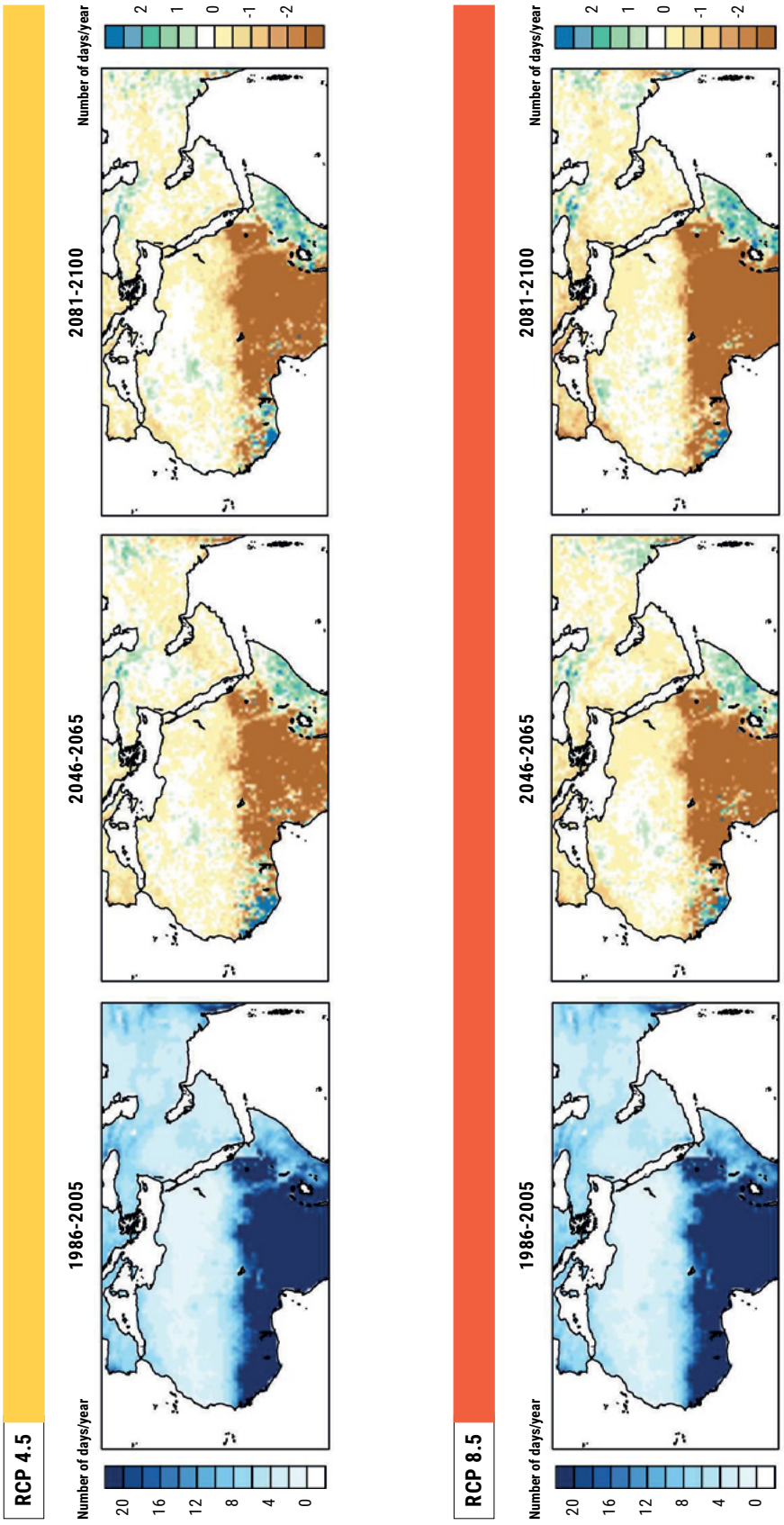



**FIGURE 13**
Mean change in CWD for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

1.2. EXTREME EVENTS – **1.2.2. CHANGES IN EXTREME PRECIPITATION**

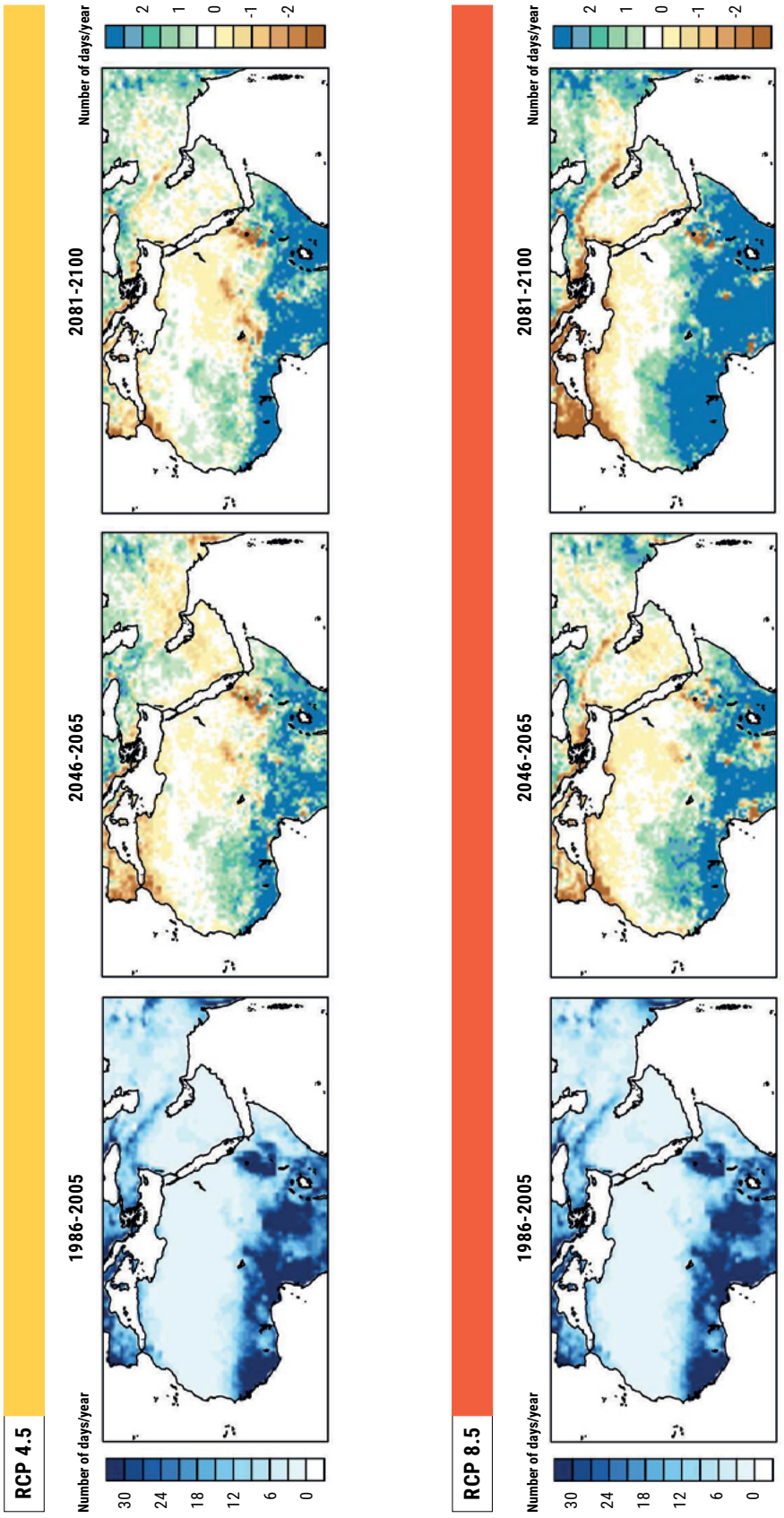



**FIGURE 14**
Mean change in R10 for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

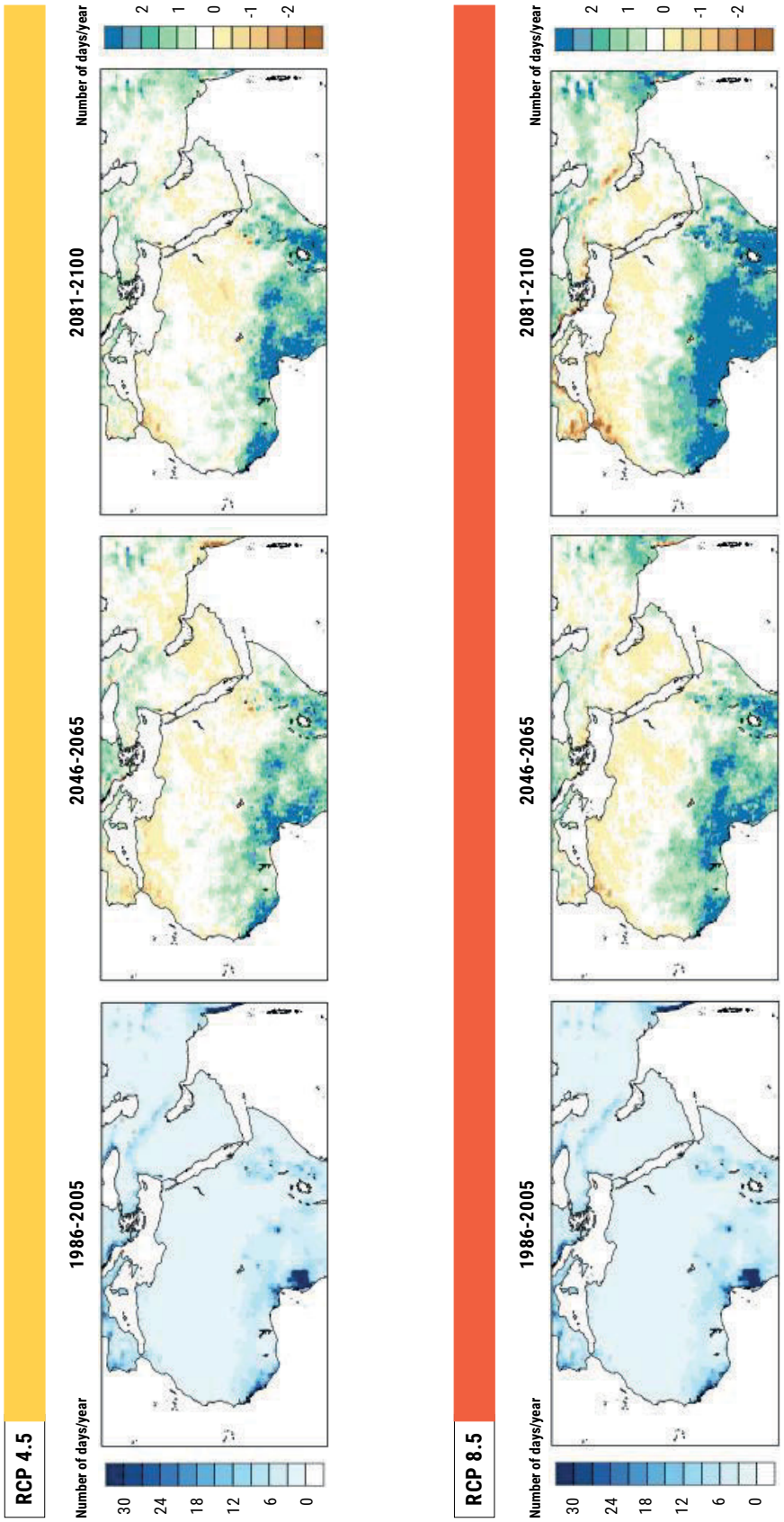



**FIGURE 15**
Mean change in R20 for mid-century and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

# CHAPTER 2

## REGIONAL HYDROLOGICAL MODELLING: ARAB REGION

2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF

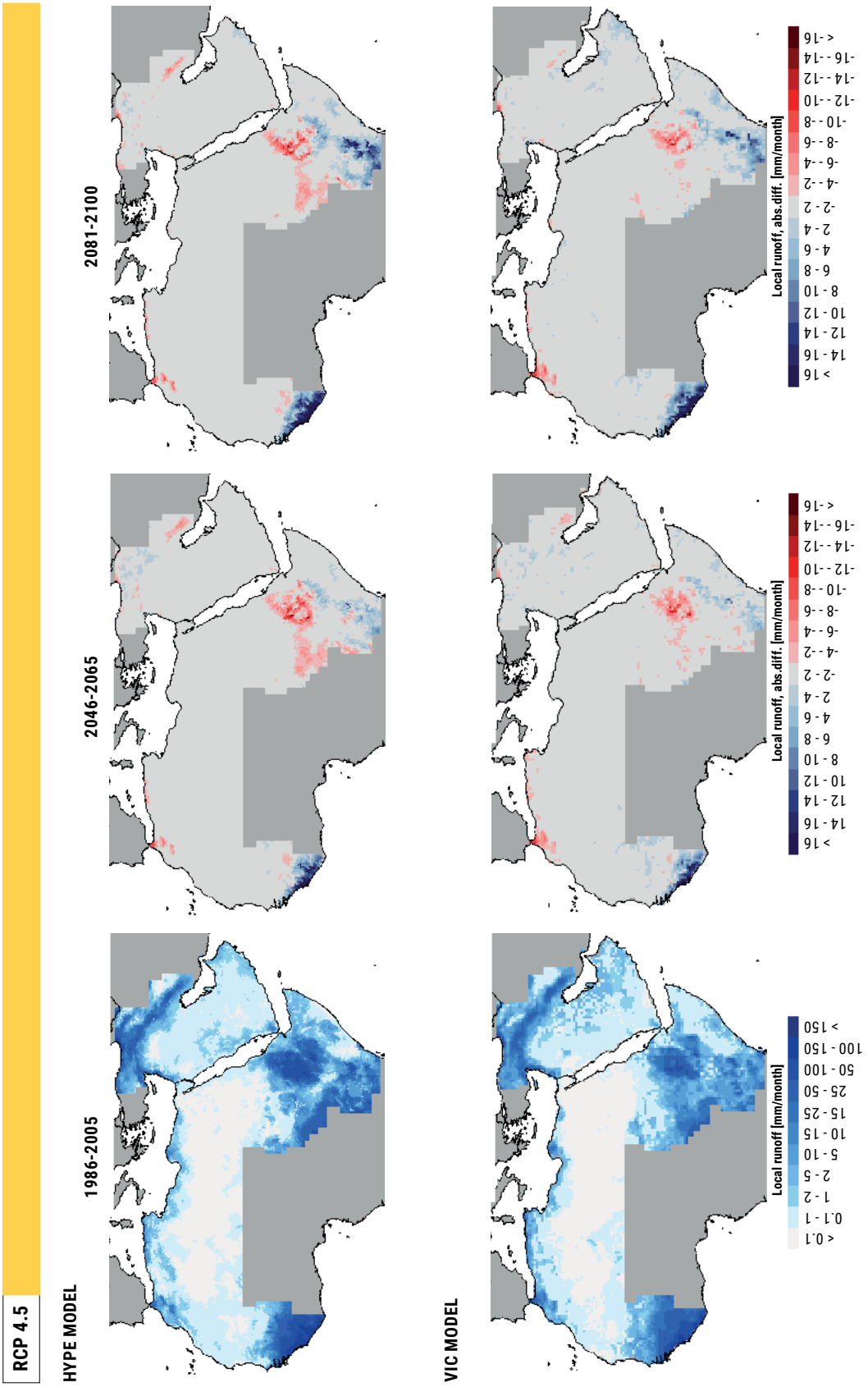



FIGURE 16
Mean change in annual runoff for mid-century and end-century for ensemble of three RCP 4.5 projections compared to the reference period using two hydrological models

2.1. HYDROLOGICAL PARAMETERS – **2.1.1. RUNOFF**

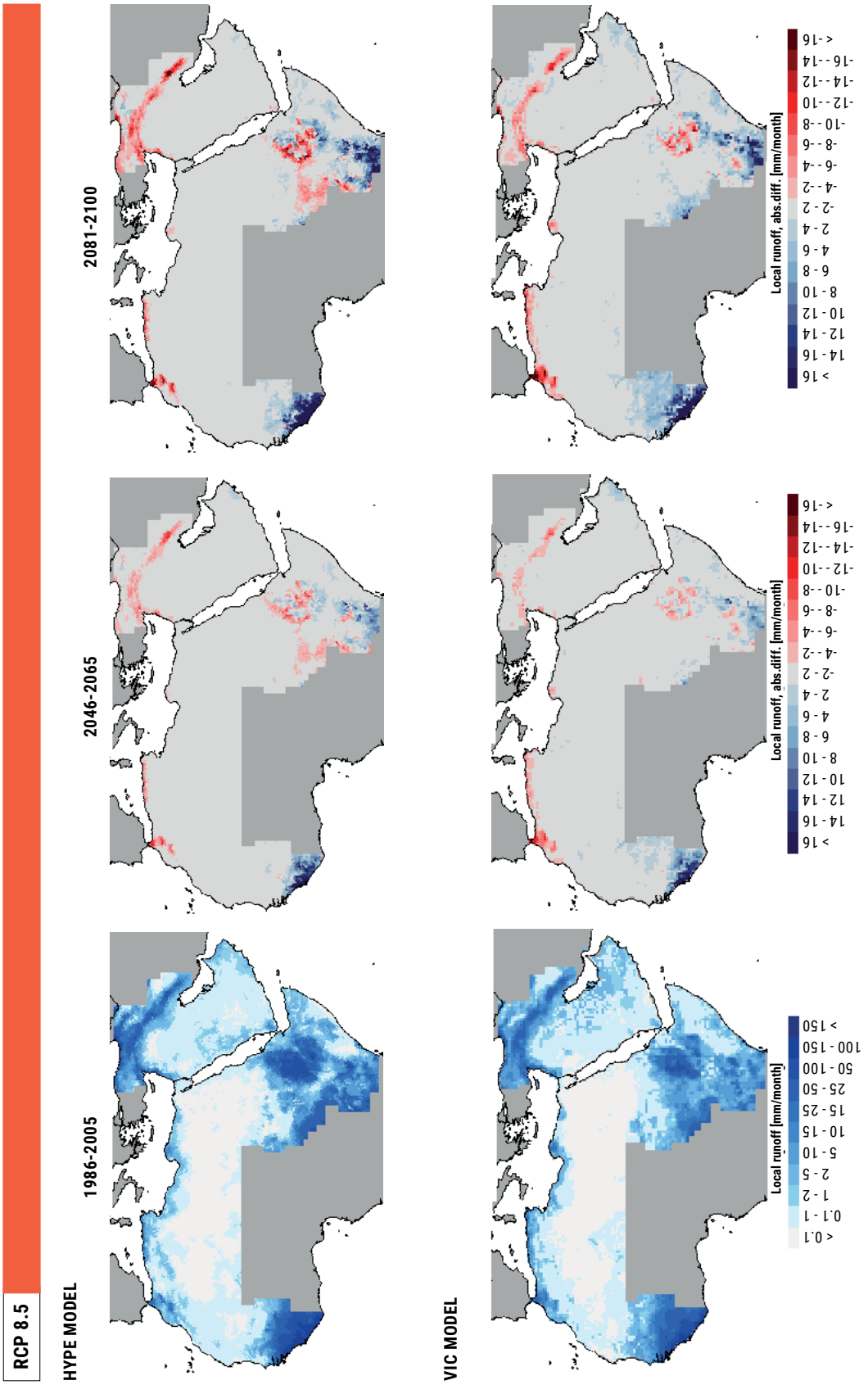
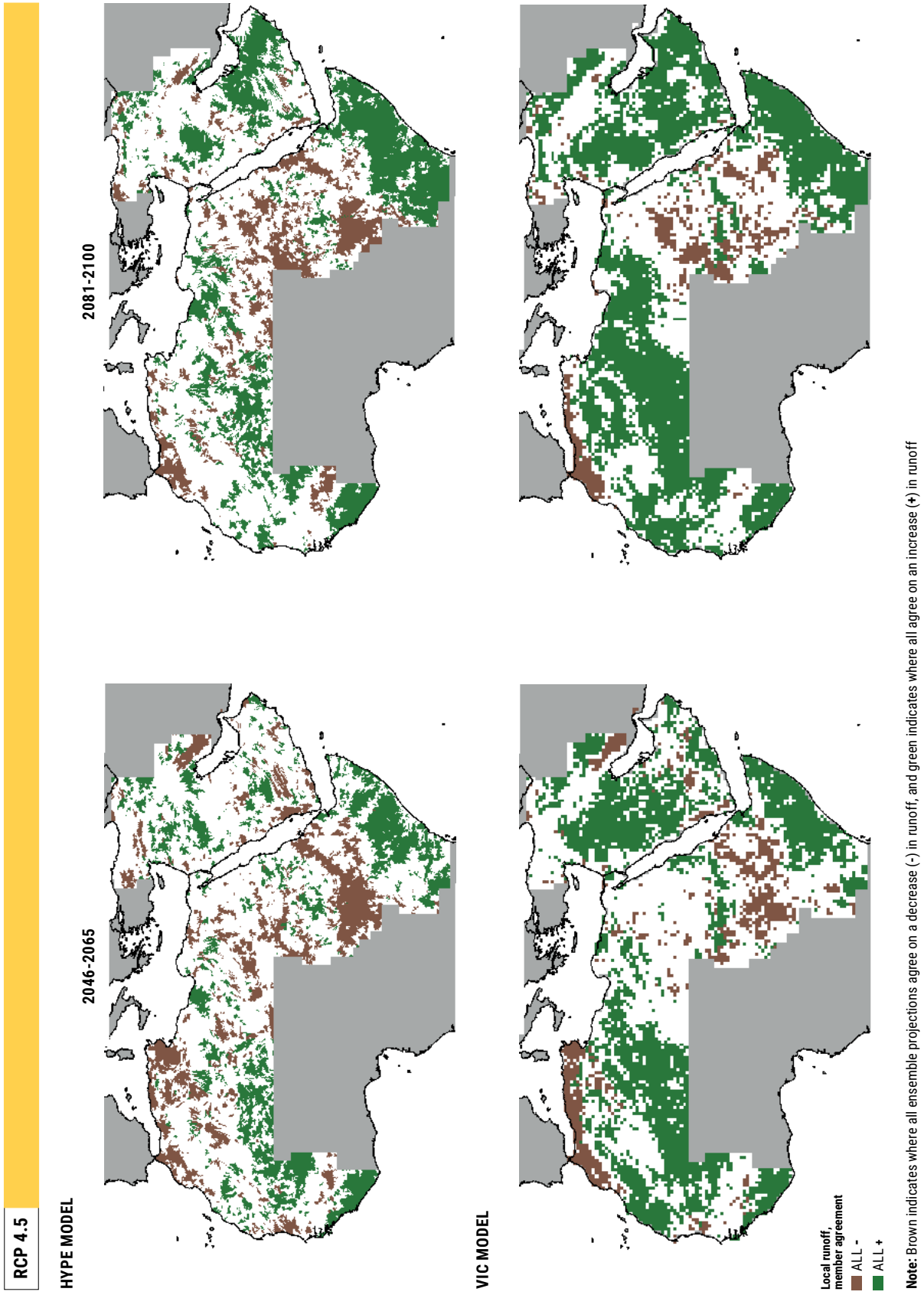



**FIGURE 17**
Mean change in annual runoff for mid-century and end-century for ensemble of three RCP 8.5 projections compared to the reference period using two hydrological models

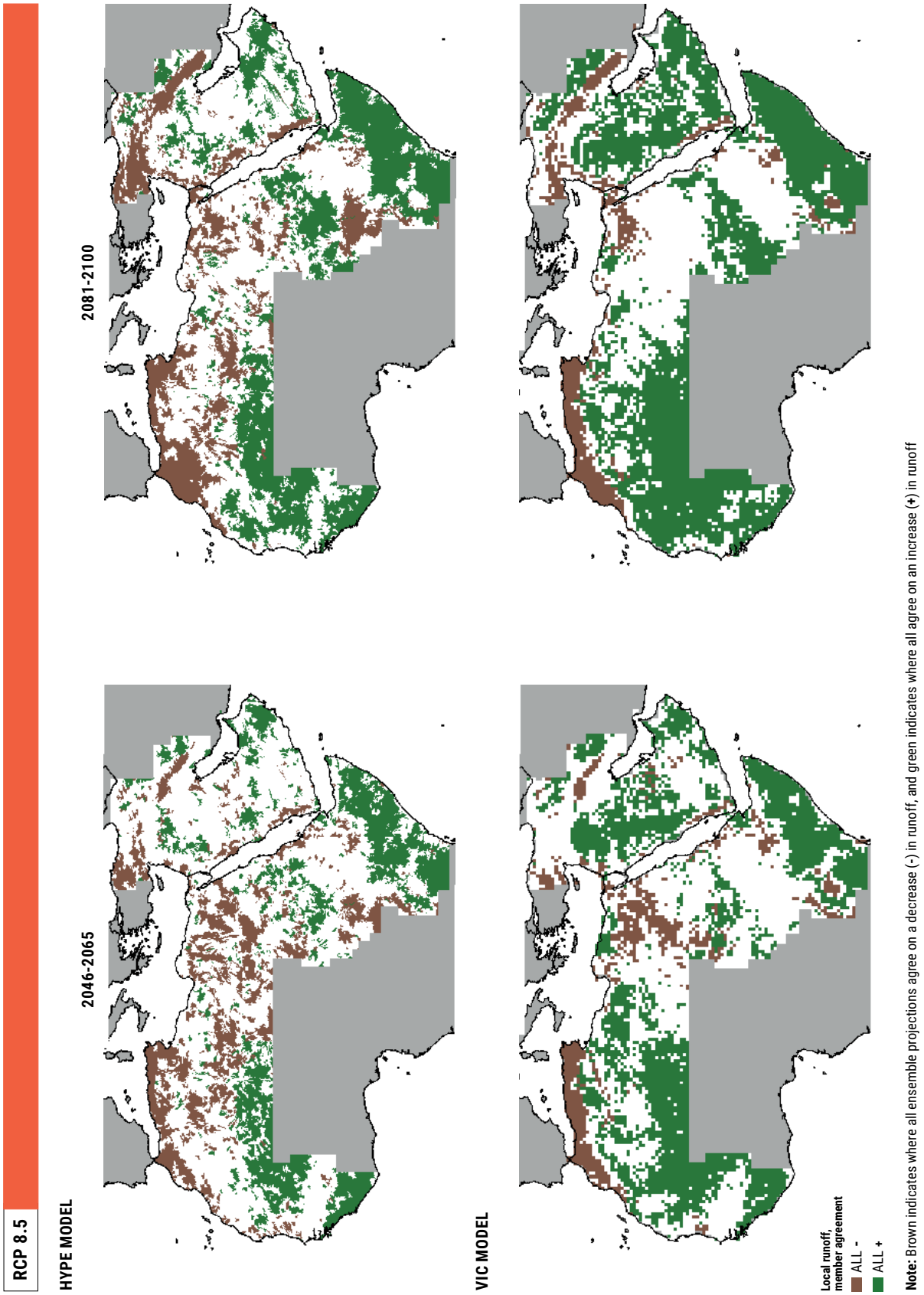
**FIGURE 18**
Agreement on mean change in annual runoff from the reference period between the ensemble of three RCP 4.5 projections for mid-century and end-century using two hydrological models




**Note:** Brown indicates where all ensemble projections agree on a decrease (-) in runoff, and green indicates where all agree on an increase (+) in runoff

2.1. HYDROLOGICAL PARAMETERS – **2.1.1. RUNOFF**

**FIGURE 19**
Agreement on mean change in annual runoff from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century using two hydrological models



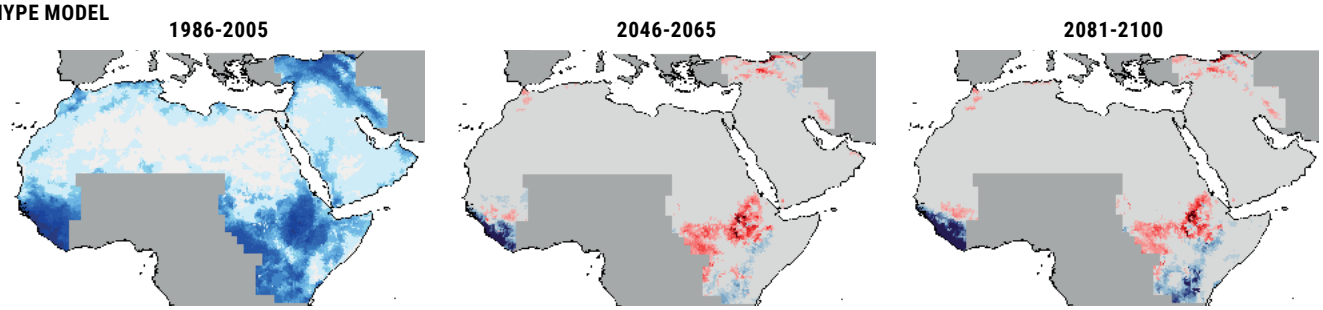

**Note:** Brown indicates where all ensemble projections agree on a decrease (-) in runoff, and green indicates where all agree on an increase (+) in runoff

2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF

**FIGURE 20**
Mean change in seasonal runoff (April-September) for mid-century and end-century for ensemble of three RCP 4.5 projections compared to the reference period using two hydrological models

**RCP 4.5** APRIL - SEPTEMBER

**HYPE MODEL**




**VIC MODEL**

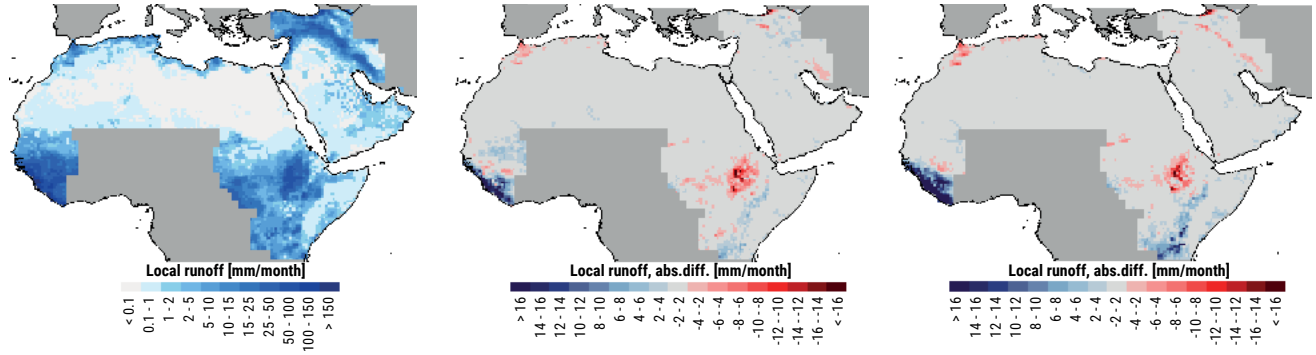
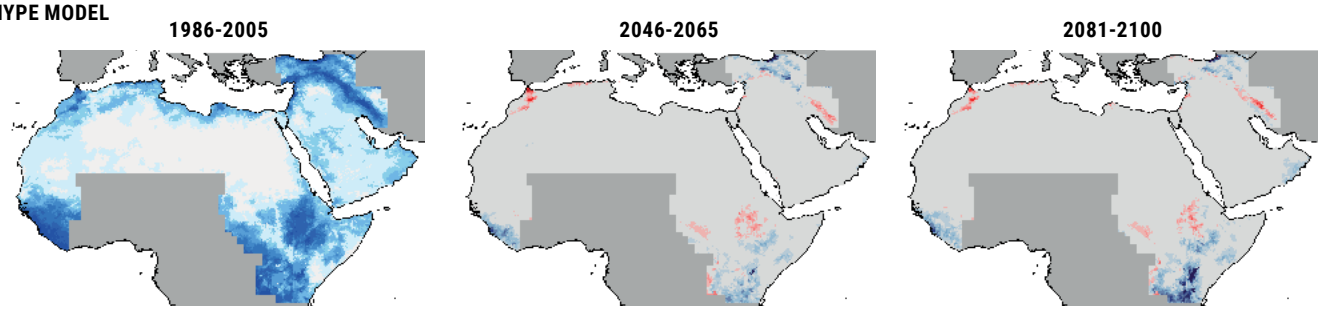


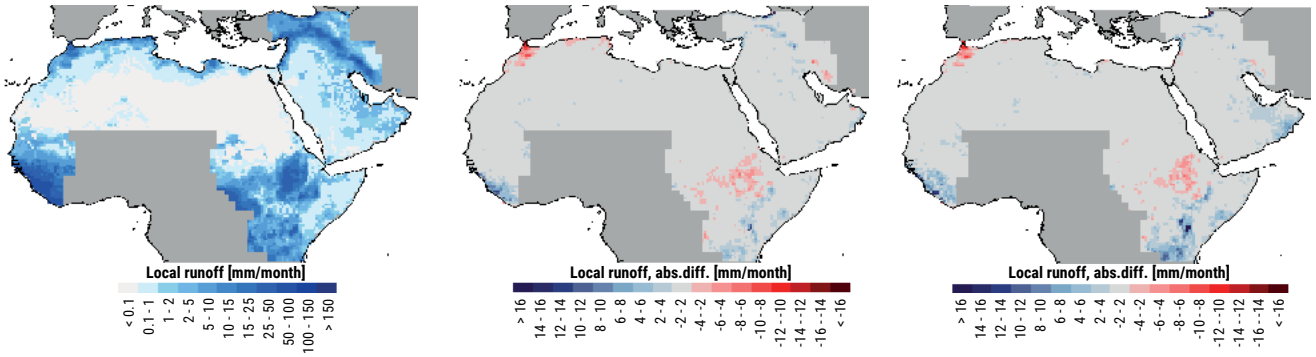

**FIGURE 21**
Mean change in seasonal runoff (October-March) for mid-century and end-century for ensemble of three RCP 4.5 projections compared to the reference period using two hydrological models

**RCP 4.5** OCTOBER - MARCH

**HYPE MODEL**




**VIC MODEL**



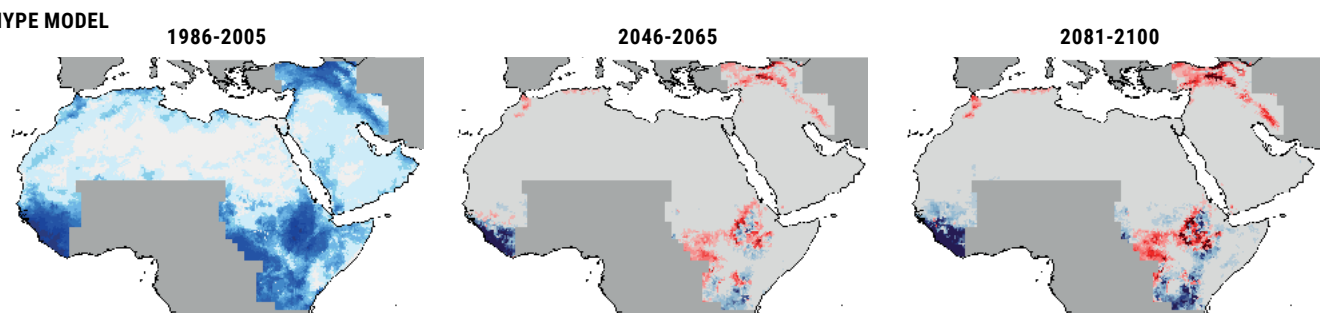
2.1. HYDROLOGICAL PARAMETERS – **2.1.1. RUNOFF**

**FIGURE 22**

Mean change in seasonal runoff (April-September) for mid-century and end-century for ensemble of three RCP 8.5 projections compared to the reference period using two hydrological models

**RCP 8.5** APRIL - SEPTEMBER

**HYPE MODEL**




**VIC MODEL**

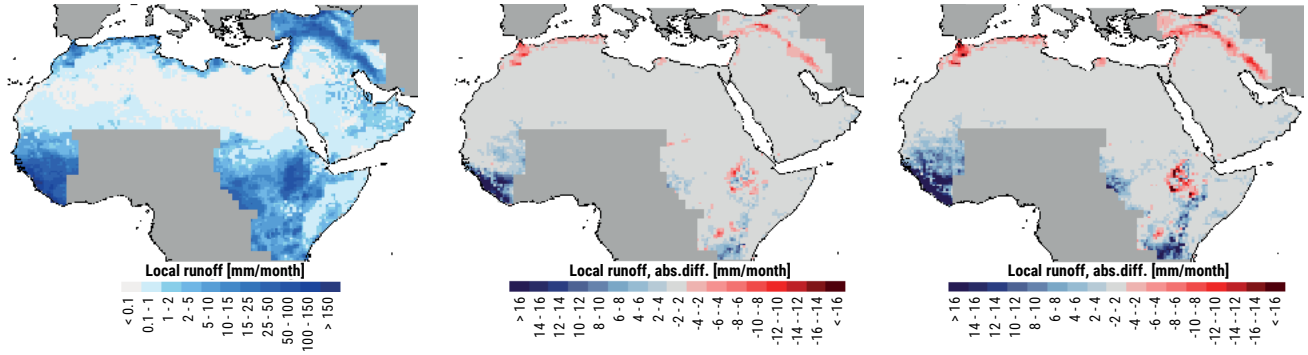
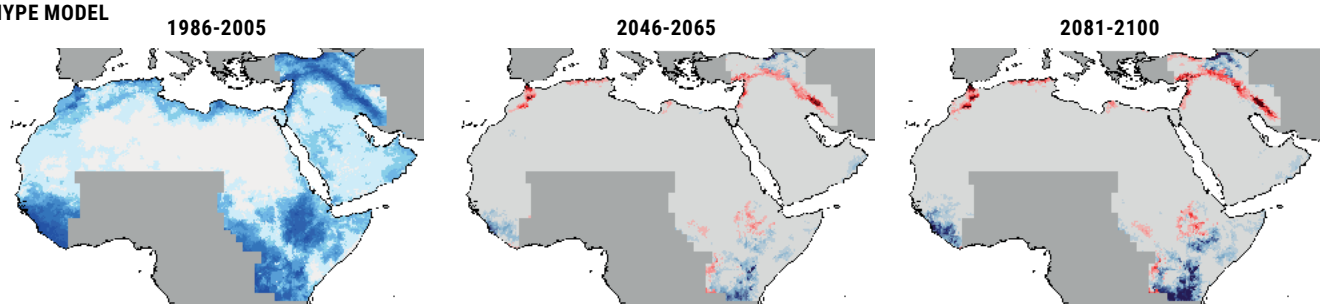



**FIGURE 23**

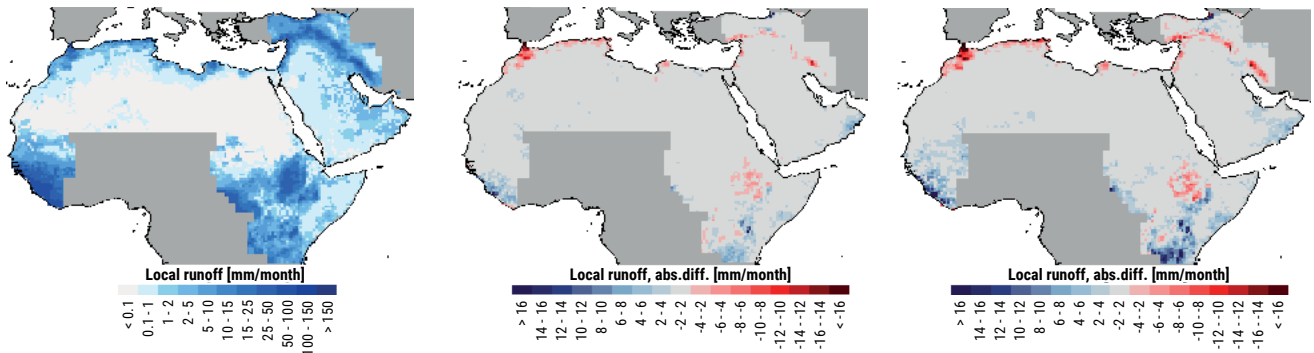
Mean change in seasonal runoff (October-March) for mid-century and end-century for ensemble of three RCP 8.5 projections compared to the reference period using two hydrological models

**RCP 8.5** OCTOBER - MARCH

**HYPE MODEL**




**VIC MODEL**



2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF

**FIGURE 24**

Agreement on mean change in seasonal runoff (April-September) from the reference period between the ensemble of three RCP 4.5 projections for mid-century and end-century using two hydrological models

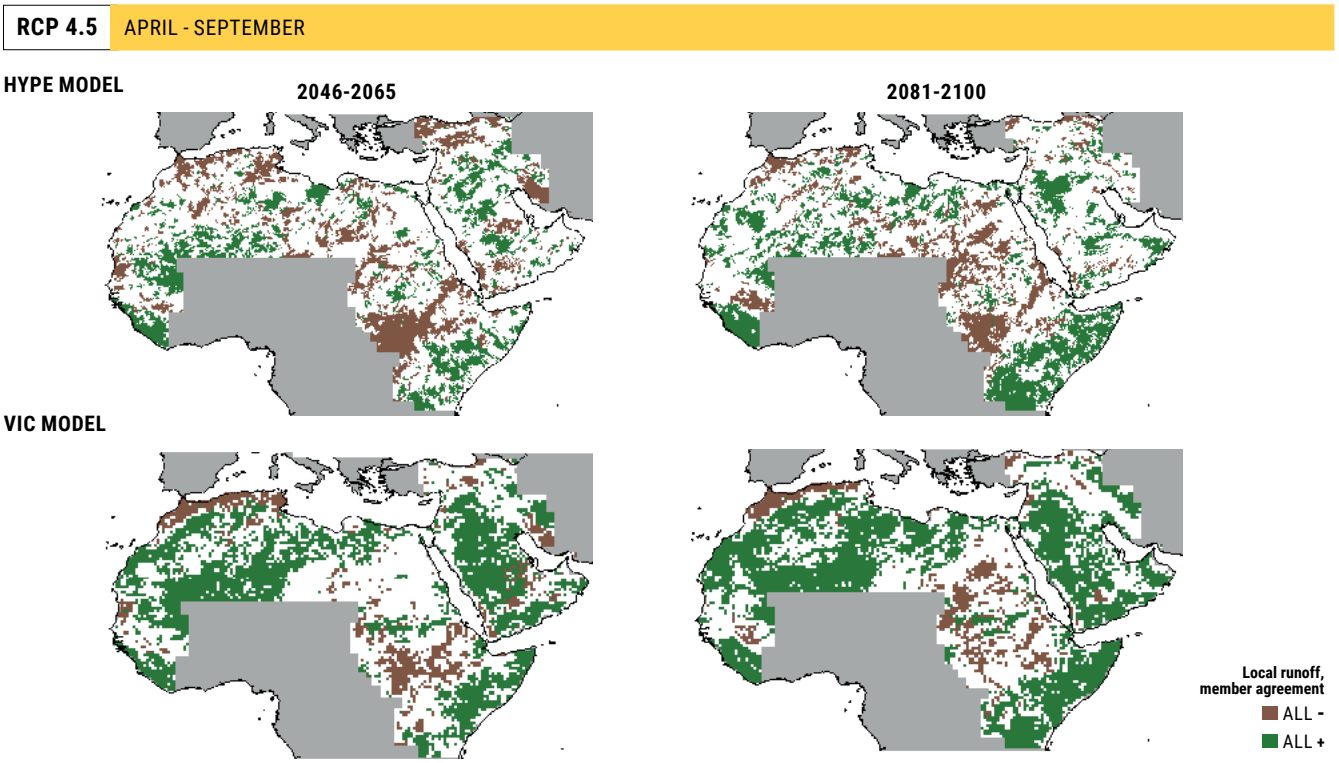
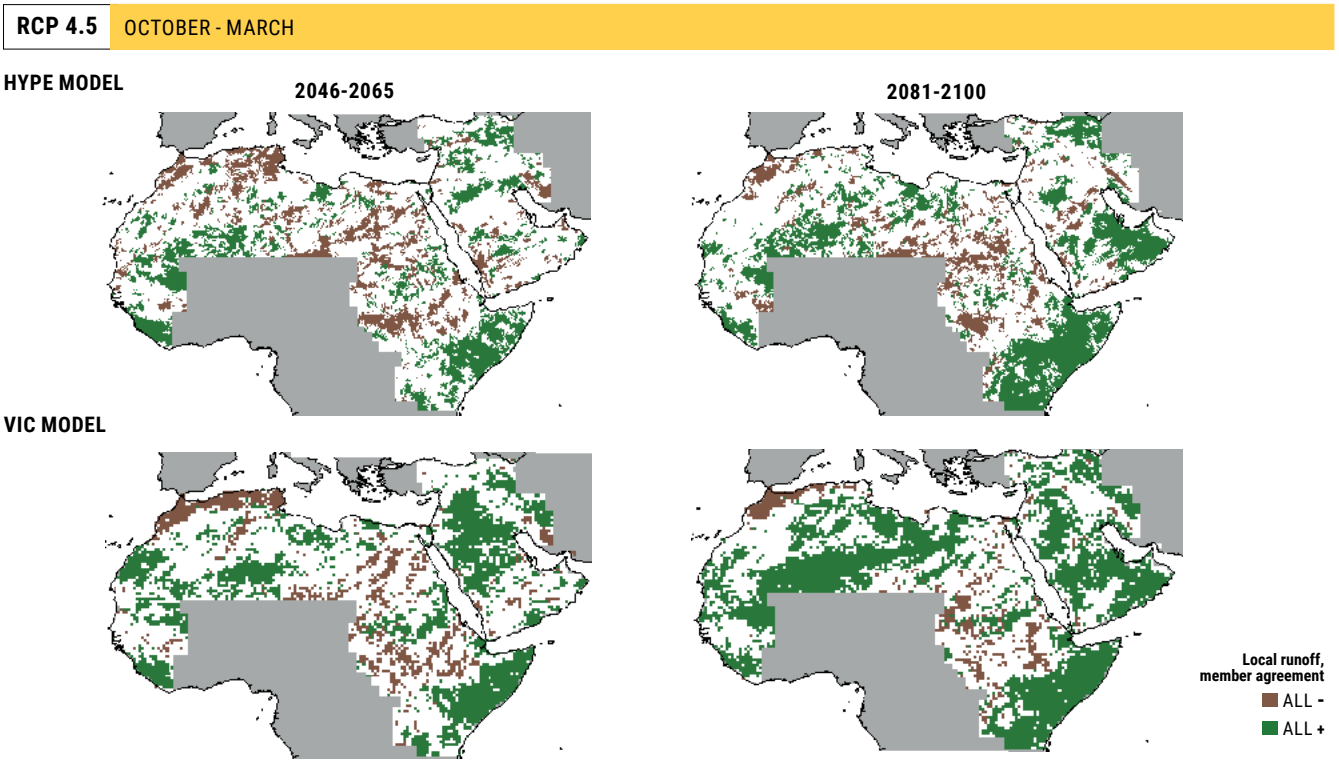



**FIGURE 25**

Agreement on mean change in seasonal runoff (October-March) from the reference period between the ensemble of three RCP 4.5 projections for mid-century and end-century using two hydrological models




**Note:** Brown indicates where all ensemble projections agree on a decrease (-) in runoff, and green indicates where all agree on an increase (+) in runoff

2.1. HYDROLOGICAL PARAMETERS – **2.1.1. RUNOFF**

**FIGURE 26**

Agreement on mean change in seasonal runoff (April-September) from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century using two hydrological models

**RCP 8.5** APRIL - SEPTEMBER

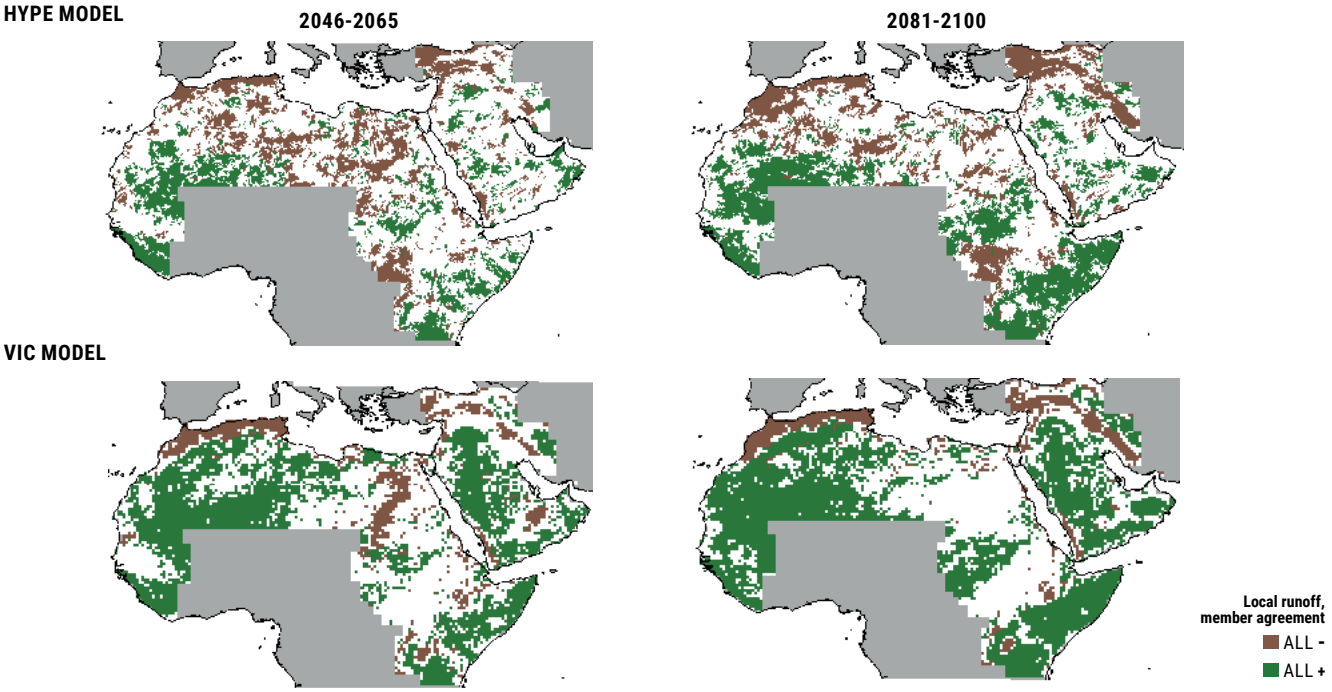
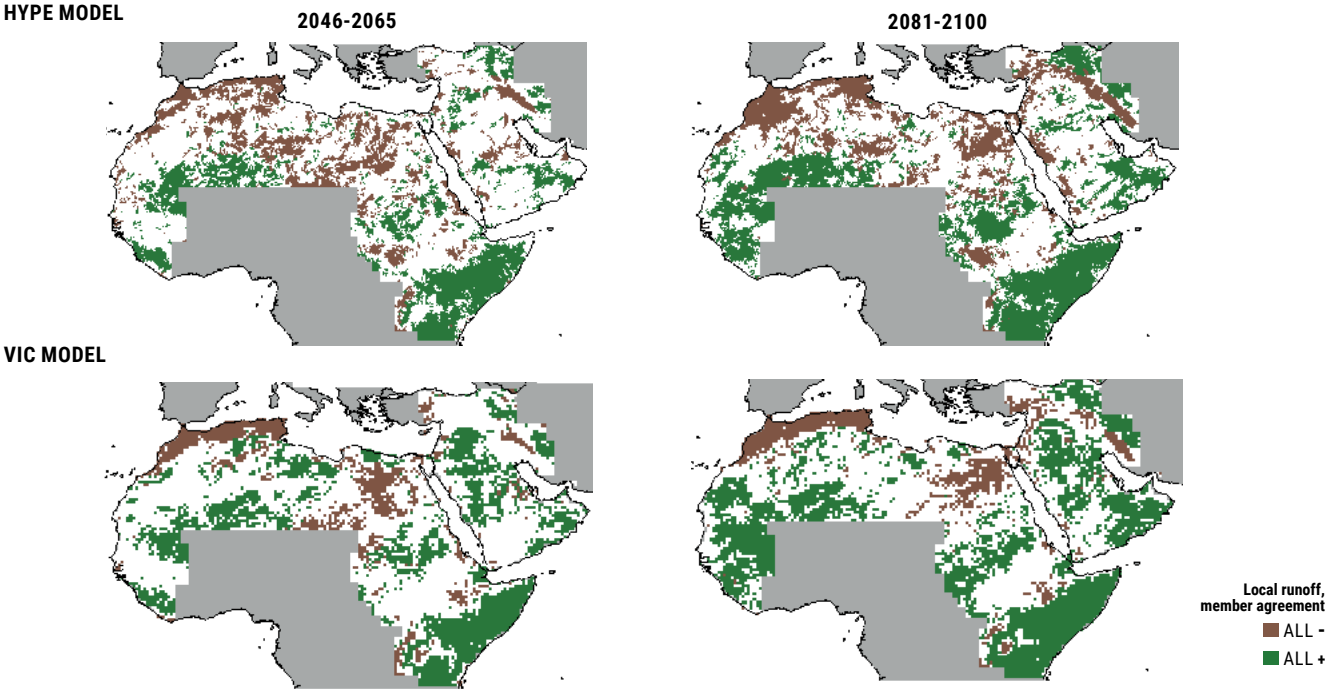



**FIGURE 27**

Agreement on mean change in seasonal runoff (October-March) from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century using two hydrological models

**RCP 8.5** OCTOBER - MARCH




**Note:** Brown indicates where all ensemble projections agree on a decrease (**-**) in runoff, and green indicates where all agree on an increase (**+**) in runoff

2.1. HYDROLOGICAL PARAMETERS – 2.1.2. EVAPOTRANSPIRATION

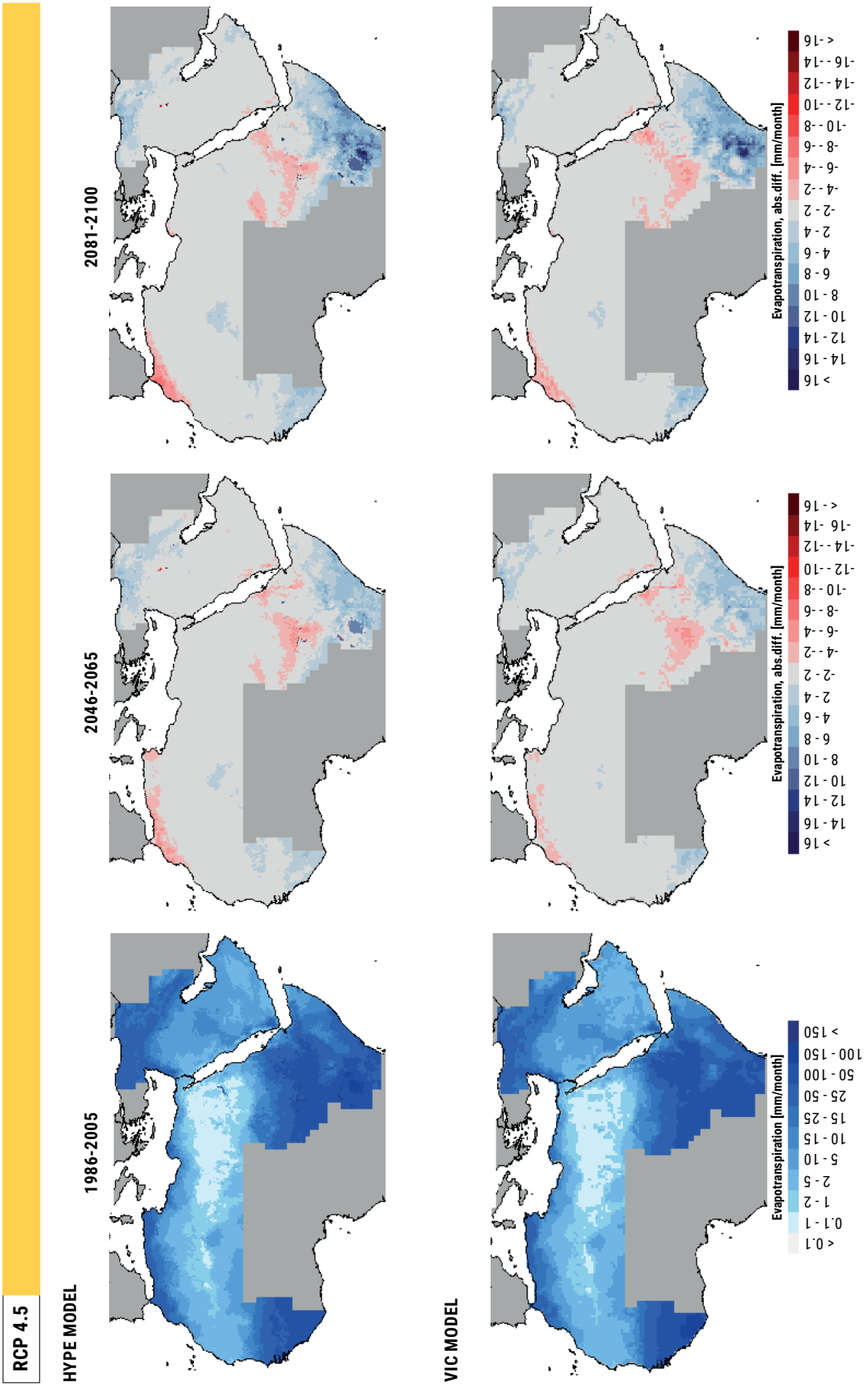



**FIGURE 28**
Mean change in annual evapotranspiration for mid-century and end-century for ensemble of three RCP 4.5 projections compared to the reference period using two hydrological models

2.1. HYDROLOGICAL PARAMETERS – **2.1.2. EVAPOTRANSPIRATION**

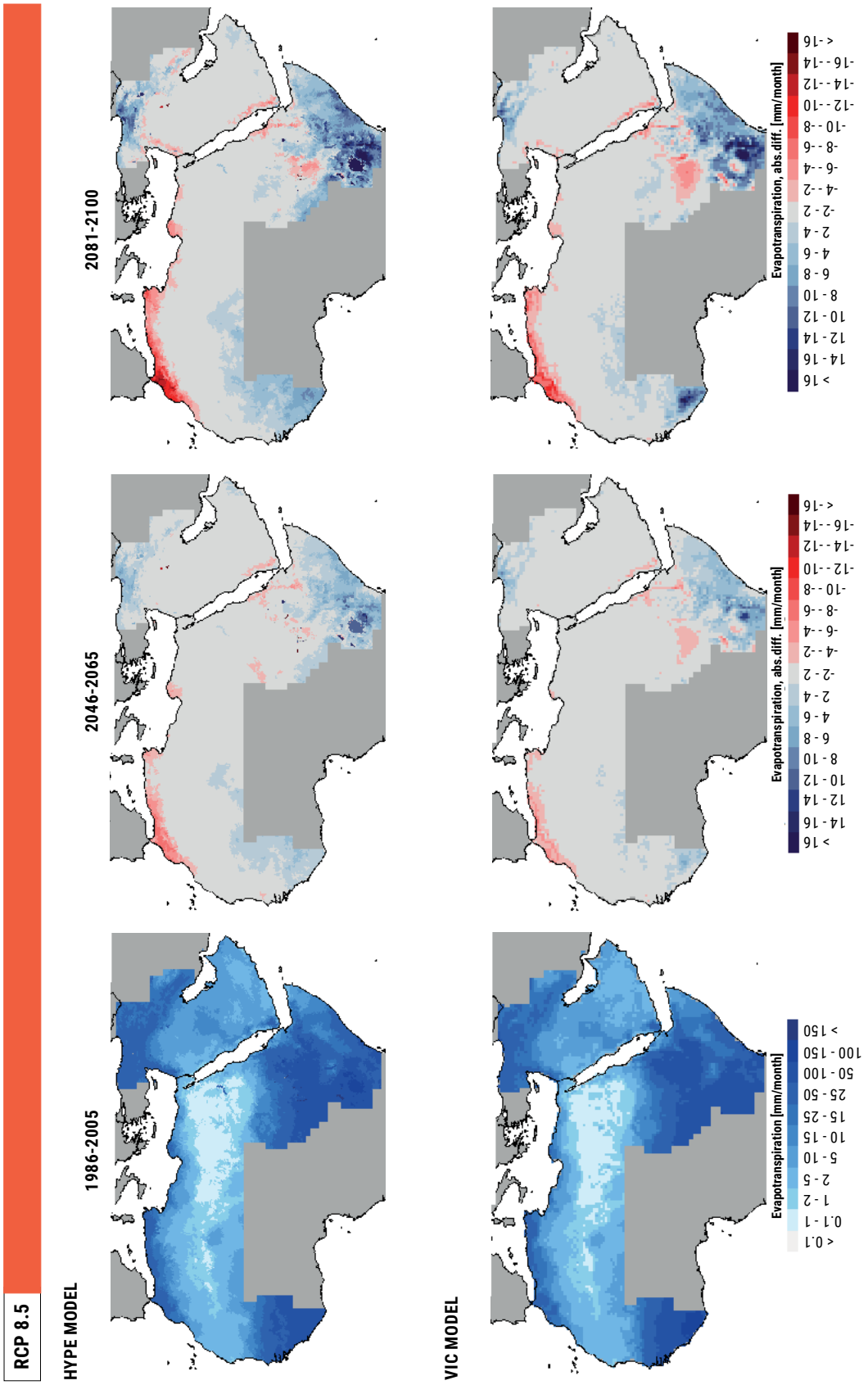
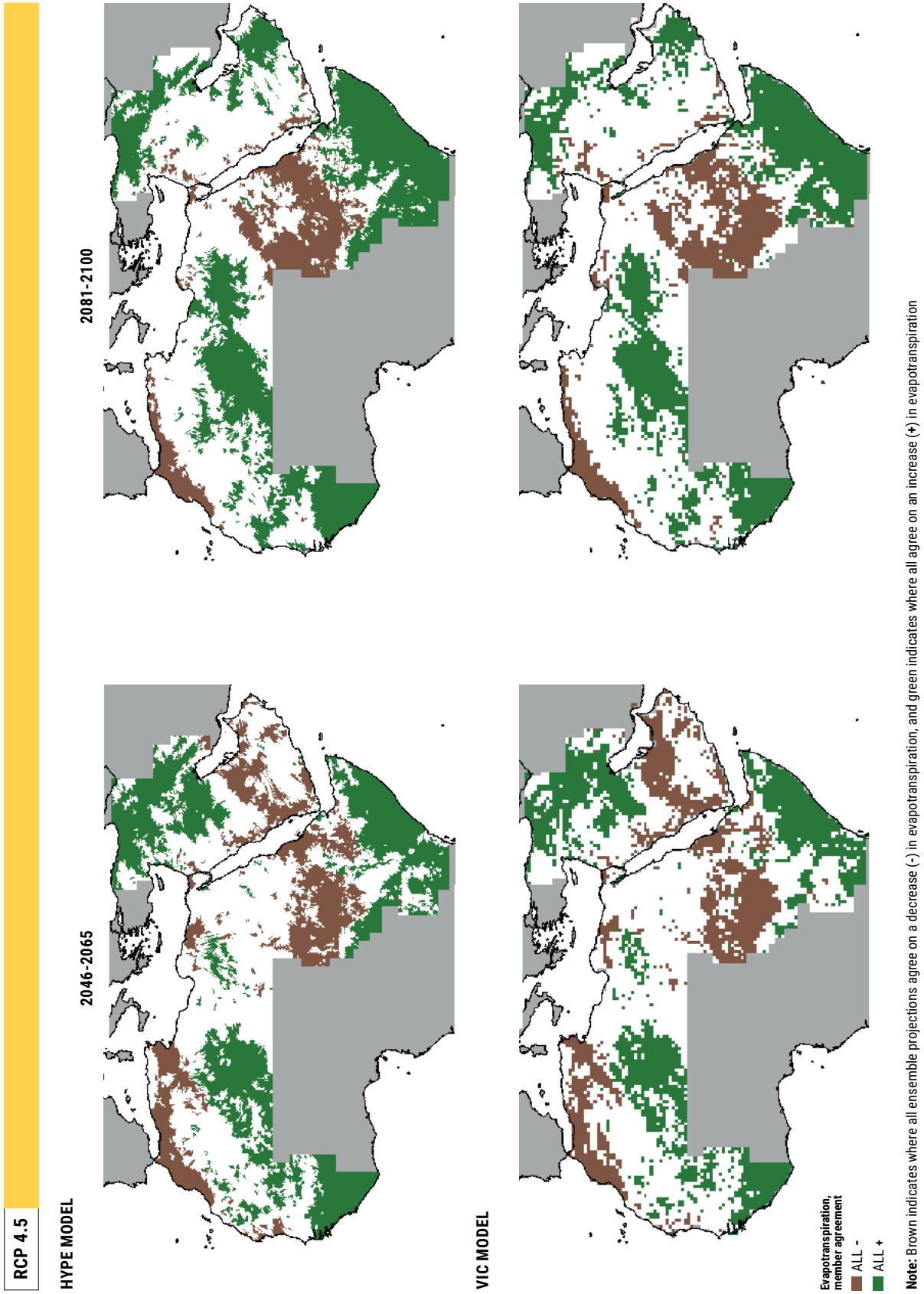



**FIGURE 29**
Mean change in annual evapotranspiration for mid-century and end-century for ensemble of three RCP 8.5 projections compared to the reference period using two hydrological models

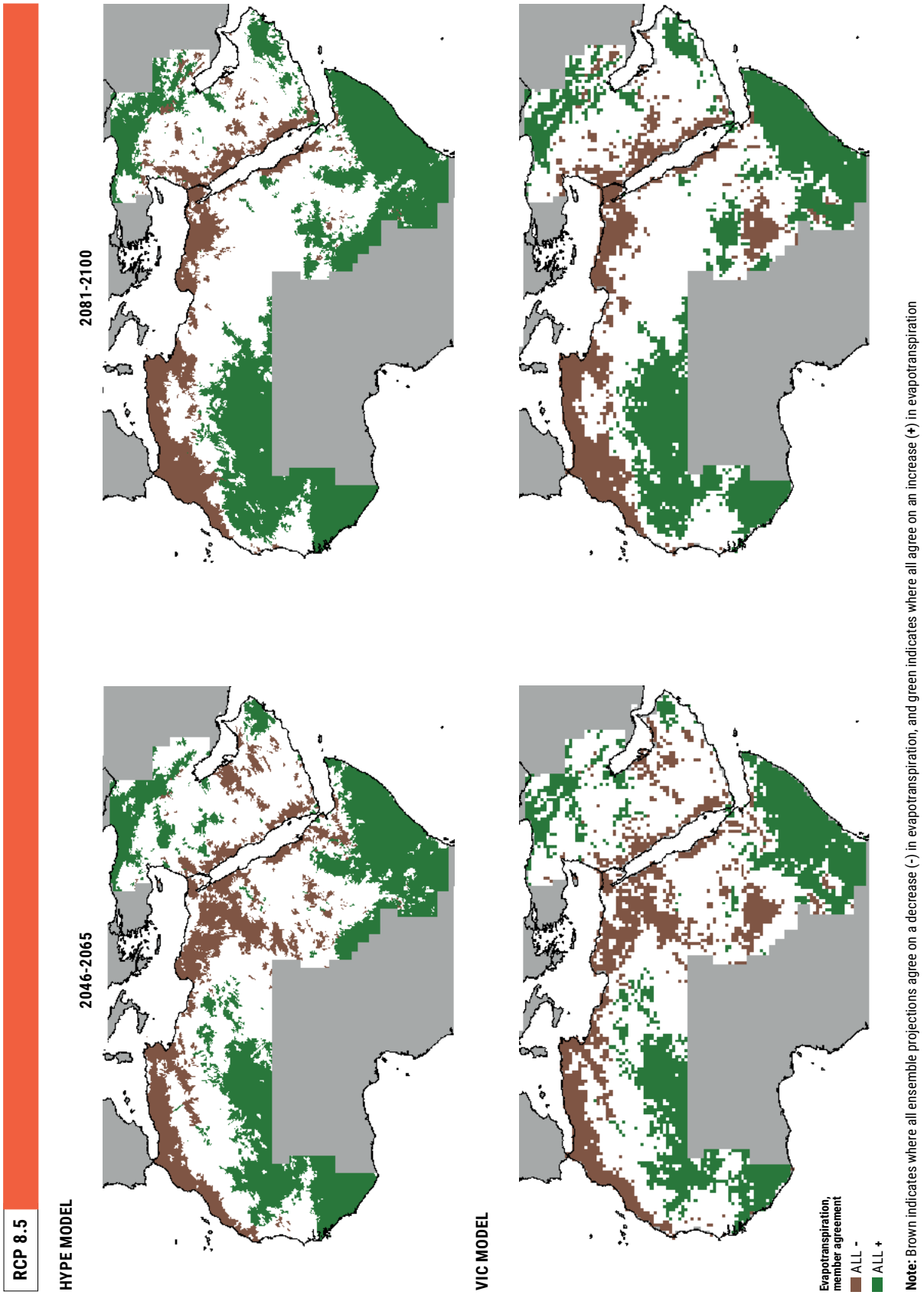
**FIGURE 30**
Agreement on mean change in annual evapotranspiration from the reference period between the ensemble of three RCP 4.5 projections for mid-century and end-century using two hydrological models




**Note:** Brown indicates where all ensemble projections agree on a decrease (-) in evapotranspiration, and green indicates where all agree on an increase (+) in evapotranspiration

2.1. HYDROLOGICAL PARAMETERS – **2.1.2. EVAPOTRANSPIRATION**

**FIGURE 31**
Agreement on mean change in annual evapotranspiration from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century using two hydrological models




**Note:** Brown indicates where all ensemble projections agree on a decrease (-) in evapotranspiration, and green indicates where all agree on an increase (+) in evapotranspiration

# CHAPTER 3

## MOROCCAN HIGHLANDS

3.1. GENERAL PARAMETERS – 3.1.1. TEMPERATURE

**FIGURE 32**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

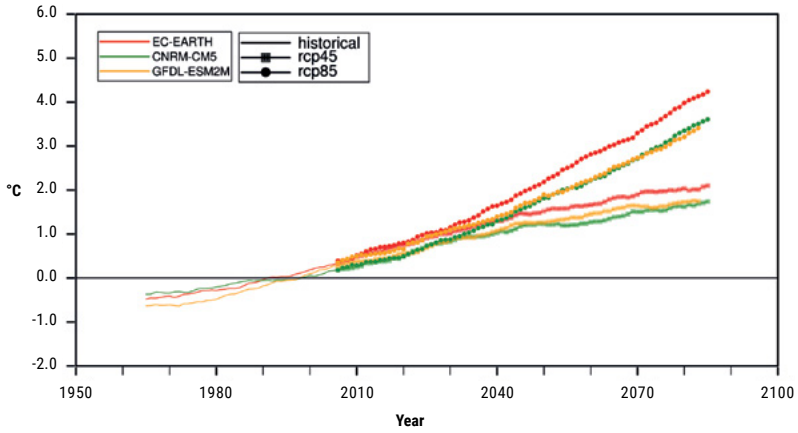



**FIGURE 33**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

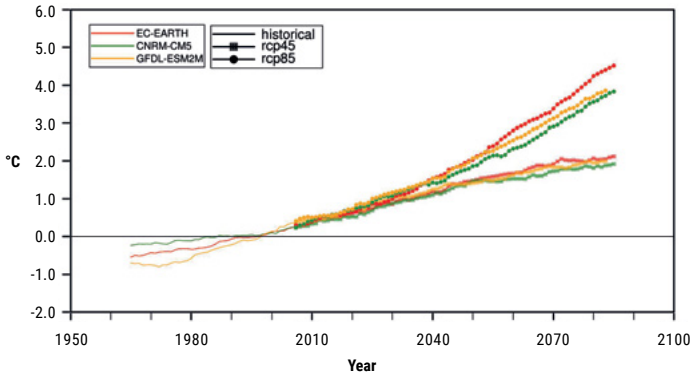



**FIGURE 34**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

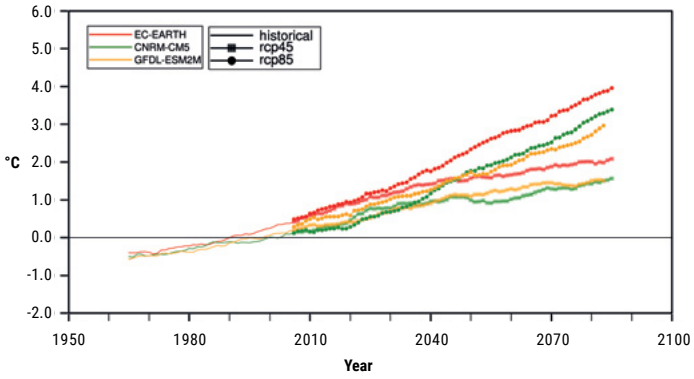



**FIGURE 35**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

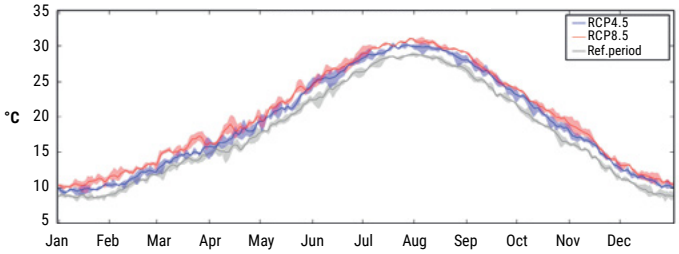
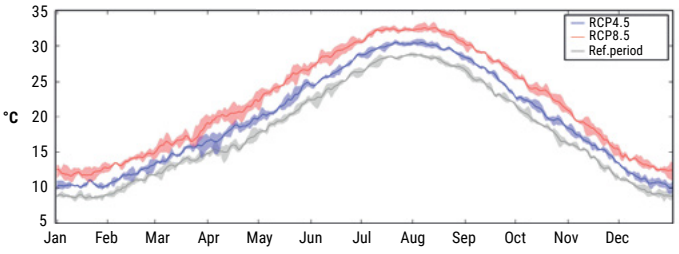



**FIGURE 36**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



3.1. GENERAL PARAMETERS – **3.1.2. PRECIPITATION**

**FIGURE 37**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

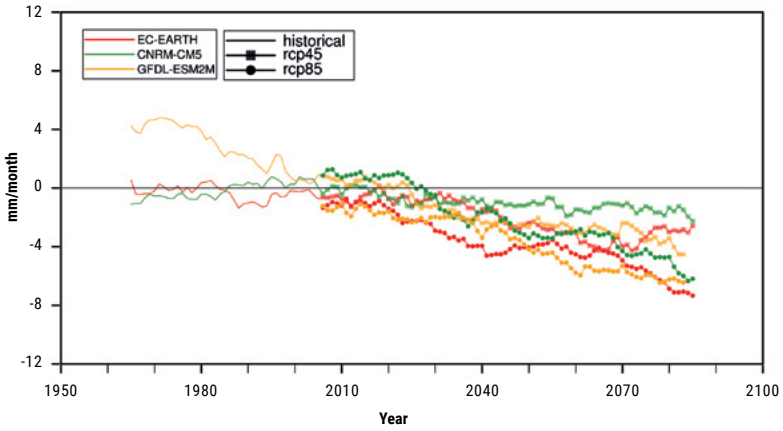



**FIGURE 38**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

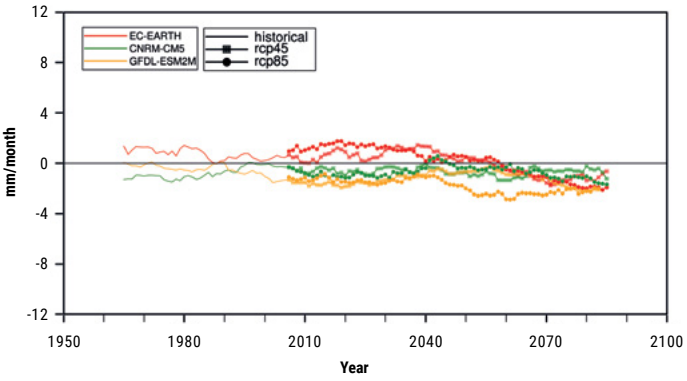



**FIGURE 39**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

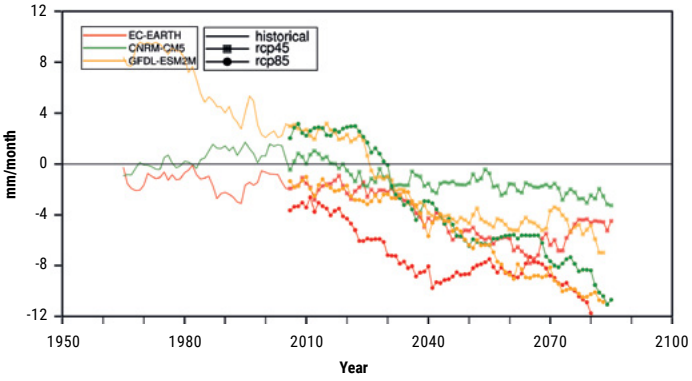



**FIGURE 40**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

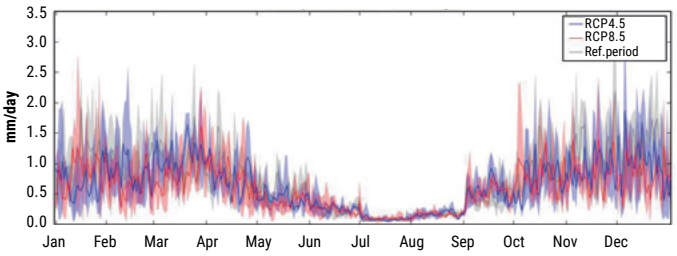
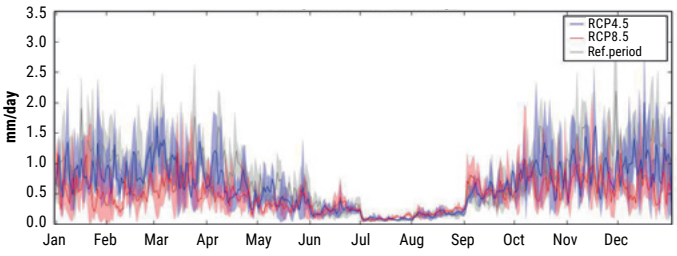



**FIGURE 41**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 3.2. EXTREME EVENTS – 3.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 42**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

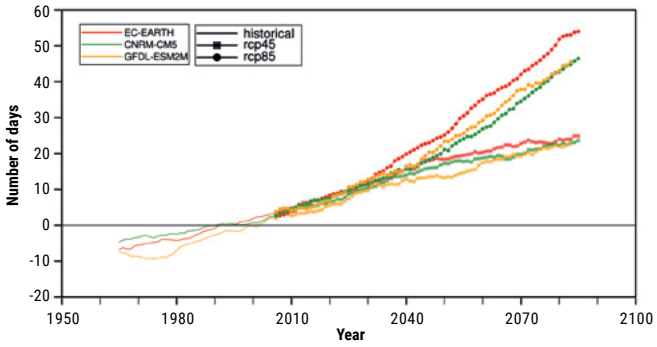



**FIGURE 43**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

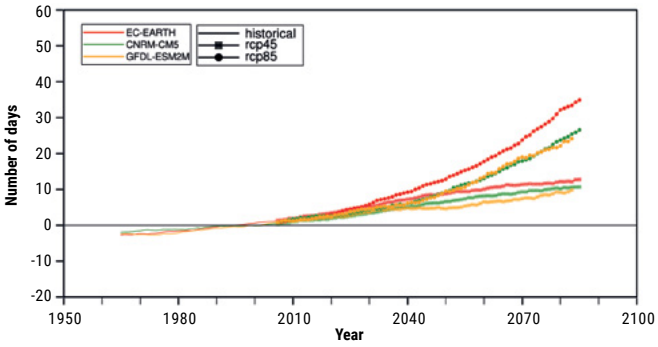
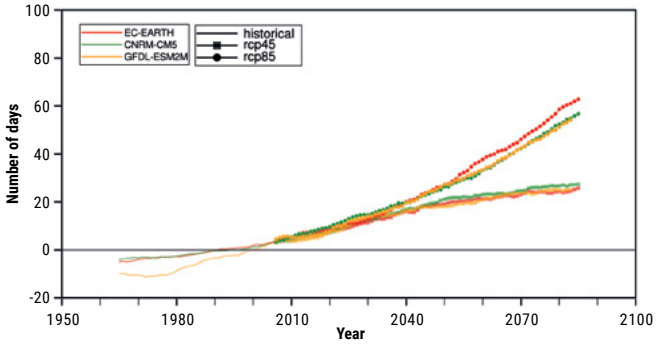



**FIGURE 44**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 3.2. EXTREME EVENTS – 3.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 45**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

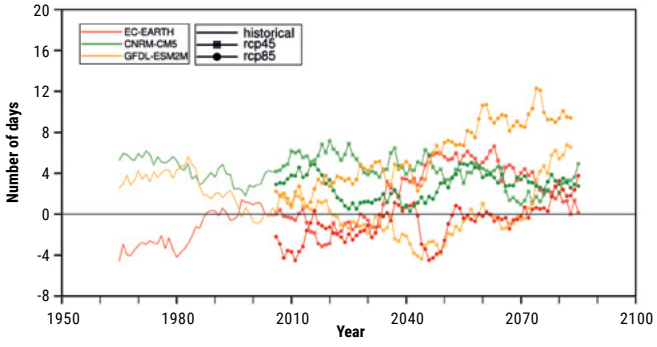



**FIGURE 46**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

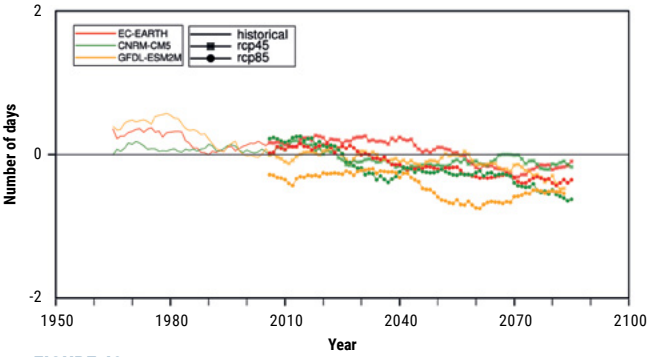



**FIGURE 47**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

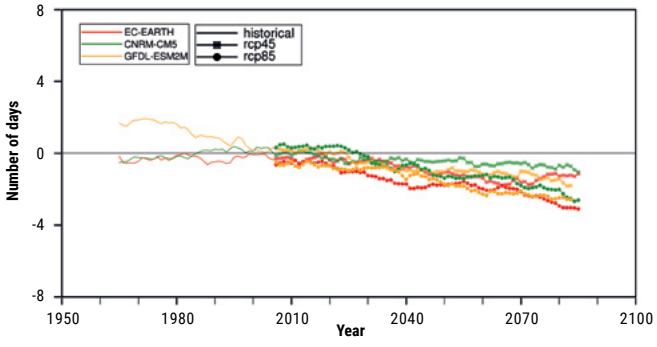
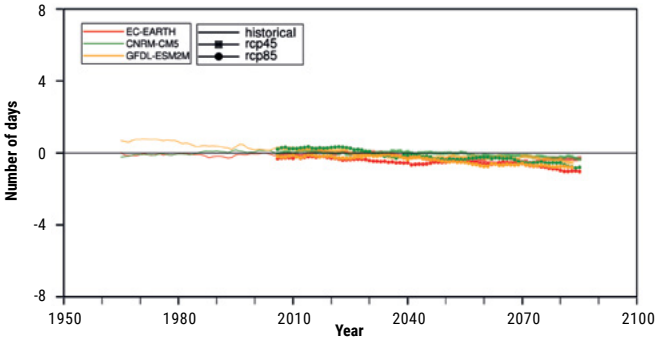



**FIGURE 48**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



3.3. HYDROLOGICAL PARAMETERS – **3.3.1. RUNOFF**

**FIGURE 49**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

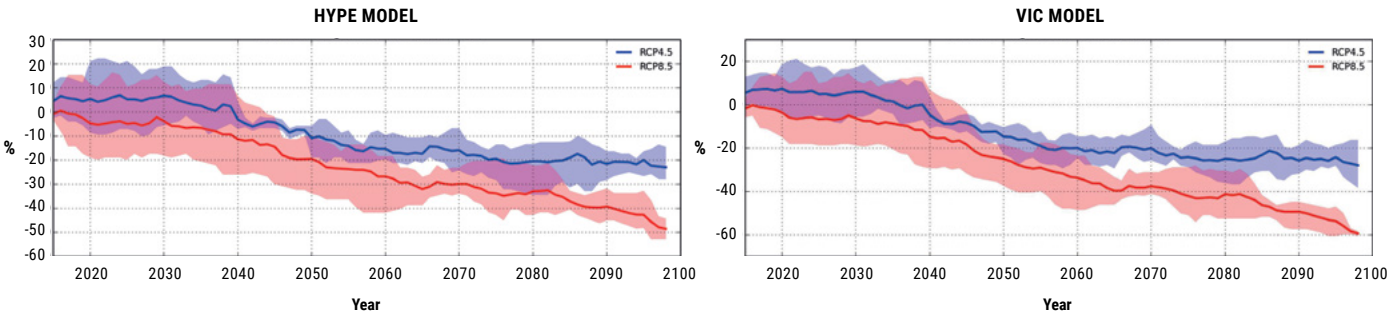



**FIGURE 50**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

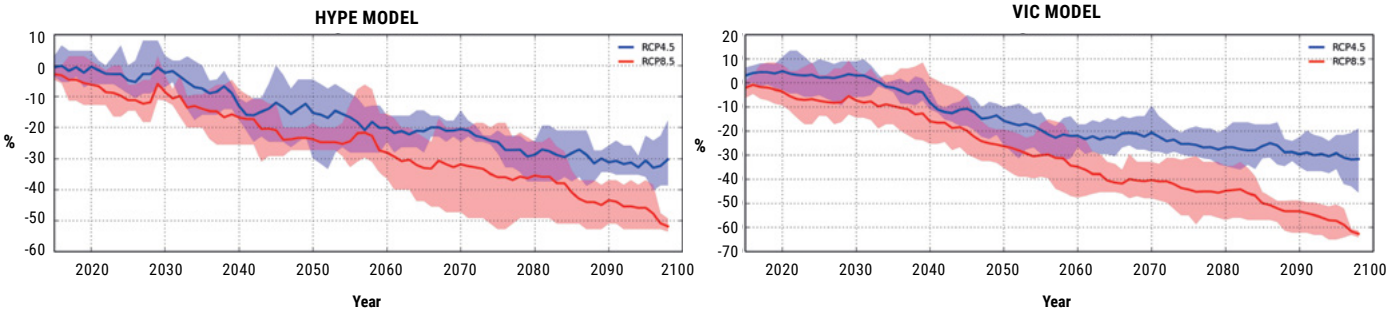
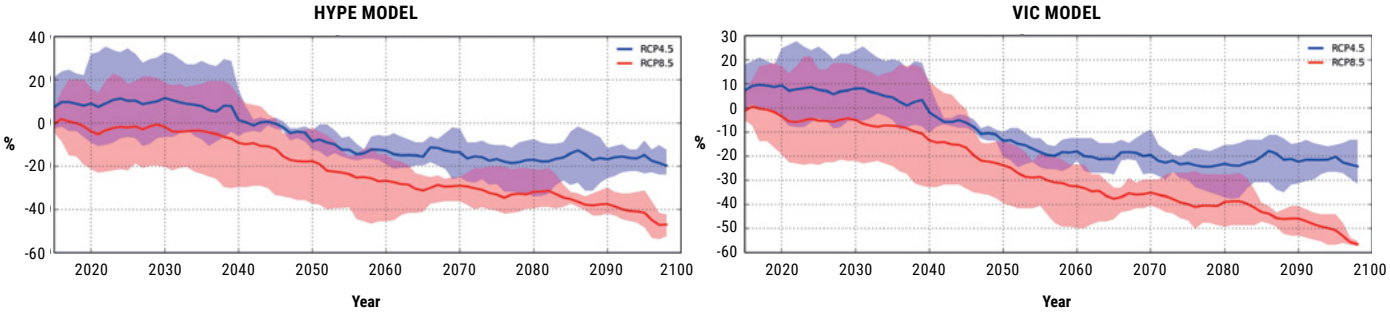
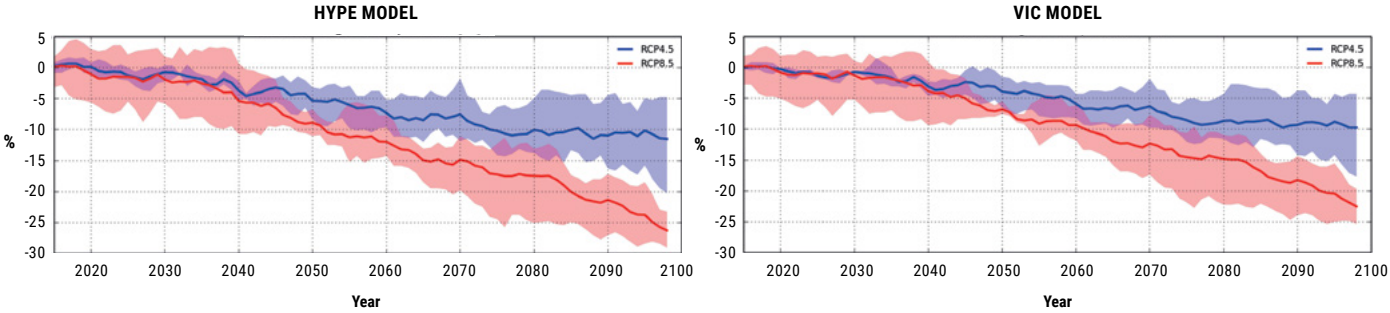



**FIGURE 51**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models




3.3. HYDROLOGICAL PARAMETERS – **3.3.2. EVAPOTRANSPIRATION**

**FIGURE 52**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



3.3. HYDROLOGICAL PARAMETERS – **3.3.3. COMPARISON 50 KM VS 25 KM RESOLUTIONS - RUNOFF**

**FIGURE 53**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

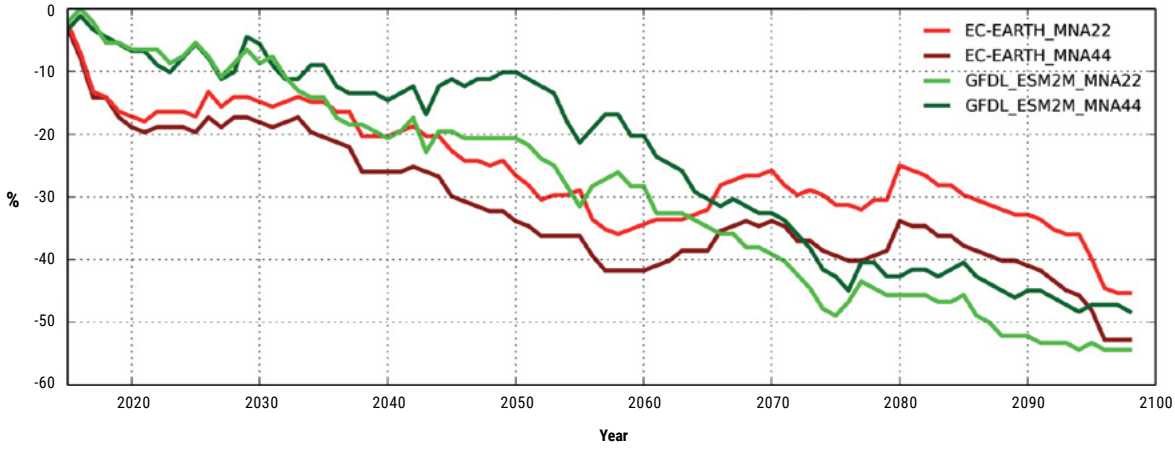



**FIGURE 54**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

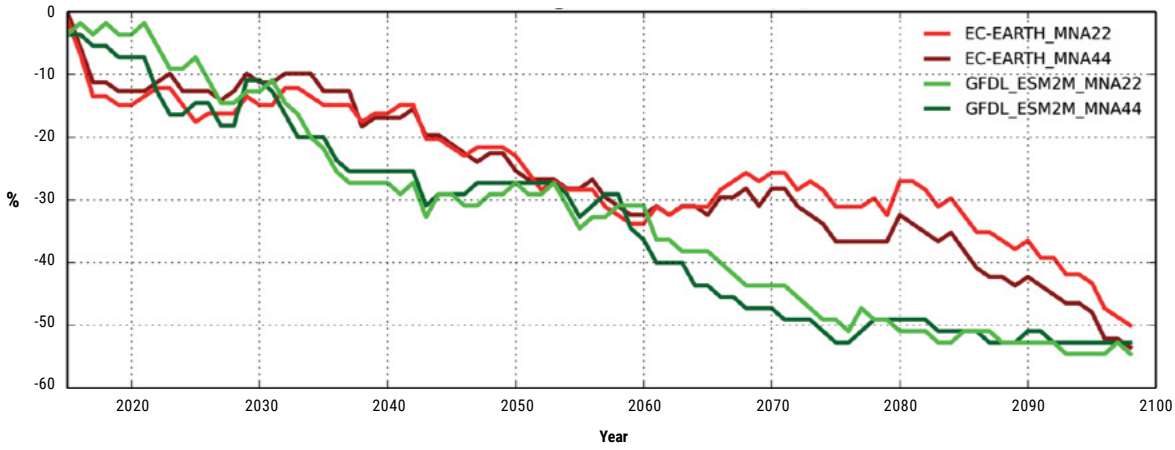
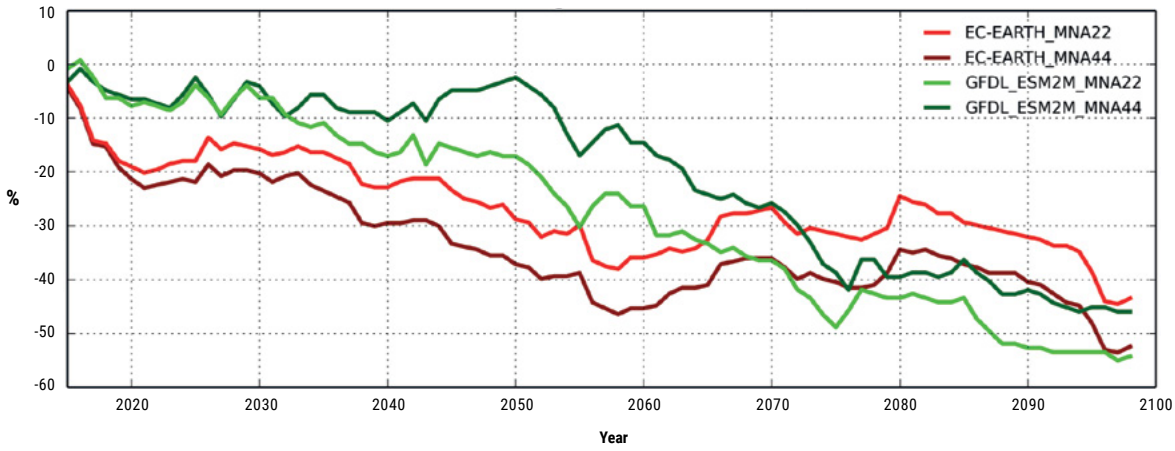
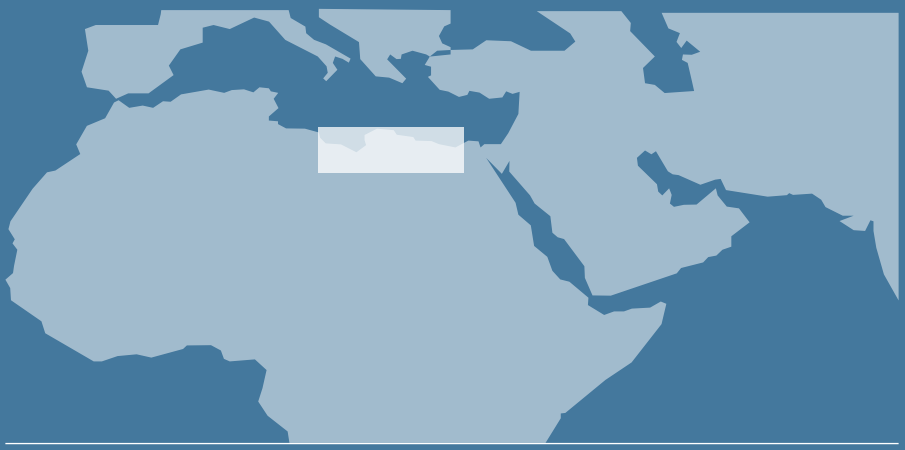



**FIGURE 55**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 4



## MEDITERRANEAN COAST

4.1. GENERAL PARAMETERS – 4.1.1. TEMPERATURE

**FIGURE 56**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

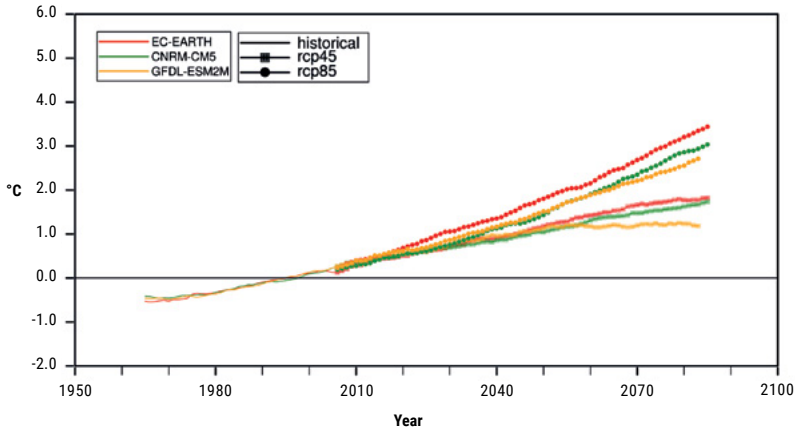



**FIGURE 57**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

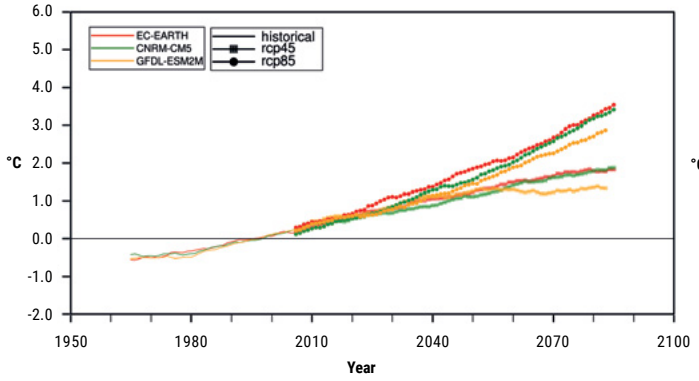



**FIGURE 58**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

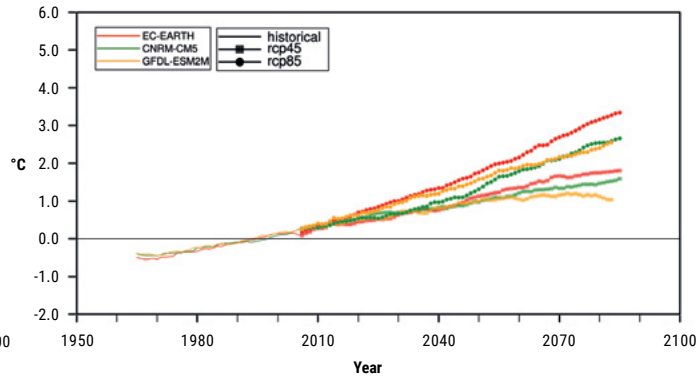



**FIGURE 59**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

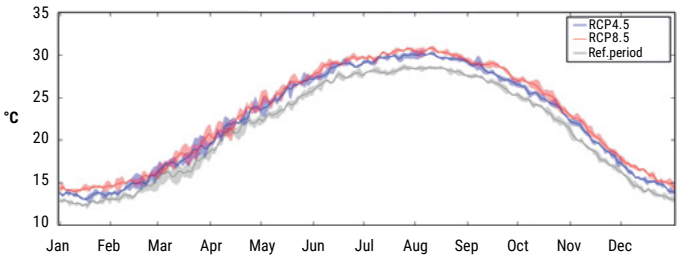
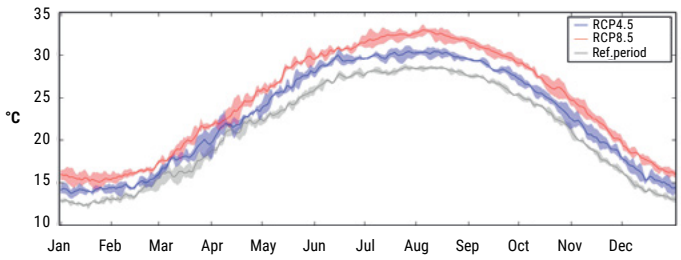



**FIGURE 60**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



4.1. GENERAL PARAMETERS – **4.1.2. PRECIPITATION**

**FIGURE 61**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

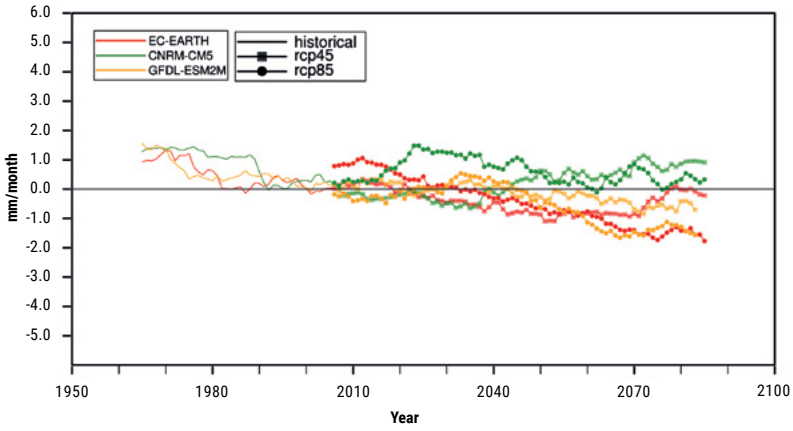



**FIGURE 62**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

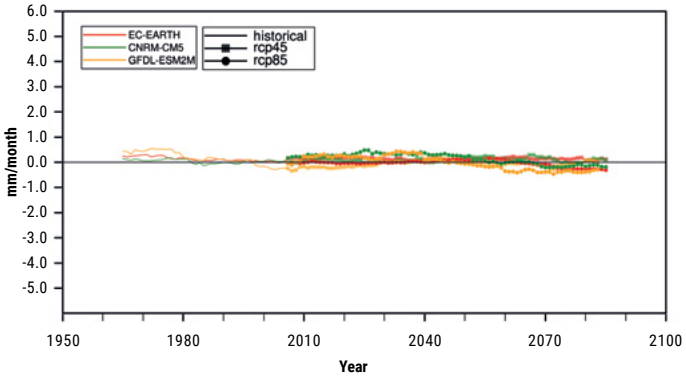



**FIGURE 63**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

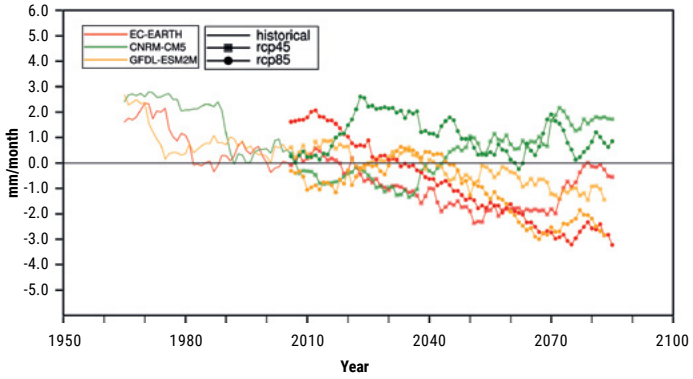



**FIGURE 64**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

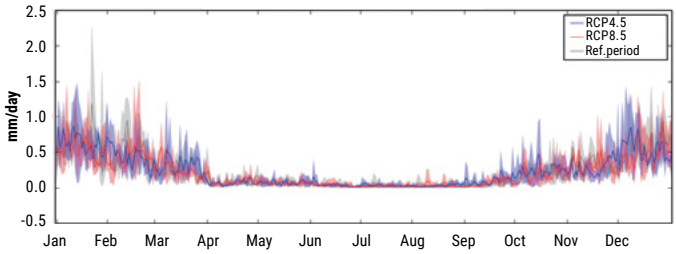
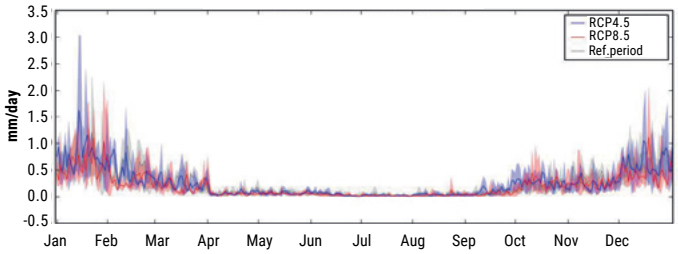



**FIGURE 65**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 4.2. EXTREME EVENTS – 4.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 66**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

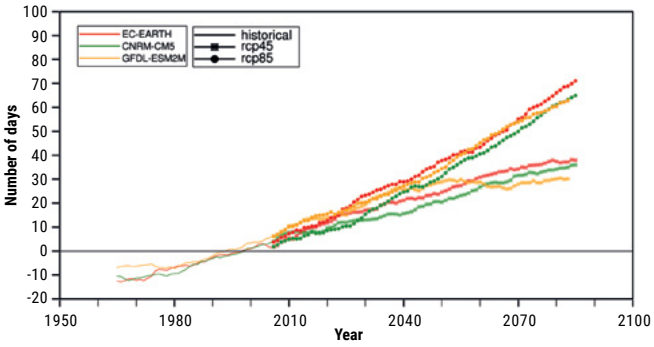



**FIGURE 67**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

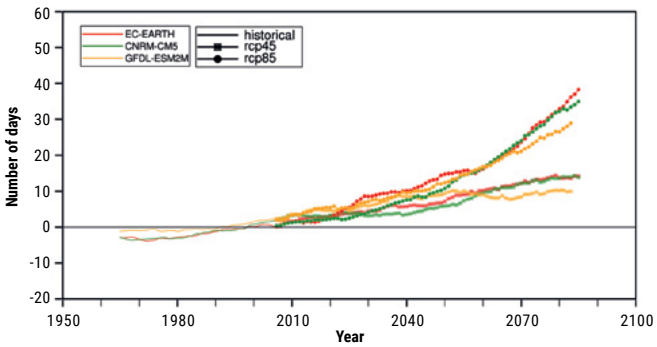
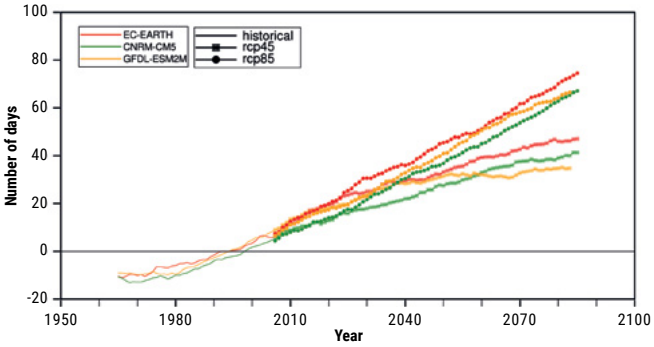



**FIGURE 68**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 4.2. EXTREME EVENTS – 4.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 69**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

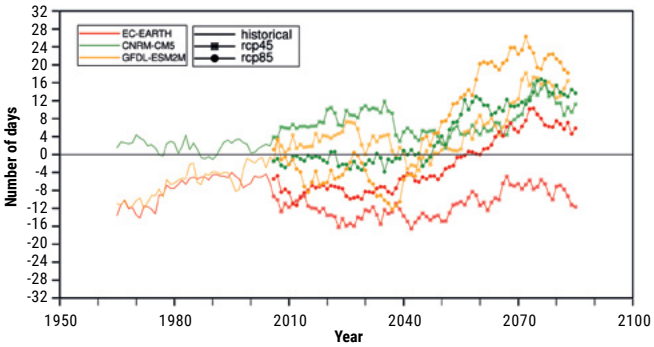



**FIGURE 70**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

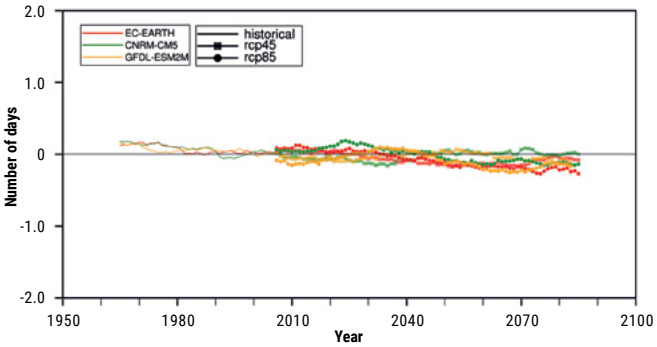



**FIGURE 71**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

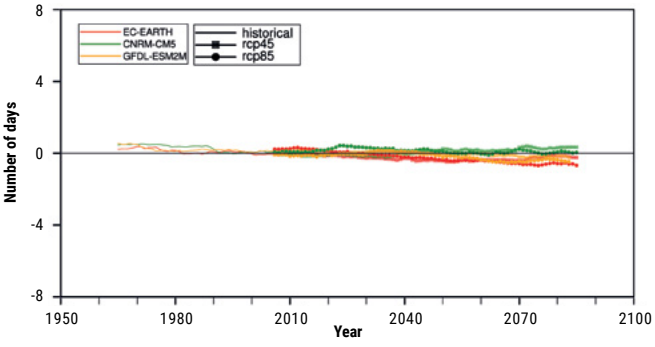
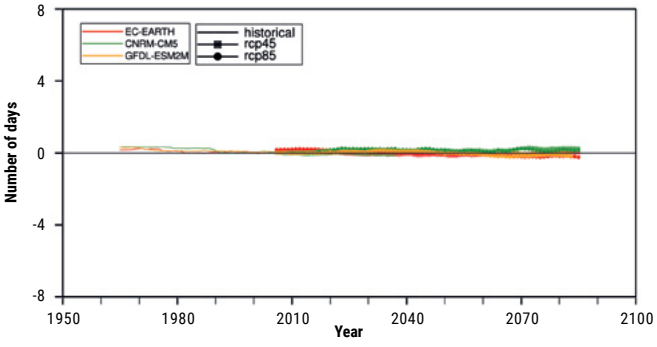



**FIGURE 72**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



## 4.3. HYDROLOGICAL PARAMETERS – 4.3.1. RUNOFF

**FIGURE 73**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

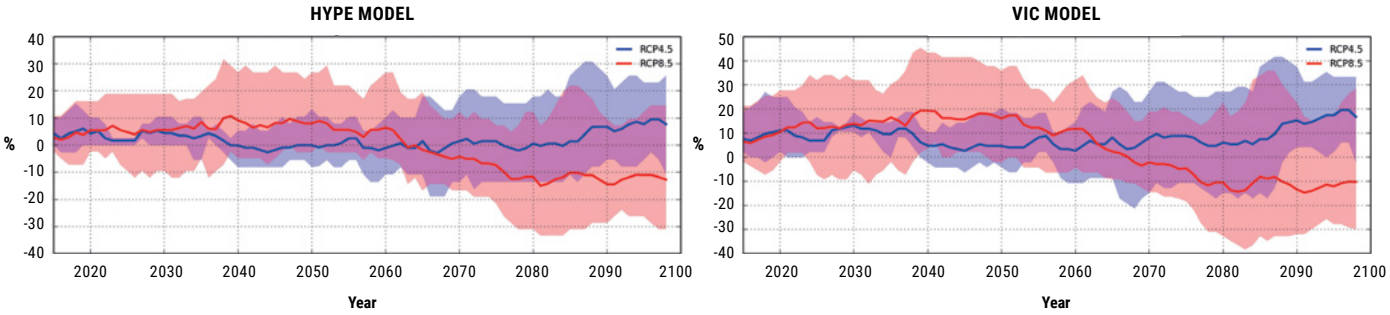



**FIGURE 74**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

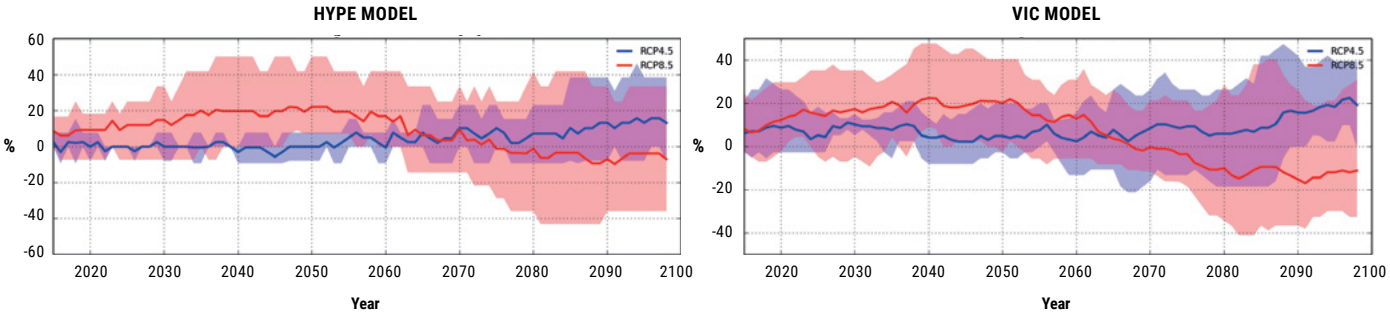
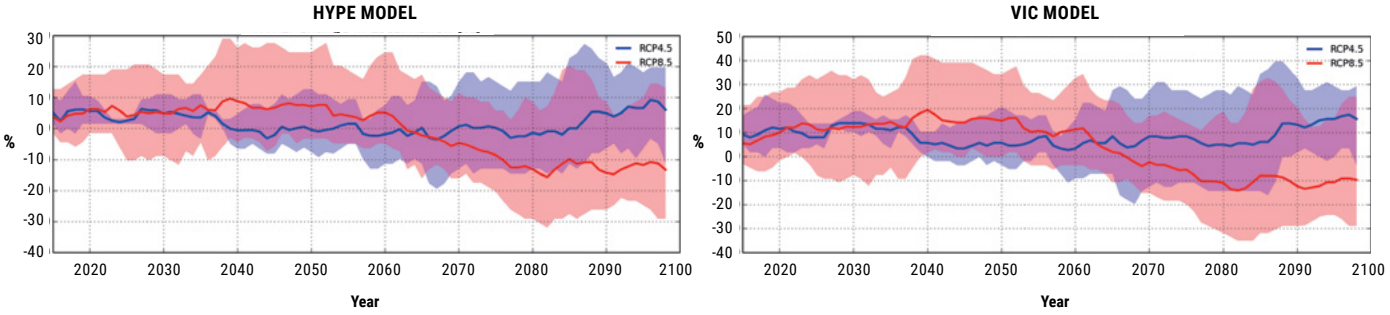
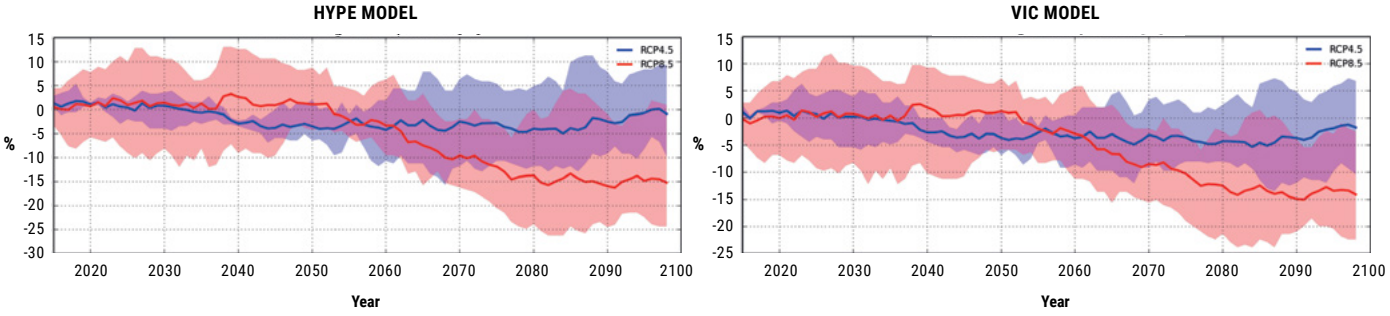



**FIGURE 75**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models




## 4.3. HYDROLOGICAL PARAMETERS – 4.3.2. EVAPOTRANSPIRATION

**FIGURE 76**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



4.3. HYDROLOGICAL PARAMETERS – **4.3.3. COMPARISON 50 KM VS 25 KM RESOLUTIONS - RUNOFF**

**FIGURE 77**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

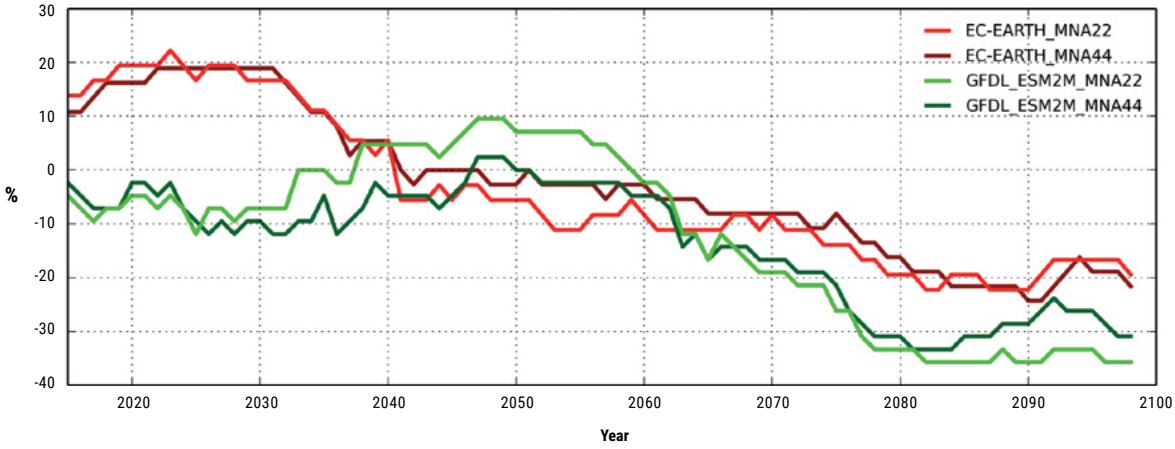



**FIGURE 78**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

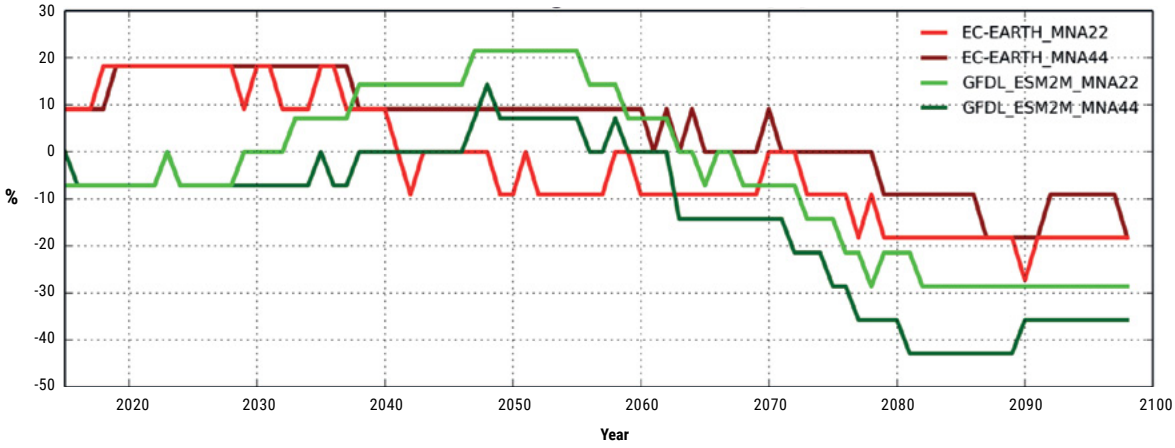
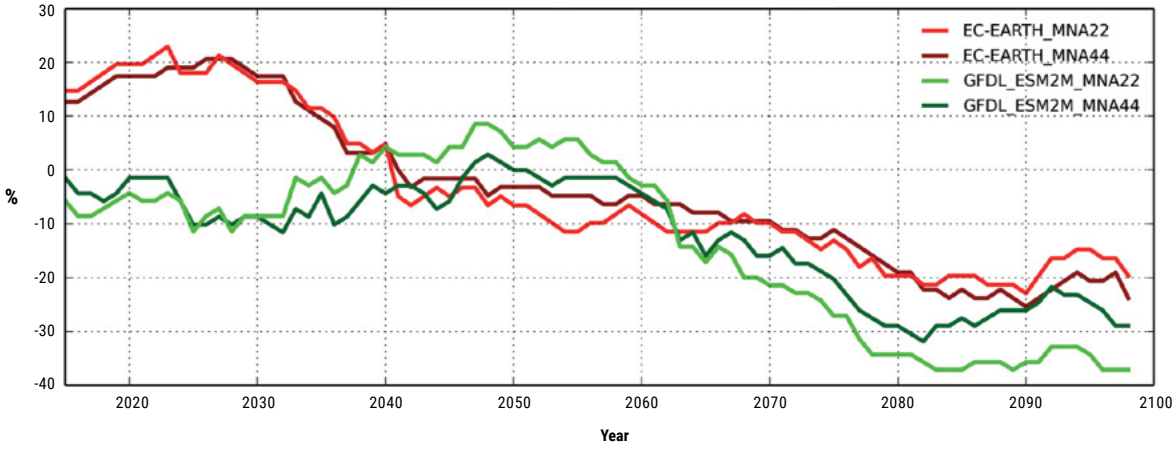
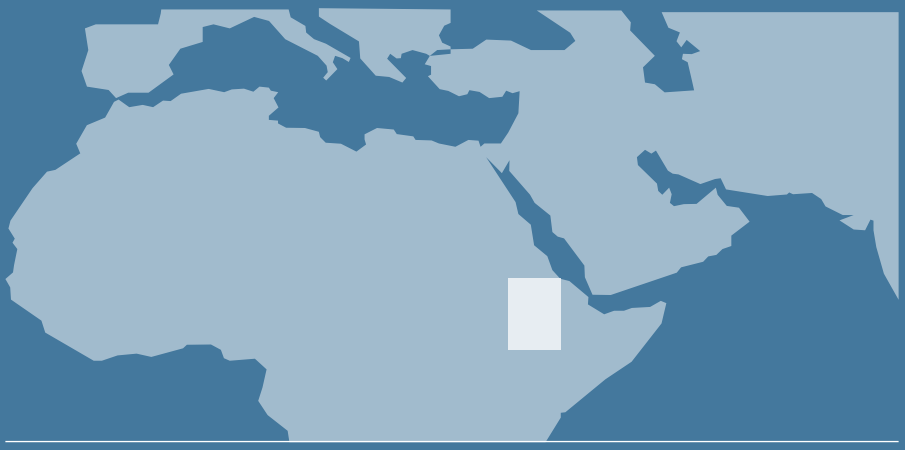



**FIGURE 79**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 5



## NILE RIVER: BLUE NILE HEADWATERS

5.1. GENERAL PARAMETERS – 5.1.1. TEMPERATURE

**FIGURE 80**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

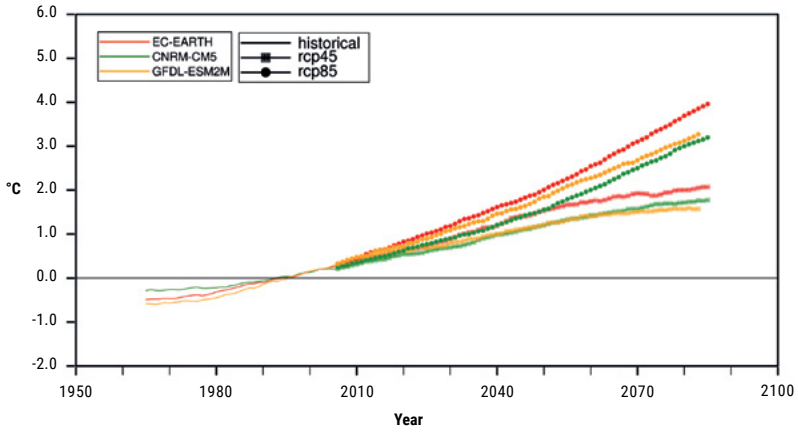



**FIGURE 81**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

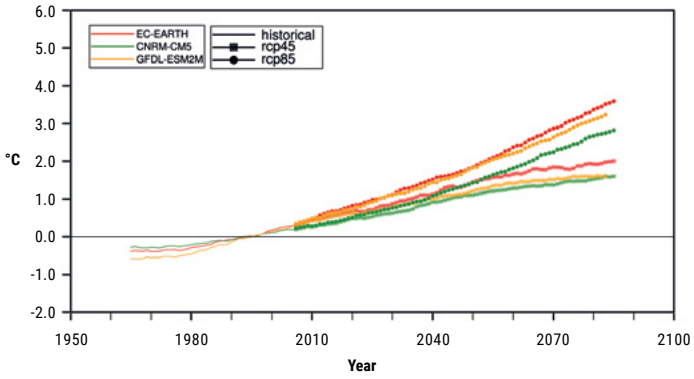



**FIGURE 82**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

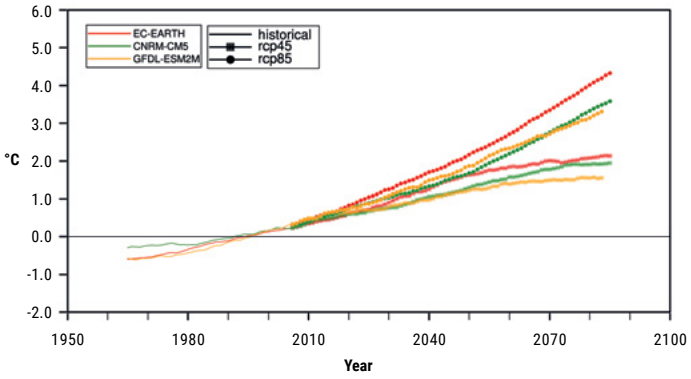



**FIGURE 83**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

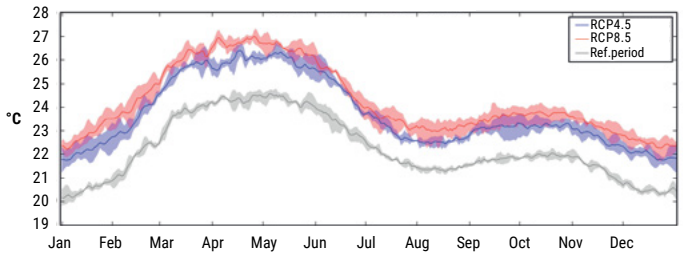
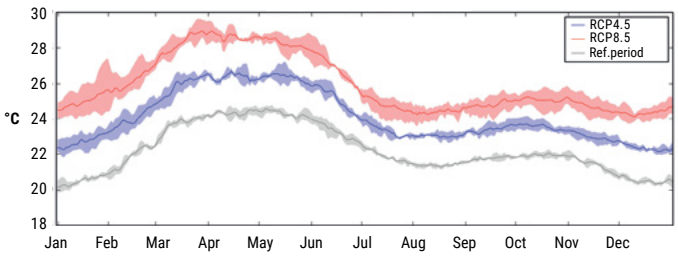



**FIGURE 84**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



5.1. GENERAL PARAMETERS – **5.1.2. PRECIPITATION**

**FIGURE 85**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

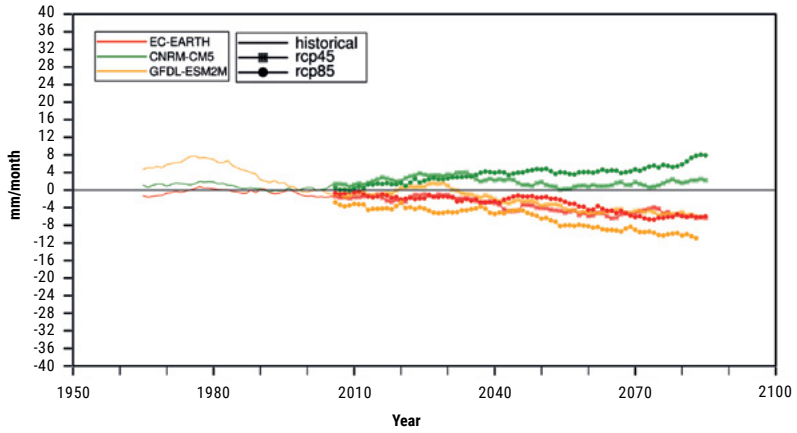



**FIGURE 86**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

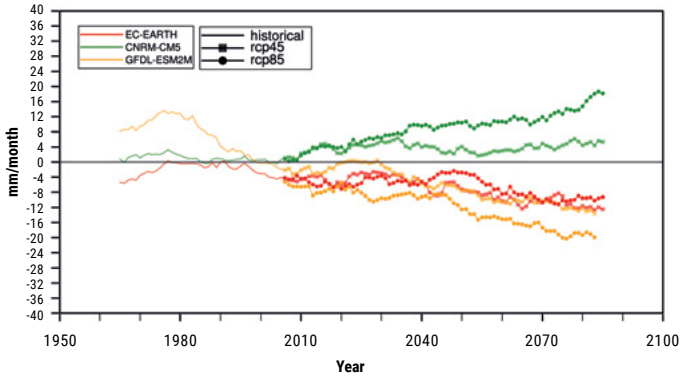



**FIGURE 87**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

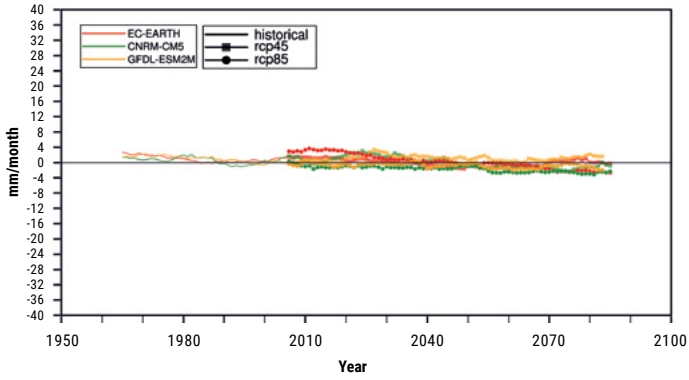



**FIGURE 88**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

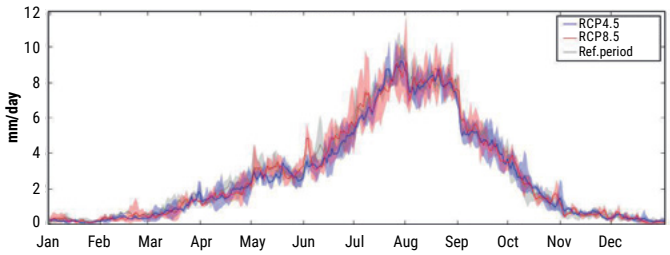
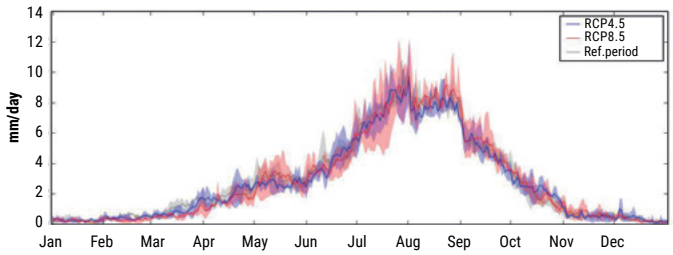



**FIGURE 89**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 5.2. EXTREME EVENTS – 5.2.2. CHANGES IN EXTREME TEMPERATURE

**FIGURE 90**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

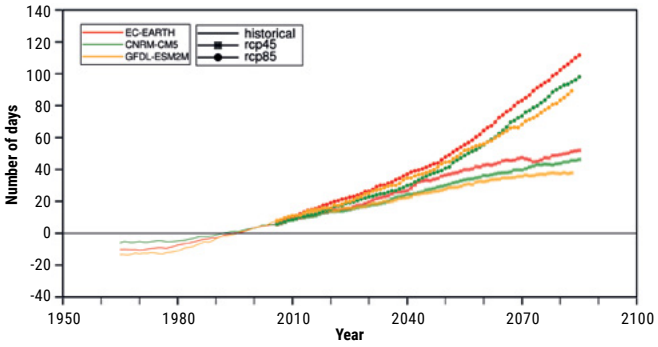



**FIGURE 91**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

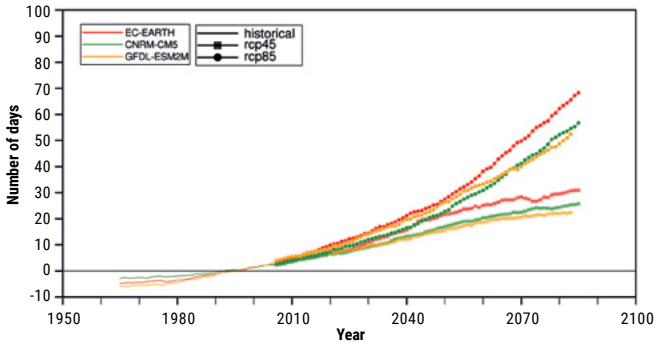
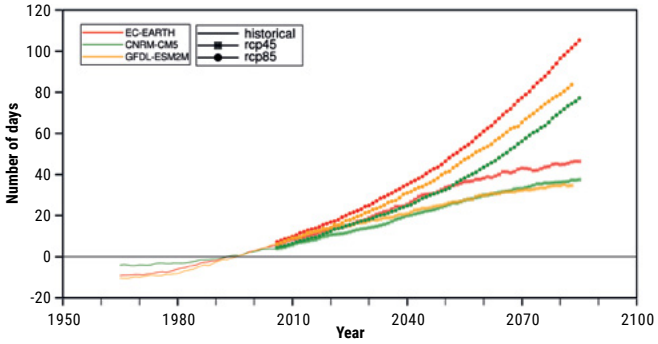



**FIGURE 92**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 5.2. EXTREME EVENTS – 5.2.3. CHANGES IN EXTREME PRECIPITATION

**FIGURE 93**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

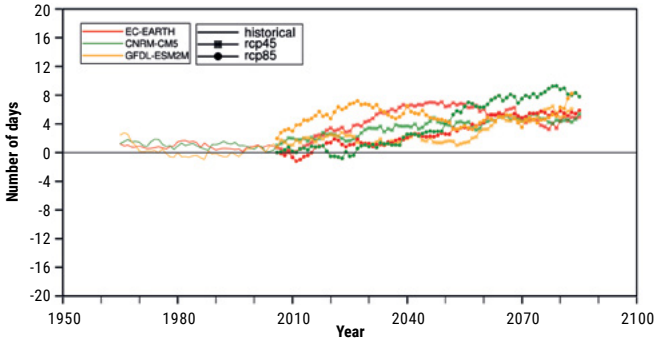



**FIGURE 94**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

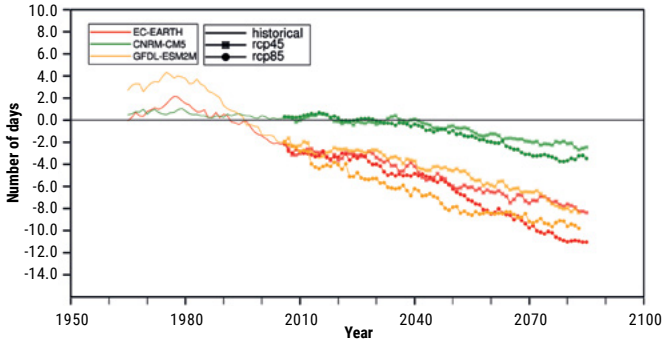



**FIGURE 95**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

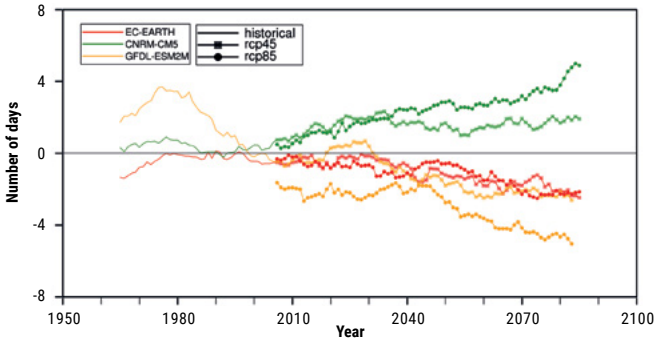
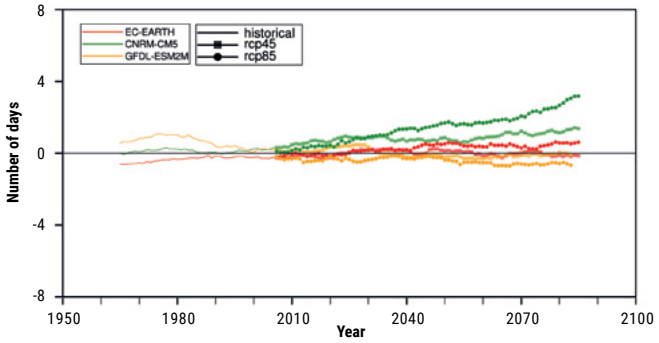



**FIGURE 96**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



5.3. HYDROLOGICAL PARAMETERS – **5.3.1. RUNOFF**

**FIGURE 97**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

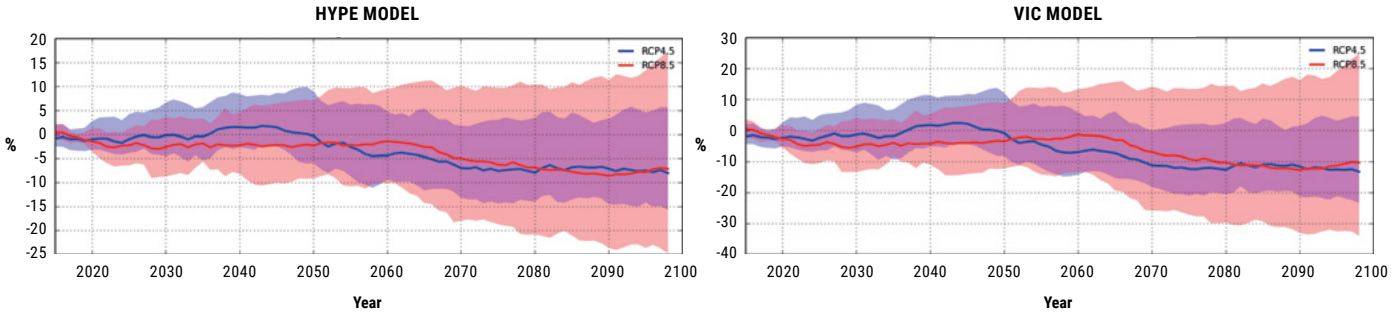



**FIGURE 98**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

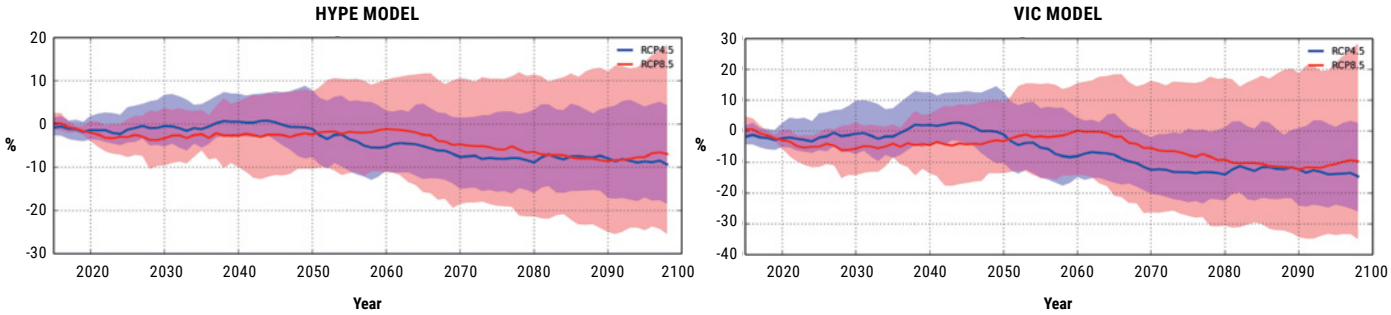
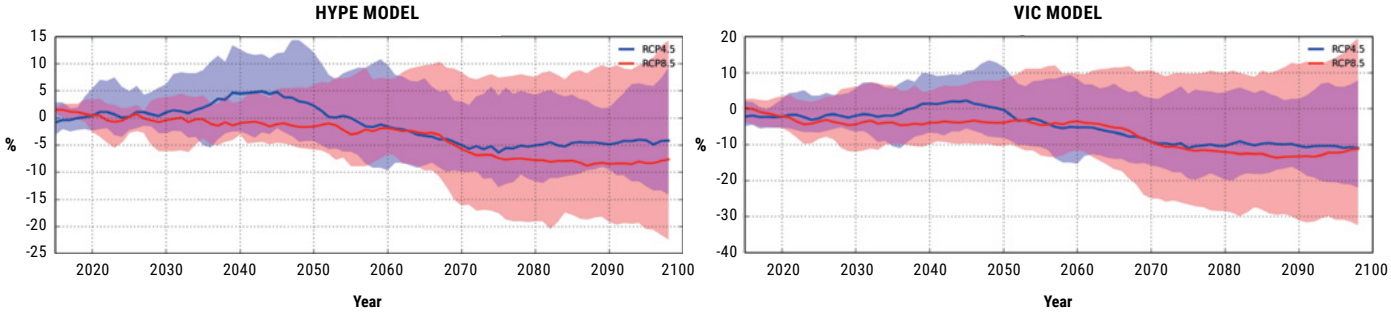



**FIGURE 99**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



5.3. HYDROLOGICAL PARAMETERS – 5.3.2. DISCHARGE

**FIGURE 100**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

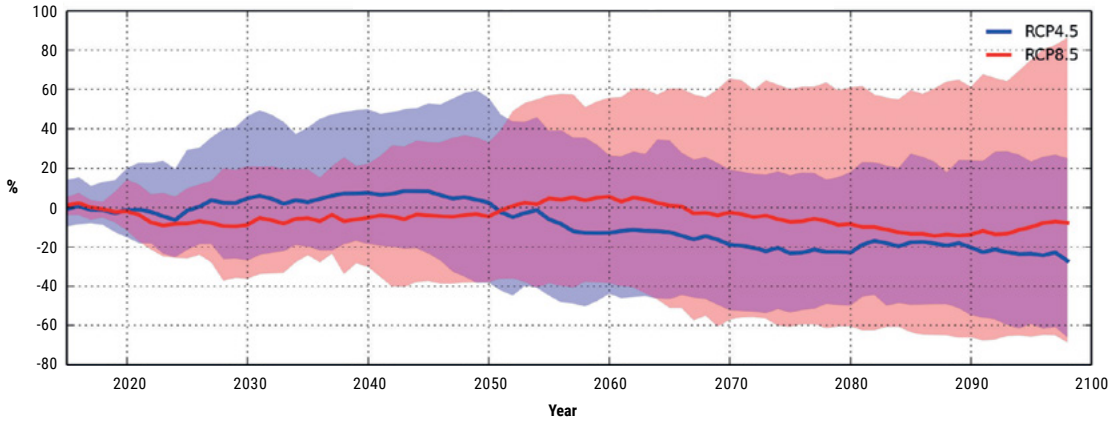



**FIGURE 101**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

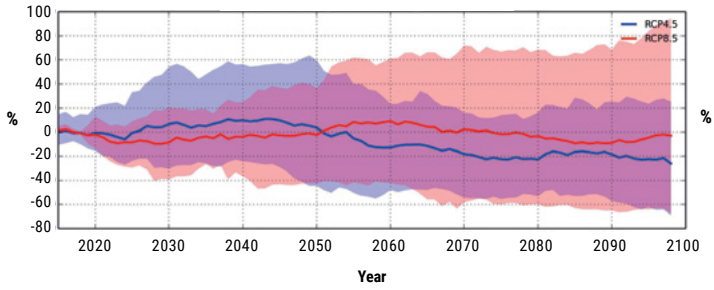
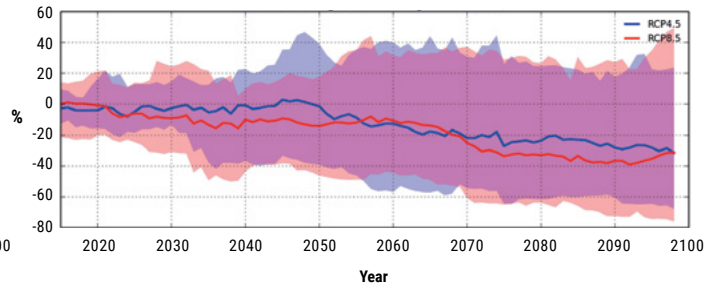
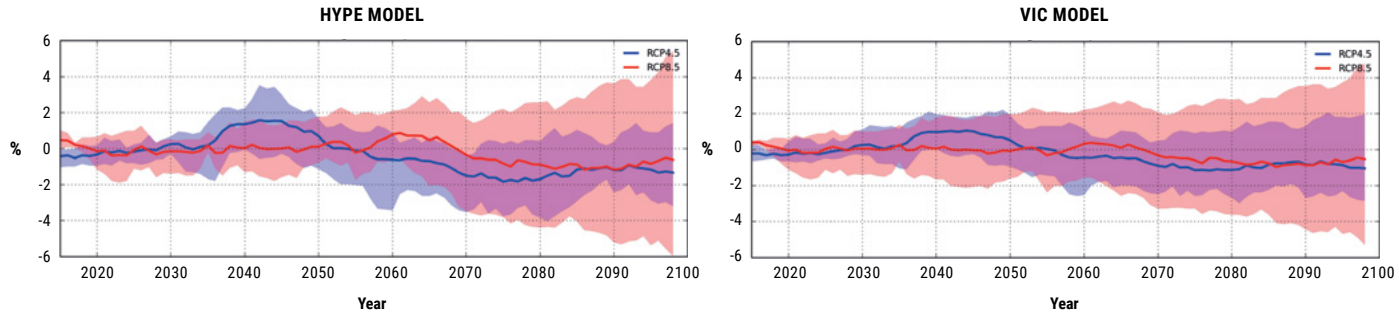



**FIGURE 102**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




5.3. HYDROLOGICAL PARAMETERS – 5.3.3. EVAPOTRANSPIRATION

**FIGURE 103**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



5.3. HYDROLOGICAL PARAMETERS – 5.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **5.3.4.1. RUNOFF**

**FIGURE 104**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

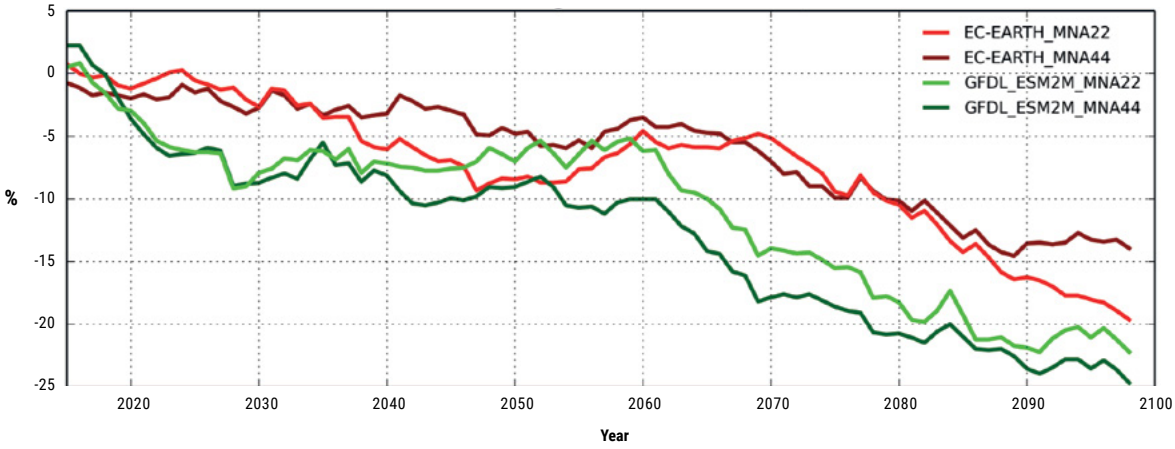



**FIGURE 105**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

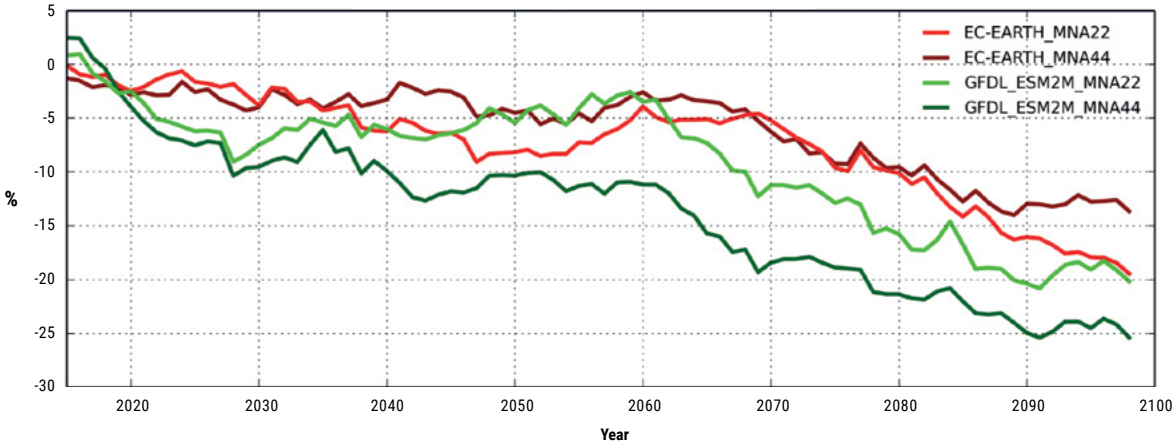
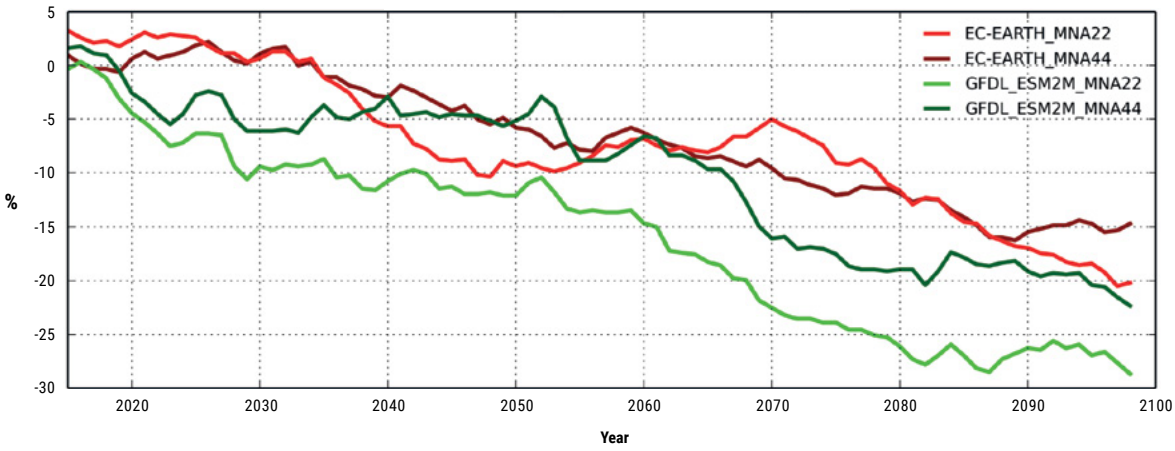



**FIGURE 106**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



5.3. HYDROLOGICAL PARAMETERS – 5.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 5.3.4.2. DISCHARGE

**FIGURE 107**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

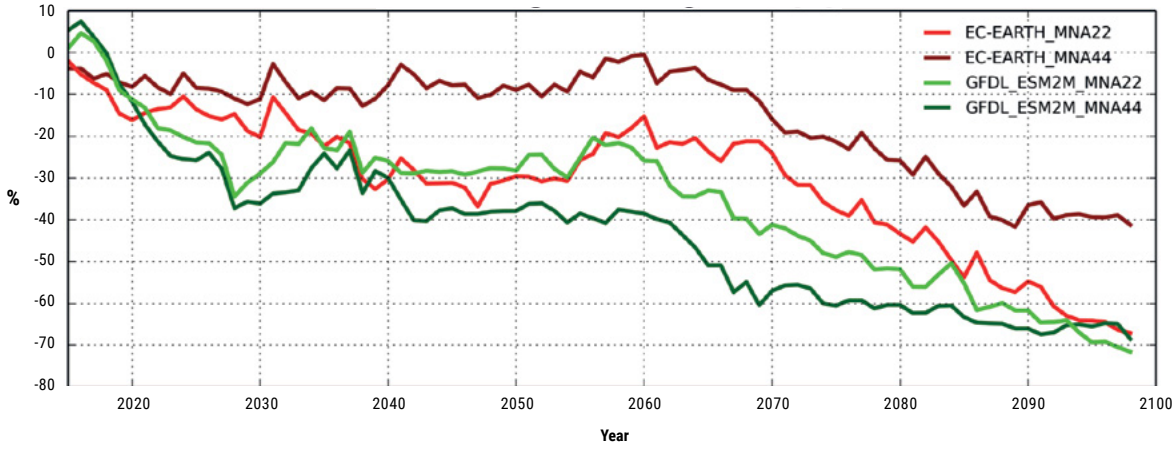



**FIGURE 108**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April- September) over time for two RCP 8.5 projections using HYPE model

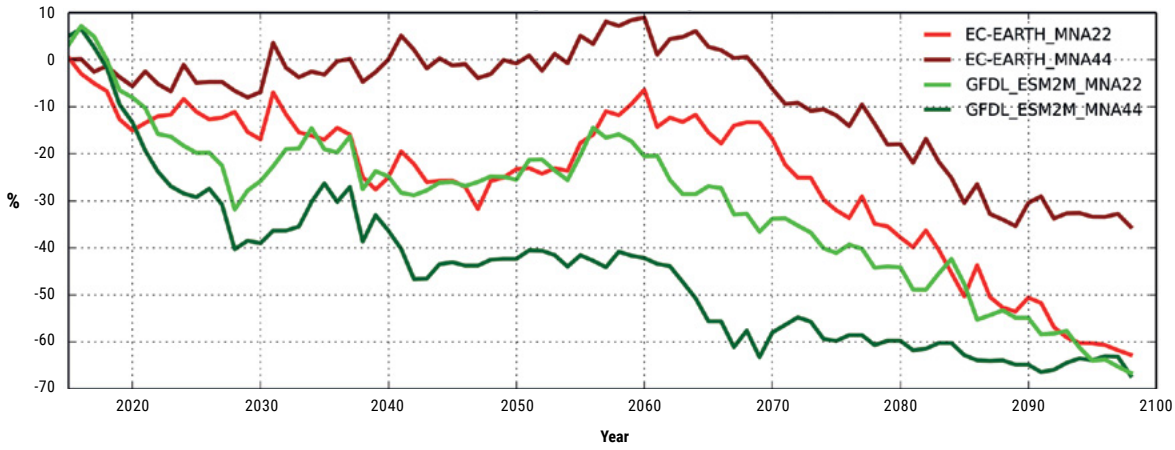
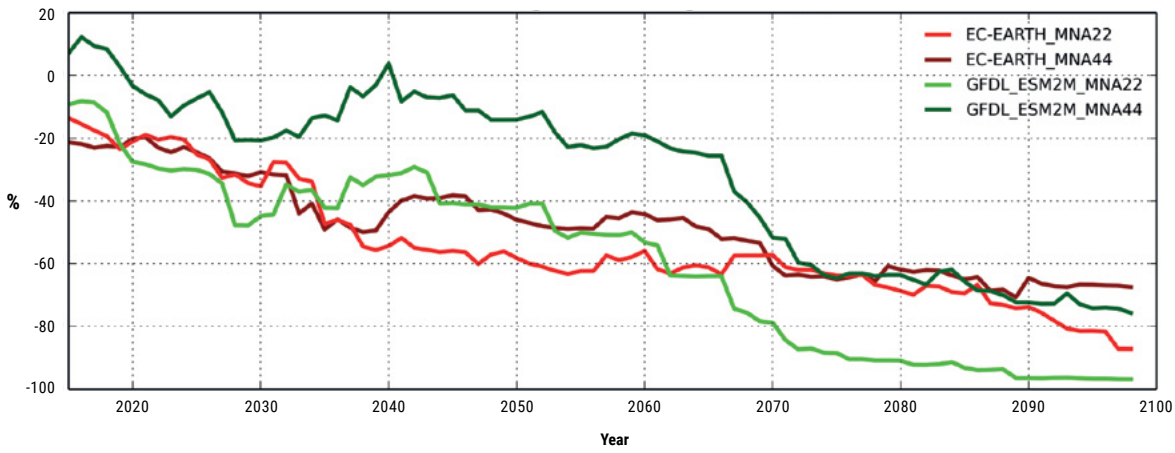



**FIGURE 109**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 6

## TIGRIS RIVER: UPPER TIGRIS

6.1. GENERAL PARAMETERS – 6.1.1. TEMPERATURE

**FIGURE 110**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

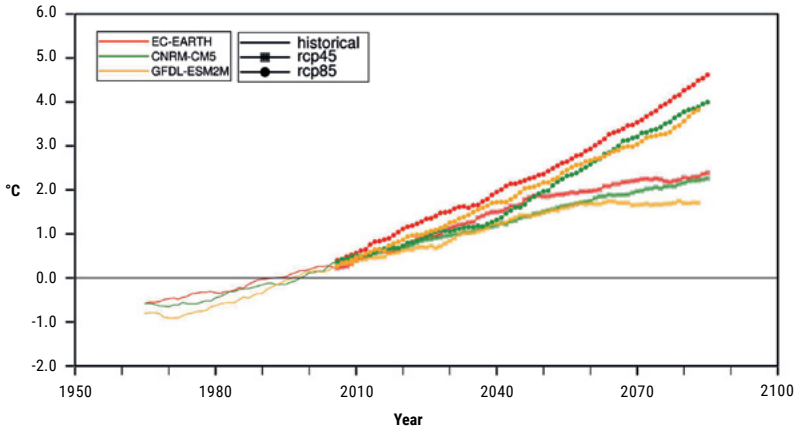



**FIGURE 111**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

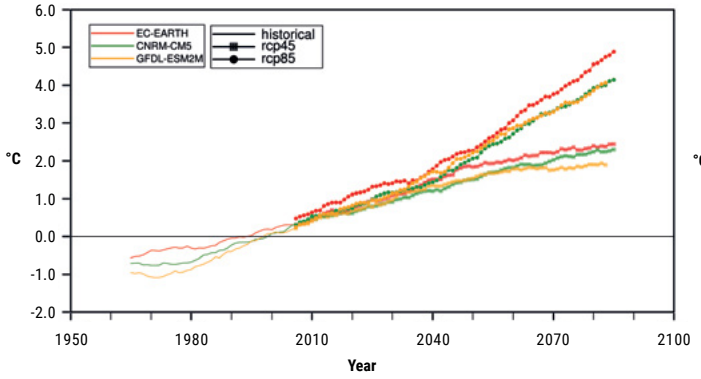



**FIGURE 112**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

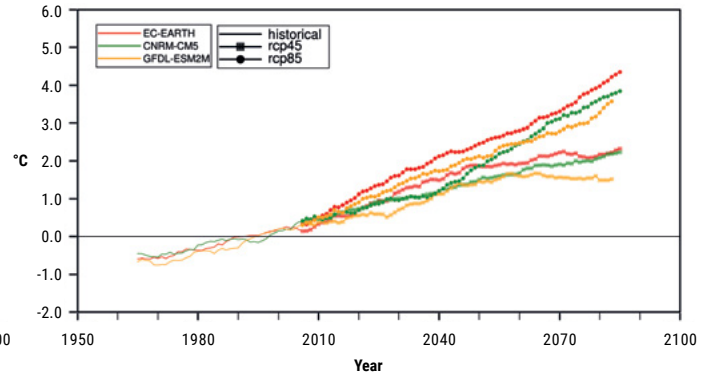



**FIGURE 113**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

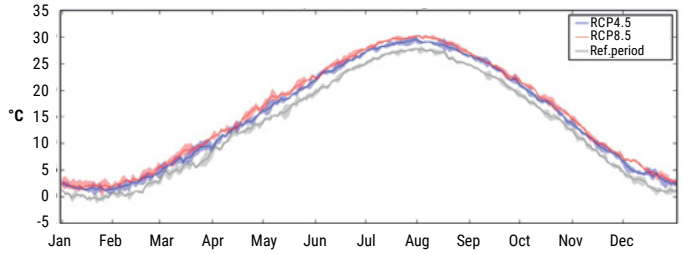
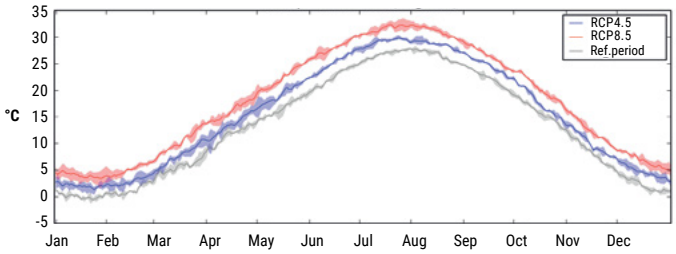



**FIGURE 114**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



6.1. GENERAL PARAMETERS – **6.1.2. PRECIPITATION**

**FIGURE 115**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

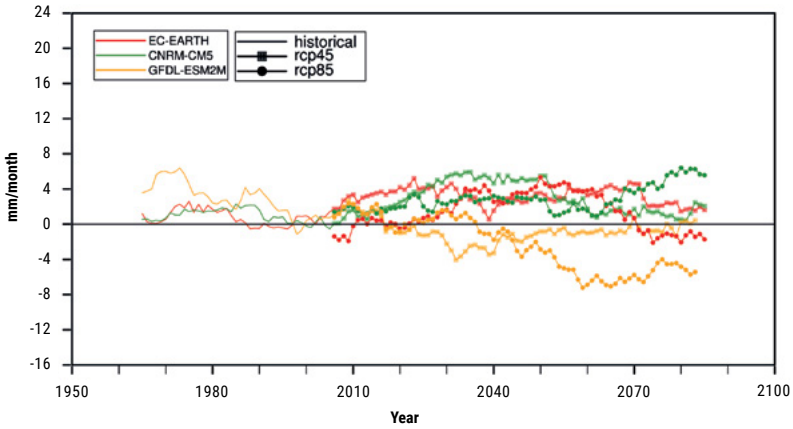



**FIGURE 116**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

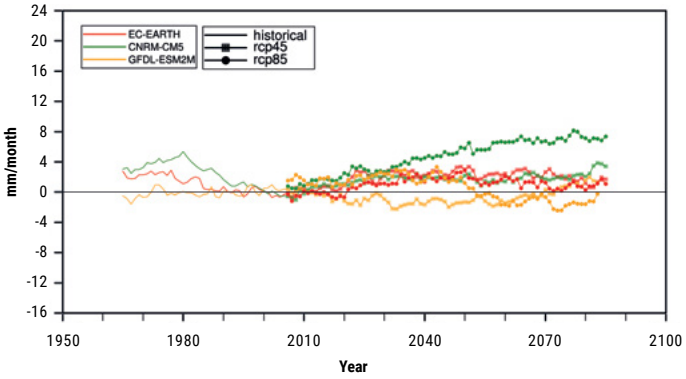



**FIGURE 117**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

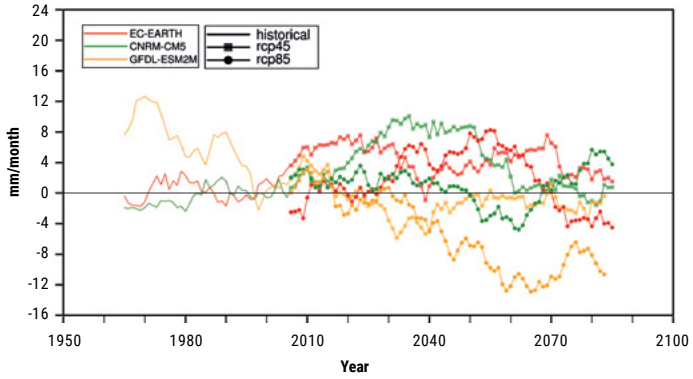



**FIGURE 118**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

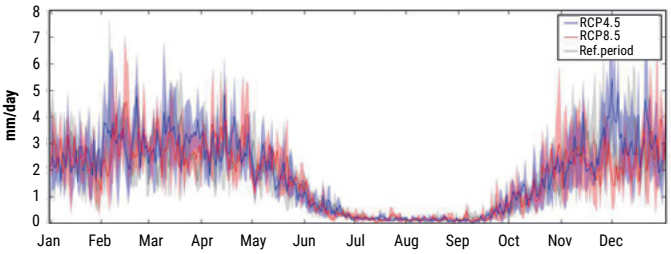
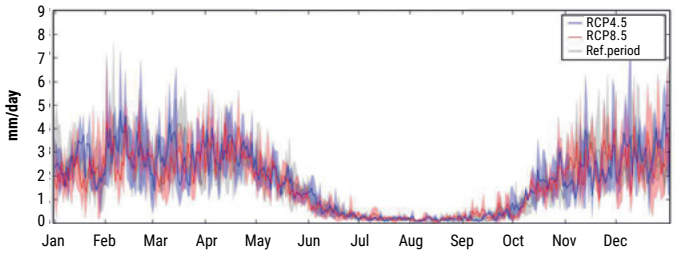



**FIGURE 119**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 6.2. EXTREME EVENTS – 6.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 120**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

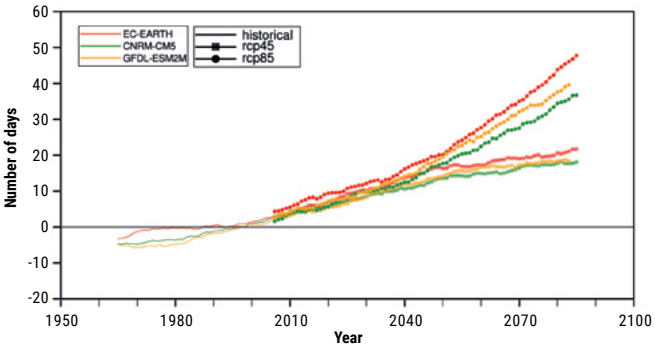



**FIGURE 121**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

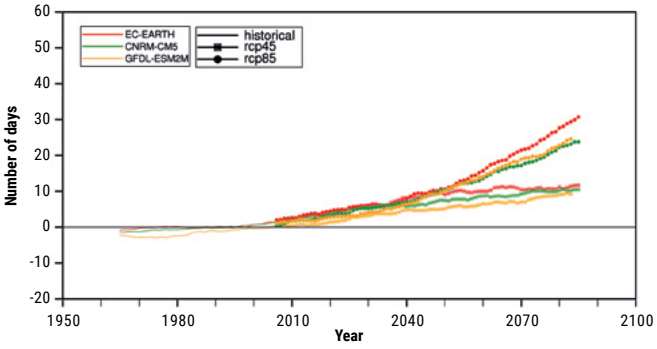
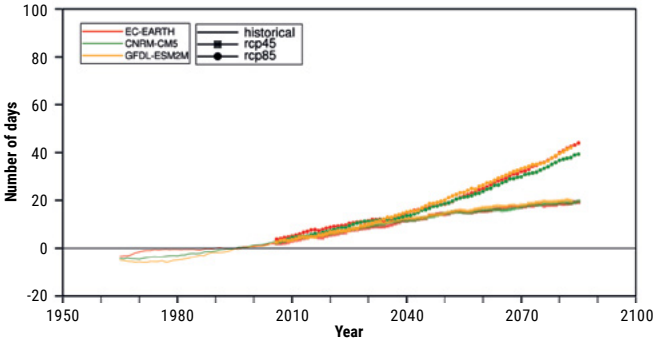



**FIGURE 122**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 6.2. EXTREME EVENTS – 6.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 123**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

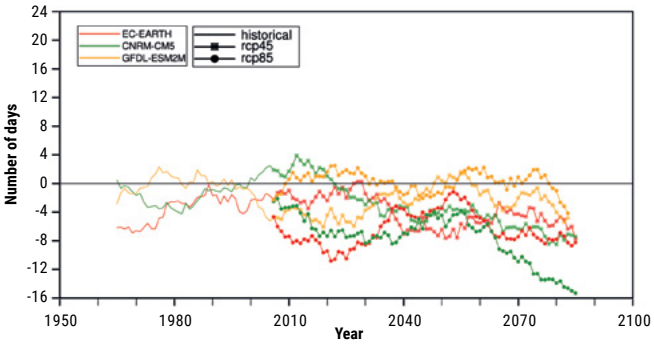



**FIGURE 124**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

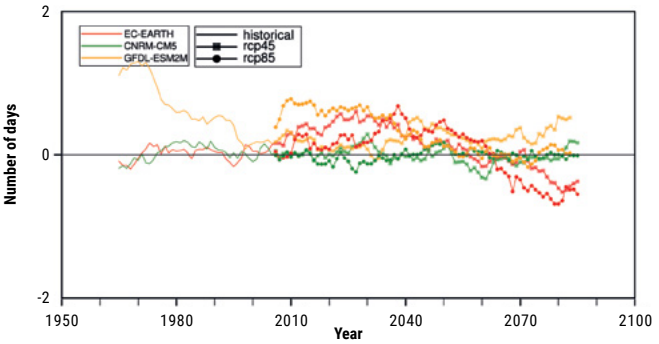



**FIGURE 125**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

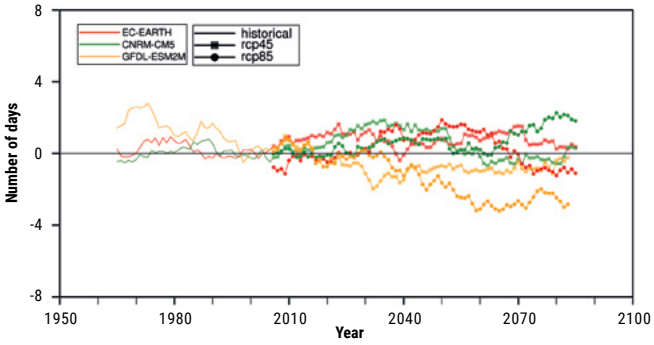
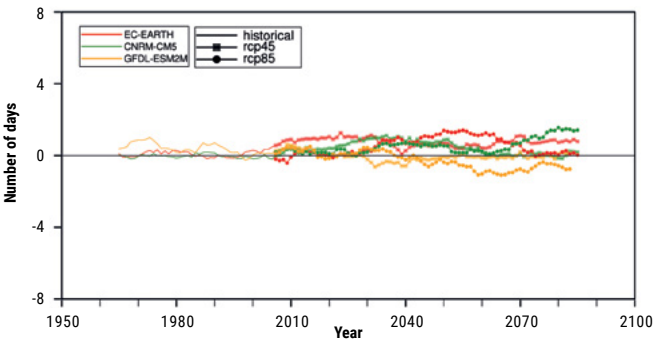



**FIGURE 126**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



6.3. HYDROLOGICAL PARAMETERS – **6.3.1. RUNOFF**

**FIGURE 127**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

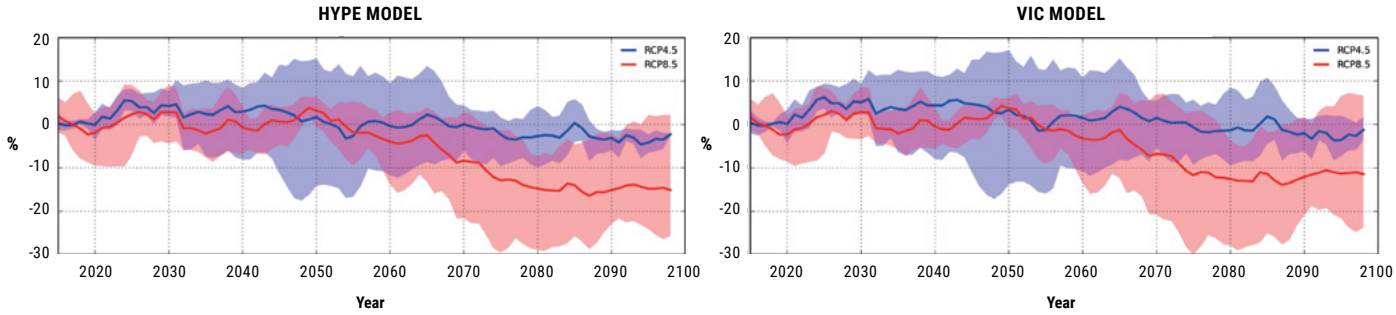



**FIGURE 128**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

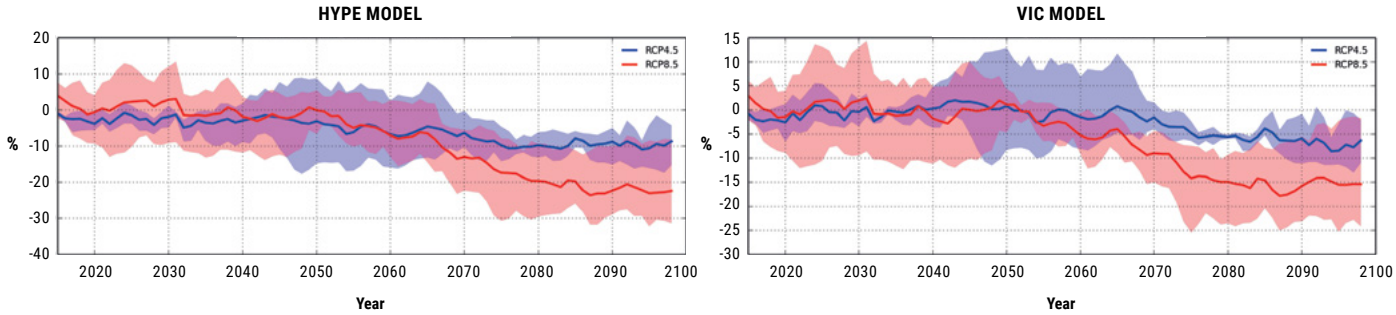
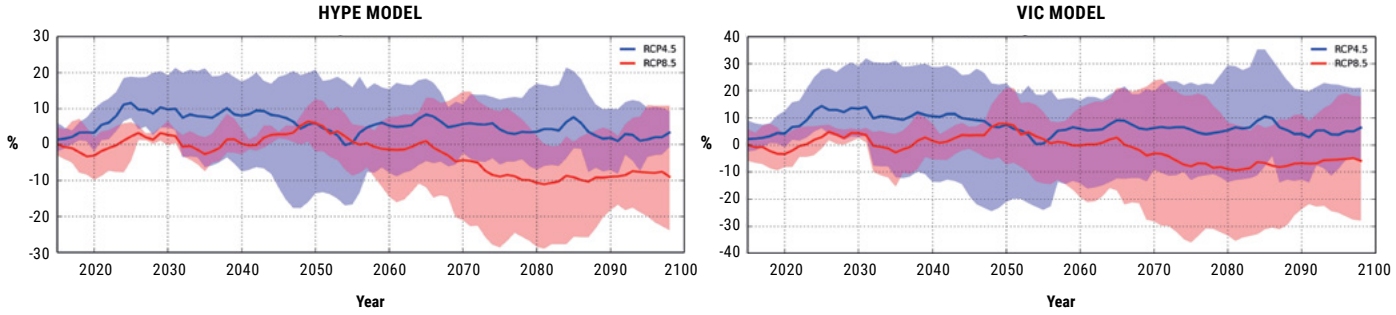



**FIGURE 129**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



6.3. HYDROLOGICAL PARAMETERS – 6.3.2. DISCHARGE

**FIGURE 130**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

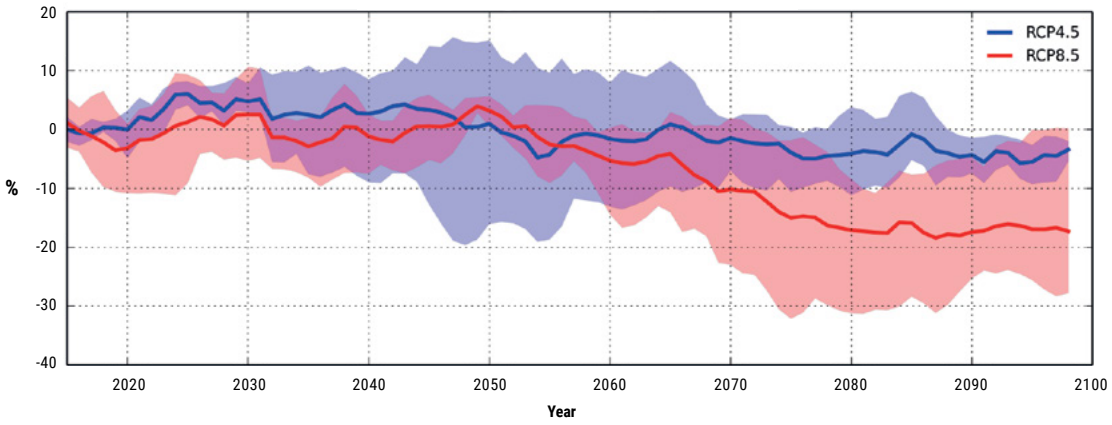



**FIGURE 131**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

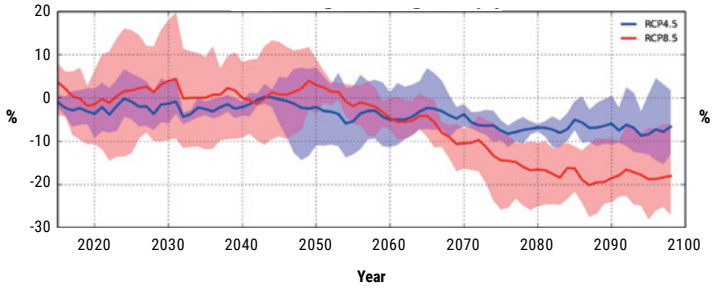
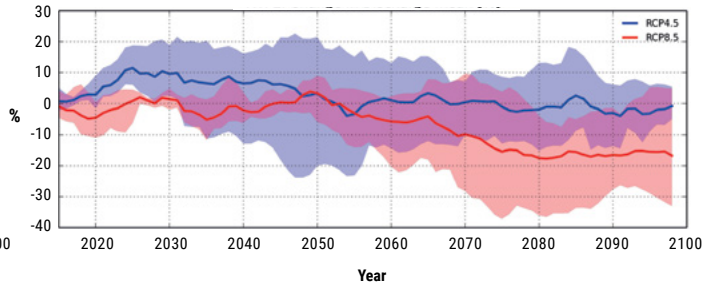
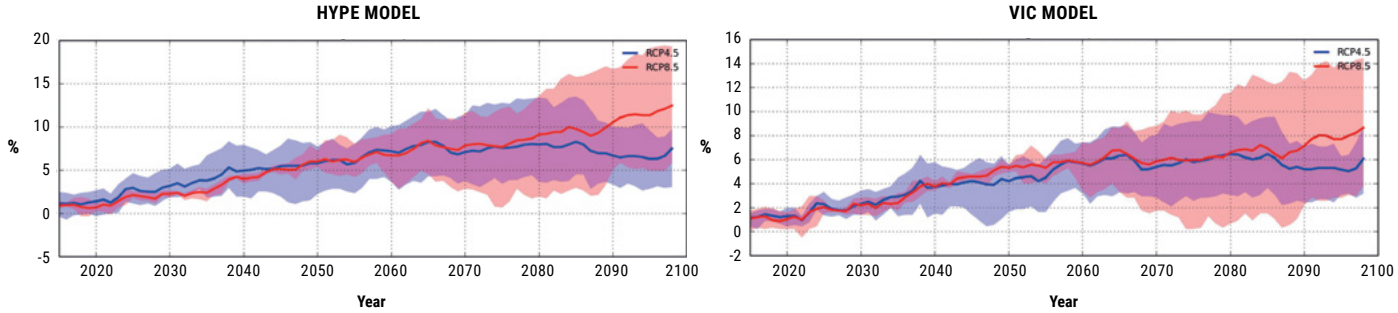



**FIGURE 132**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




6.3. HYDROLOGICAL PARAMETERS – 6.3.3. EVAPOTRANSPIRATION

**FIGURE 133**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



6.3. HYDROLOGICAL PARAMETERS – 6.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **6.3.4.1. RUNOFF**

**FIGURE 134**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

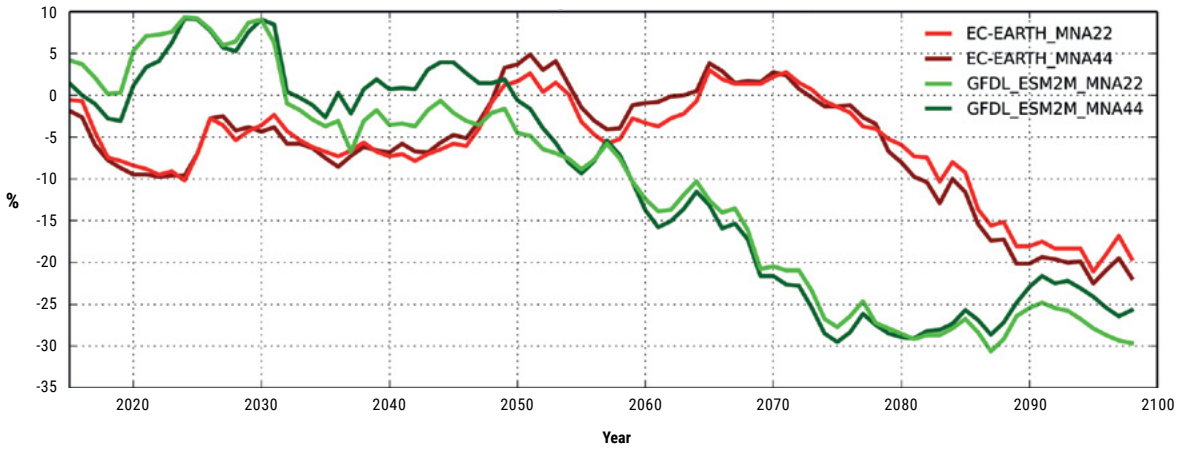



**FIGURE 135**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

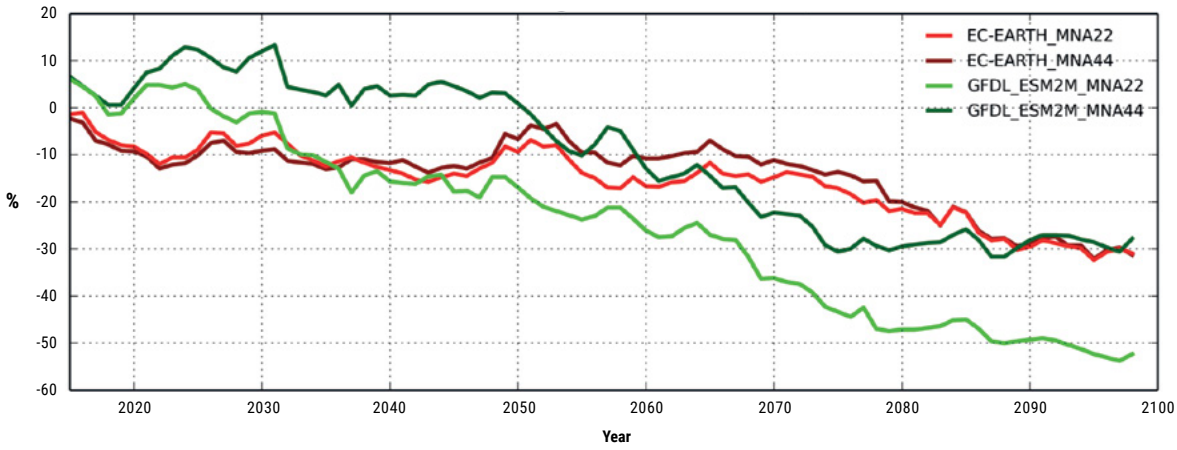



**FIGURE 136**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model

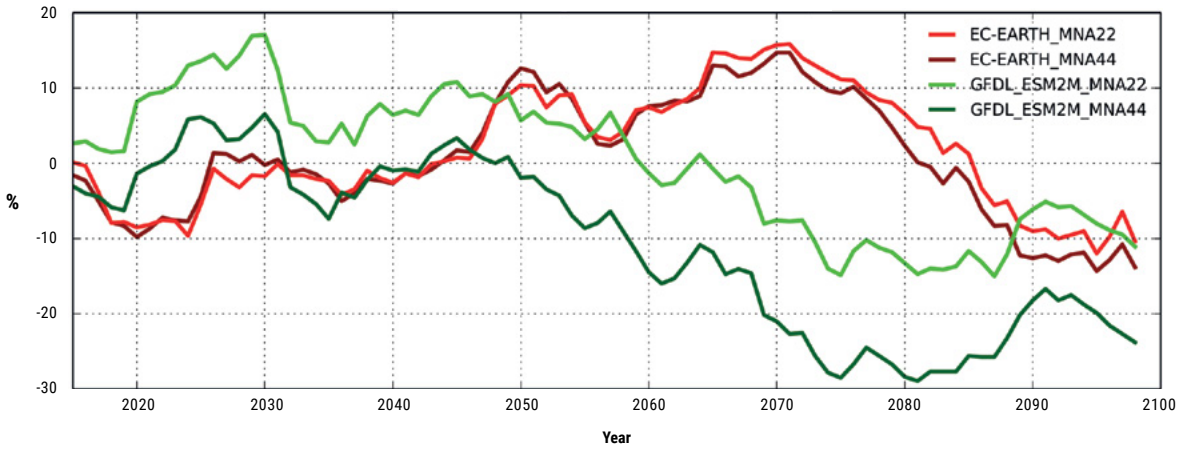


**FIGURE 137**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

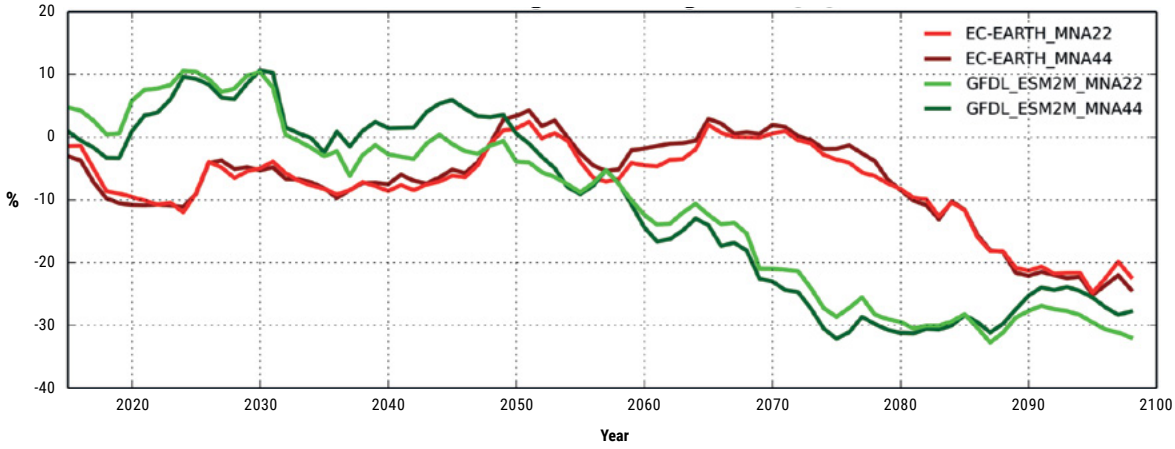



**FIGURE 138**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April-September) over time for two RCP 8.5 projections using HYPE model

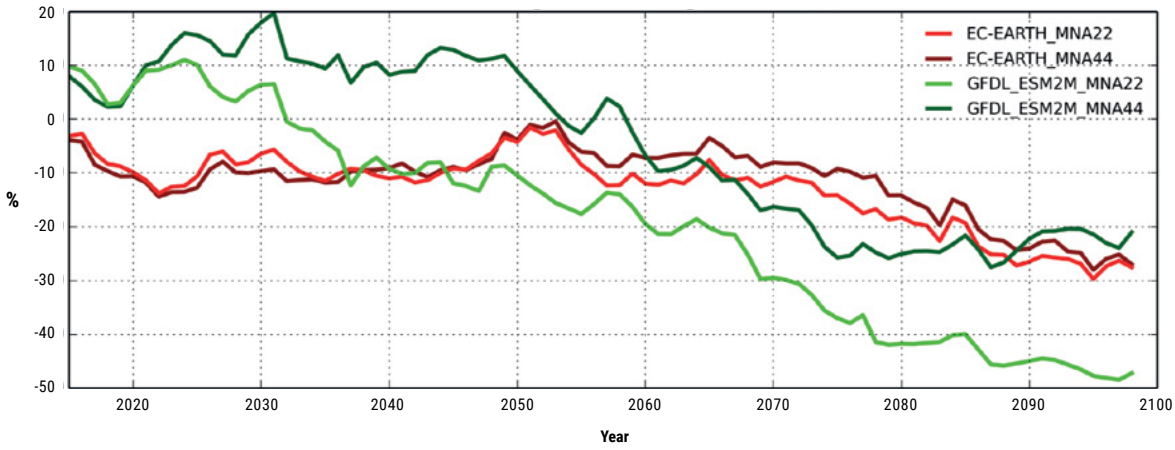
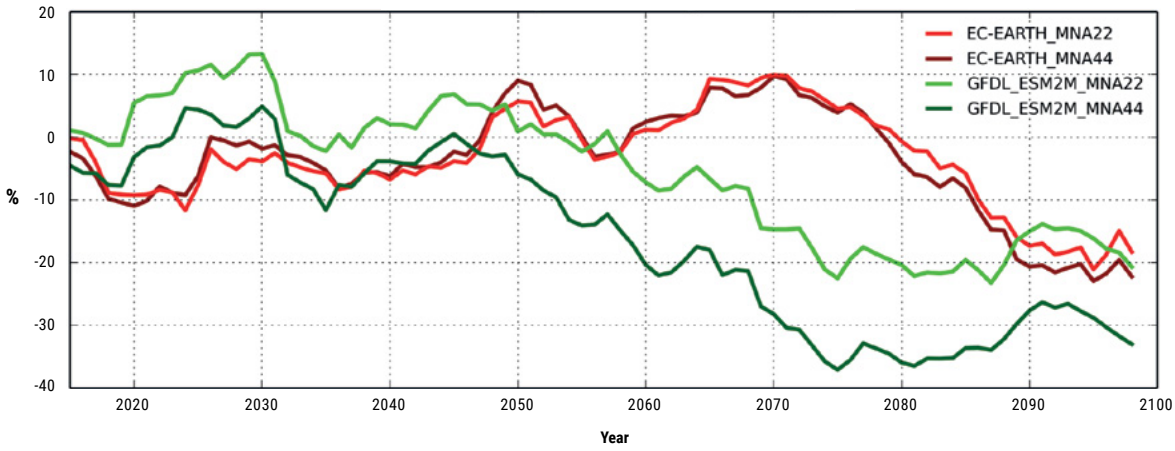



**FIGURE 139**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 7

## EUPHRATES RIVER: UPPER EUPHRATES

7.1. GENERAL PARAMETERS – 7.1.1. TEMPERATURE

**FIGURE 140**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

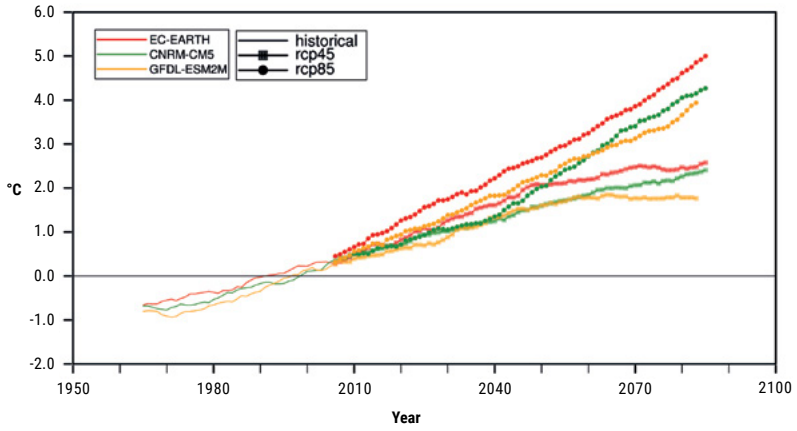



**FIGURE 141**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

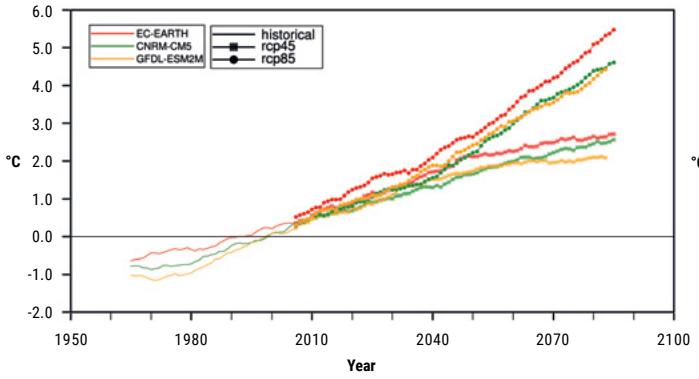



**FIGURE 142**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

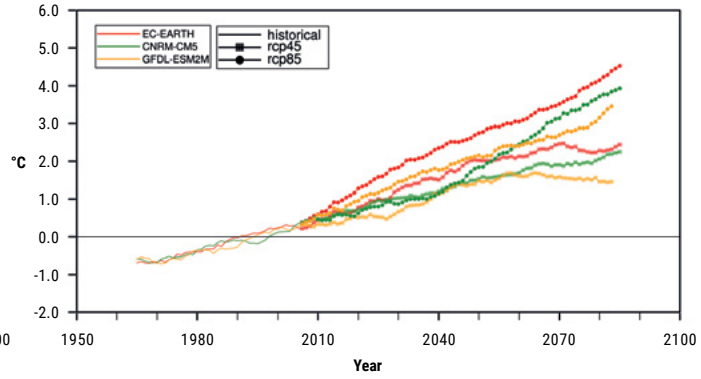



**FIGURE 143**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

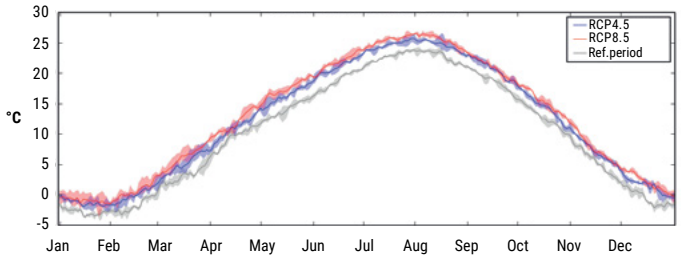
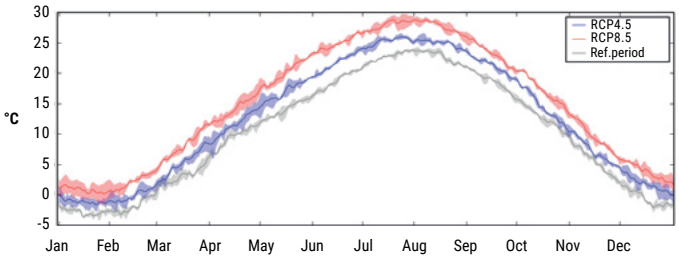



**FIGURE 144**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



7.1. GENERAL PARAMETERS – **7.1.2. PRECIPITATION**

**FIGURE 145**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

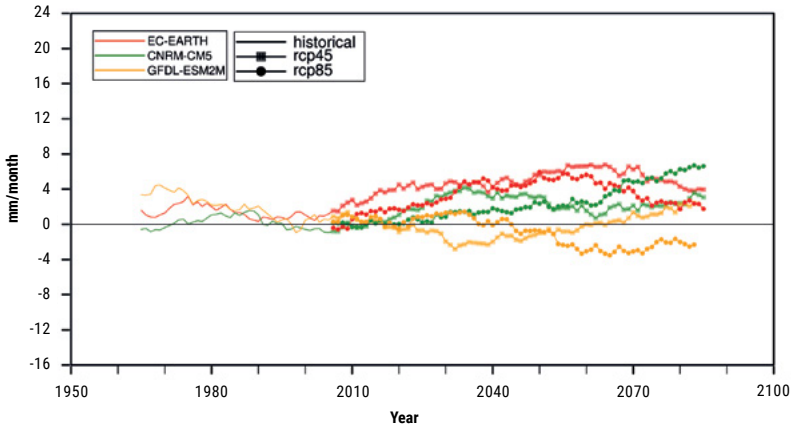



**FIGURE 146**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

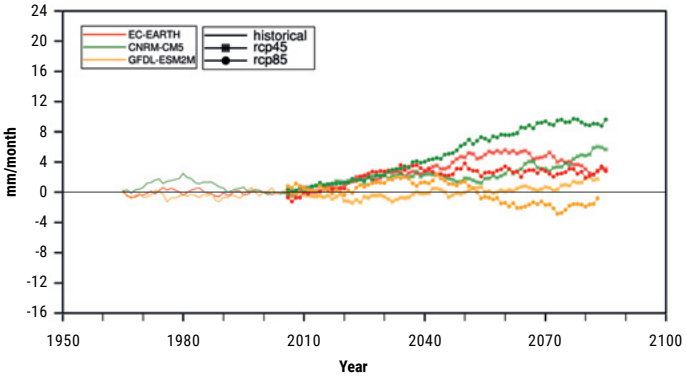



**FIGURE 147**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

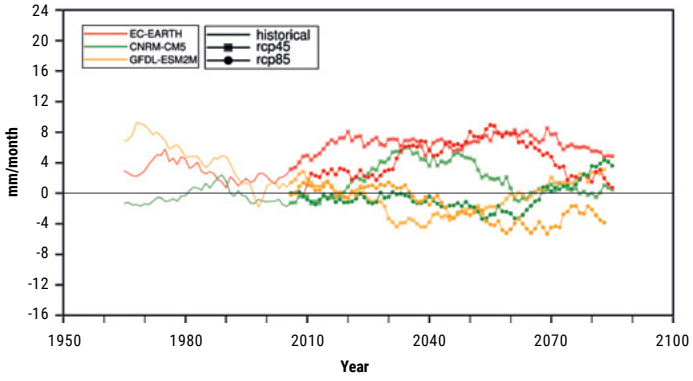



**FIGURE 148**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

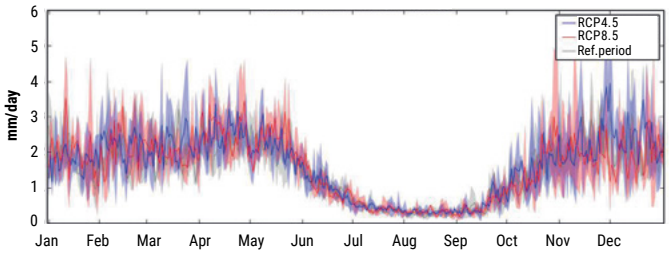
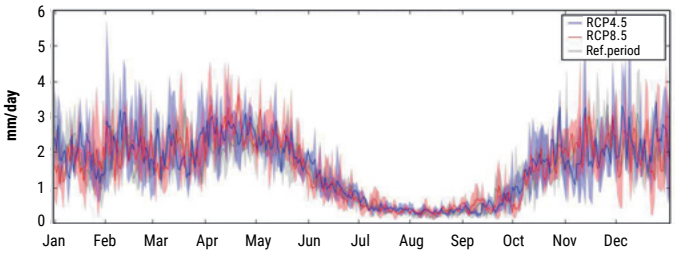



**FIGURE 149**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 7.2. EXTREME EVENTS – 7.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 150**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

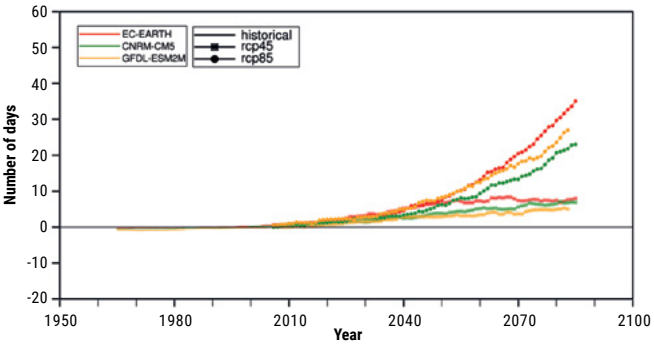



**FIGURE 151**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

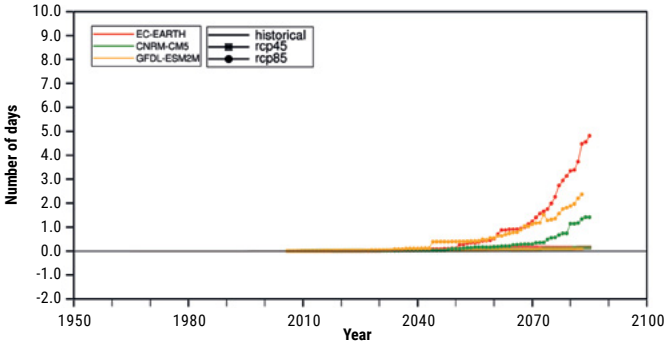
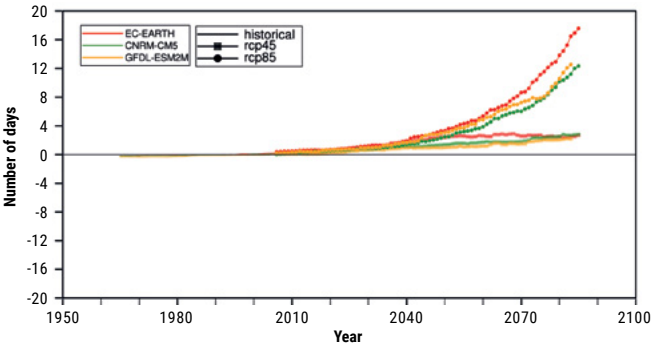



**FIGURE 152**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 7.2. EXTREME EVENTS – 7.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 153**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

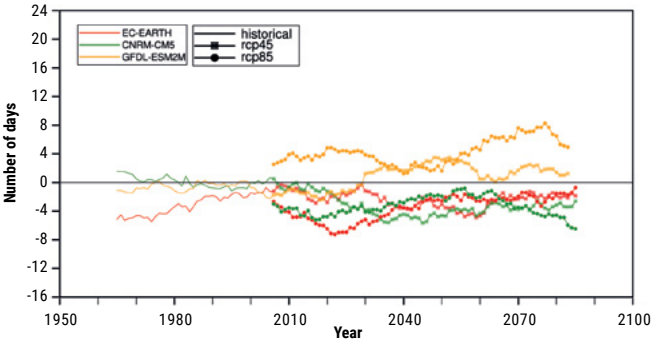



**FIGURE 154**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

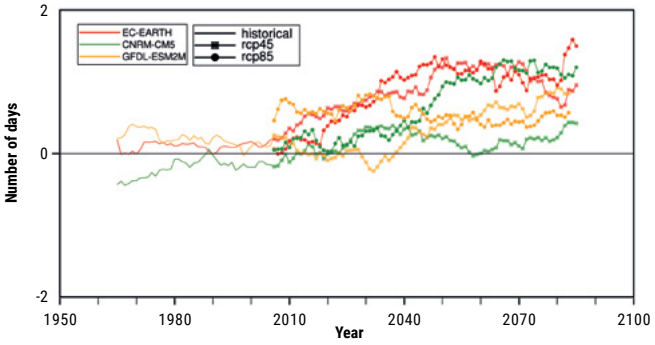



**FIGURE 155**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

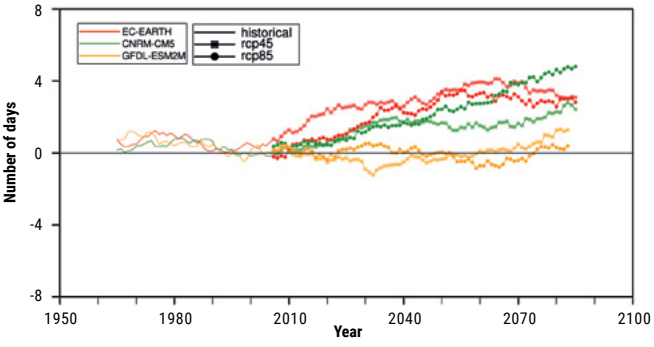
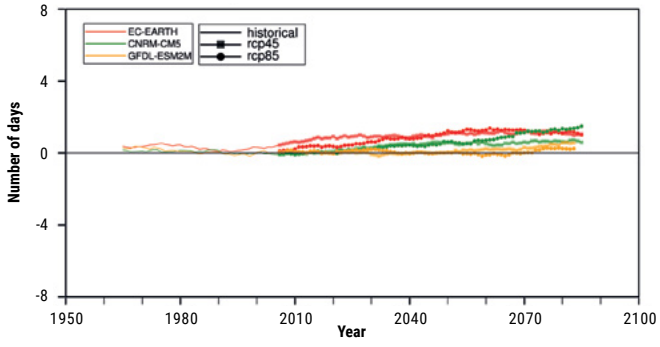



**FIGURE 156**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



7.3. HYDROLOGICAL PARAMETERS – **7.3.1. RUNOFF**

**FIGURE 157**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

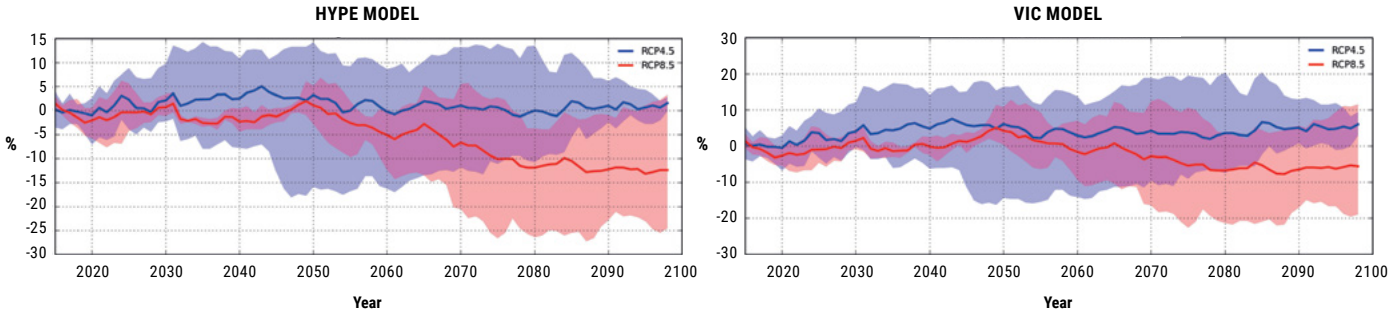



**FIGURE 158**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

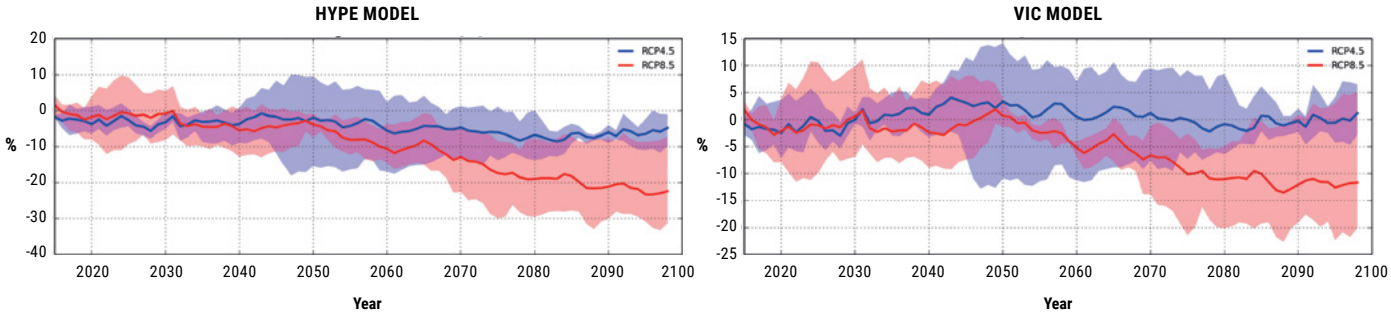
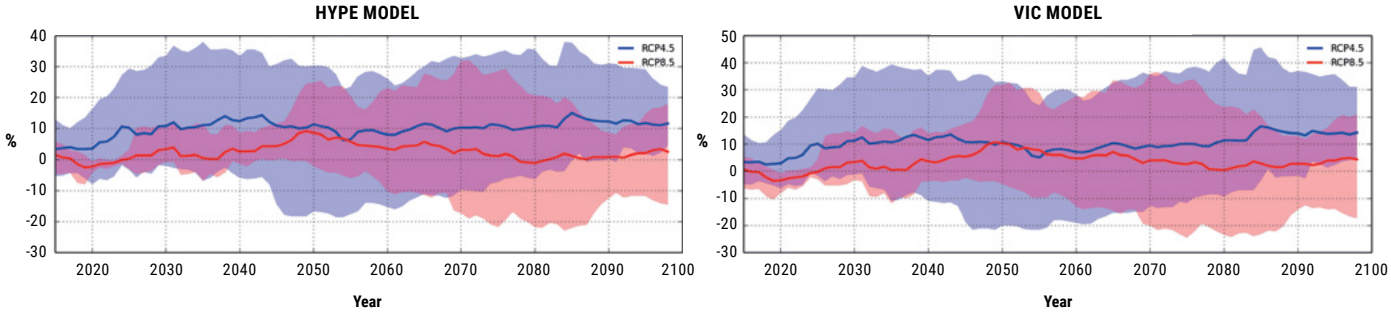



**FIGURE 159**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



7.3. HYDROLOGICAL PARAMETERS – 7.3.2. DISCHARGE

**FIGURE 160**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

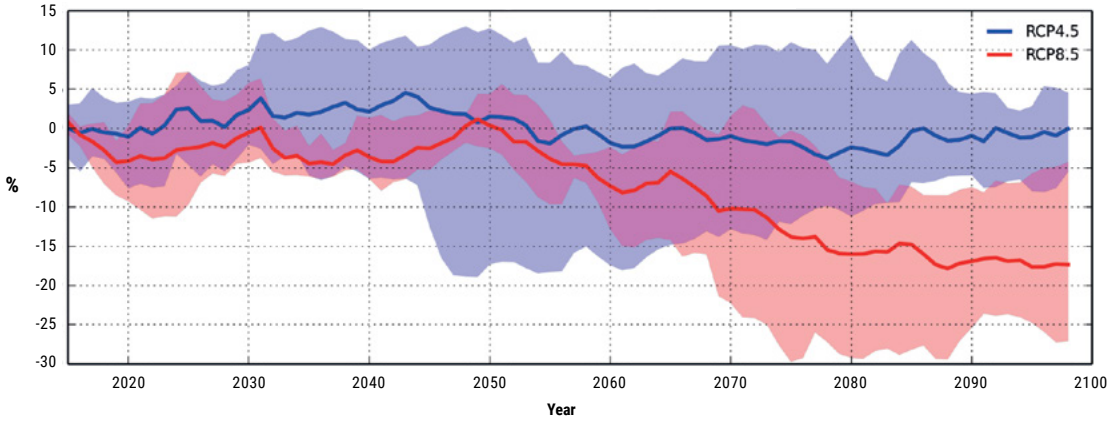



**FIGURE 161**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

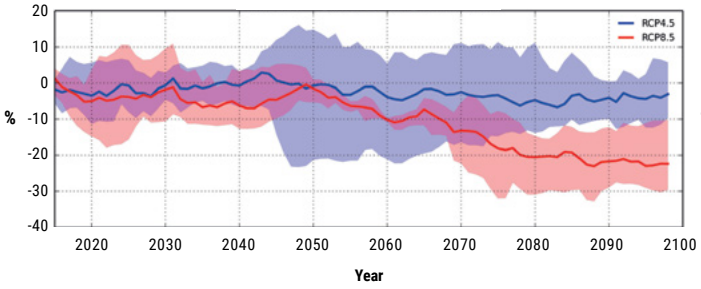
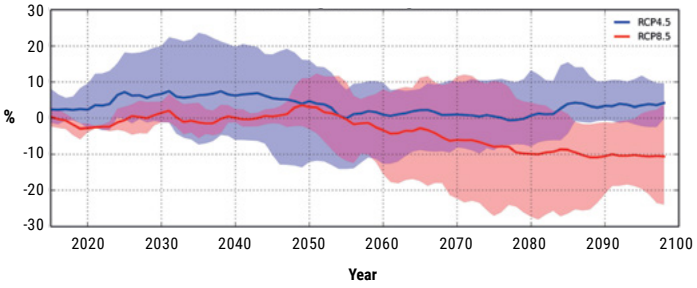
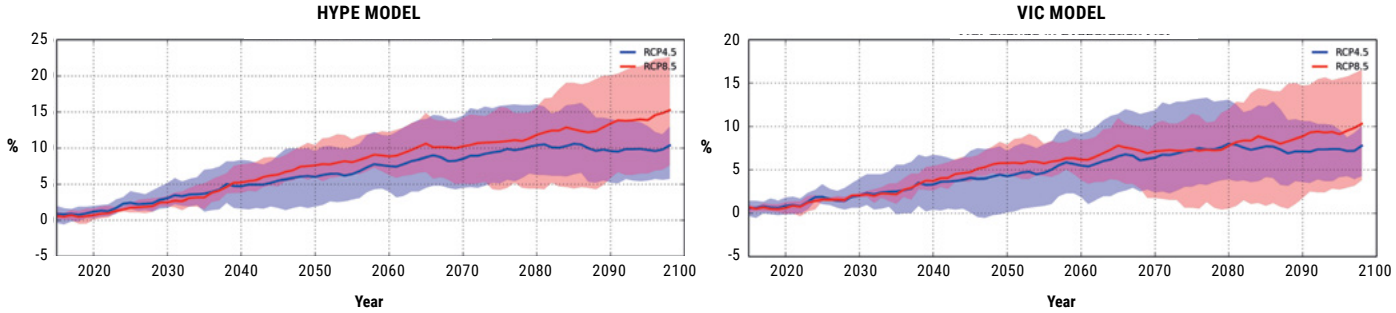



**FIGURE 162**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




7.3. HYDROLOGICAL PARAMETERS – 7.3.3. EVAPOTRANSPIRATION

**FIGURE 163**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



7.3. HYDROLOGICAL PARAMETERS – 7.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **7.3.4.1. RUNOFF**

**FIGURE 164**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

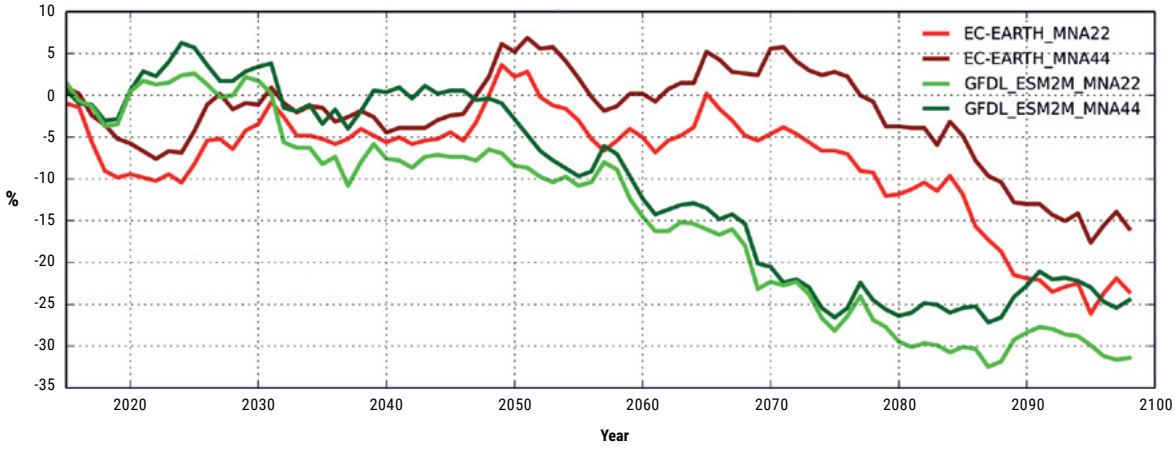



**FIGURE 165**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

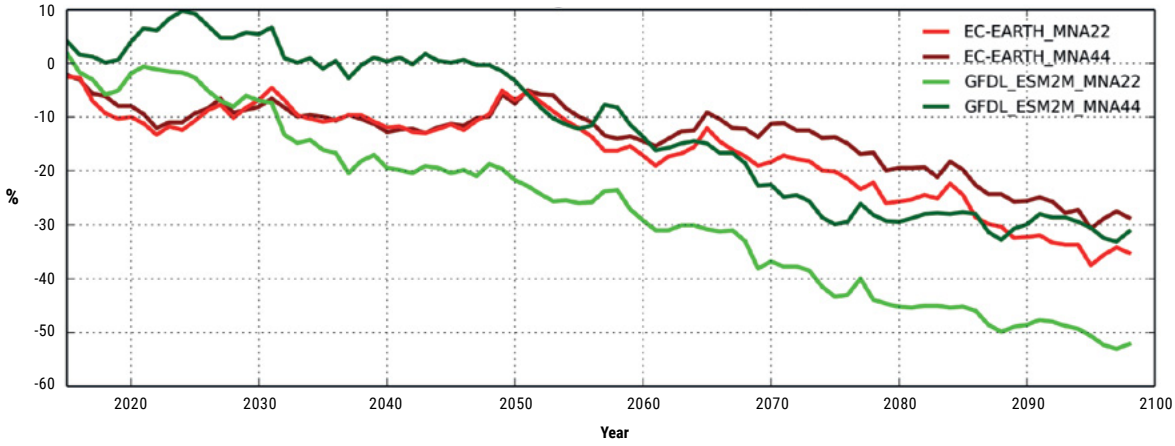
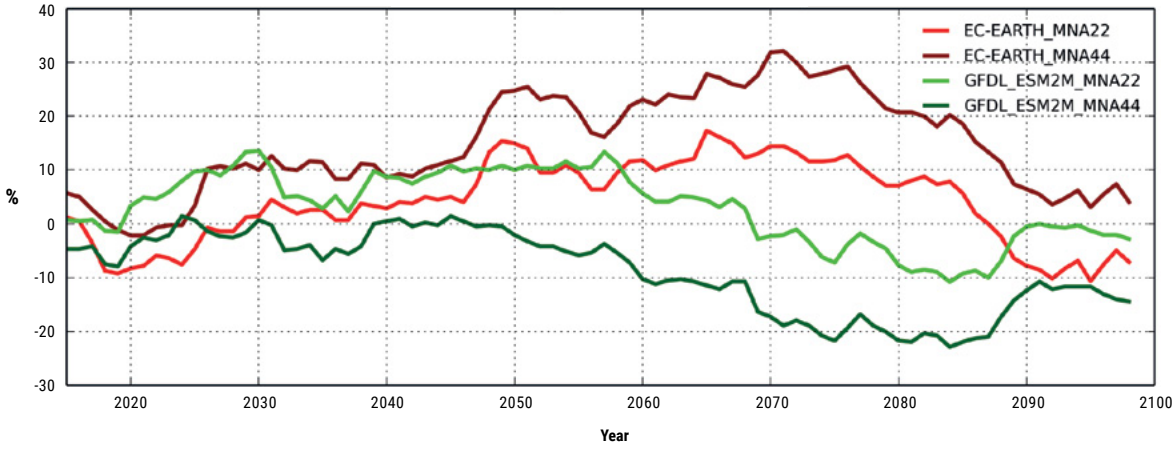



**FIGURE 166**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



7.3. HYDROLOGICAL PARAMETERS – 7.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 7.3.4.2. DISCHARGE

**FIGURE 167**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

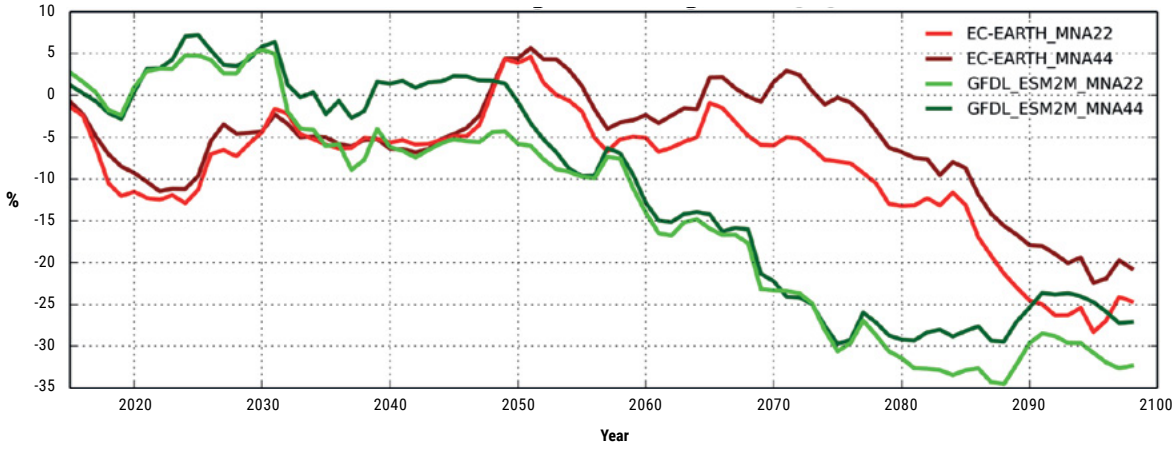



**FIGURE 168**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April-September) over time for two RCP 8.5 projections using HYPE model

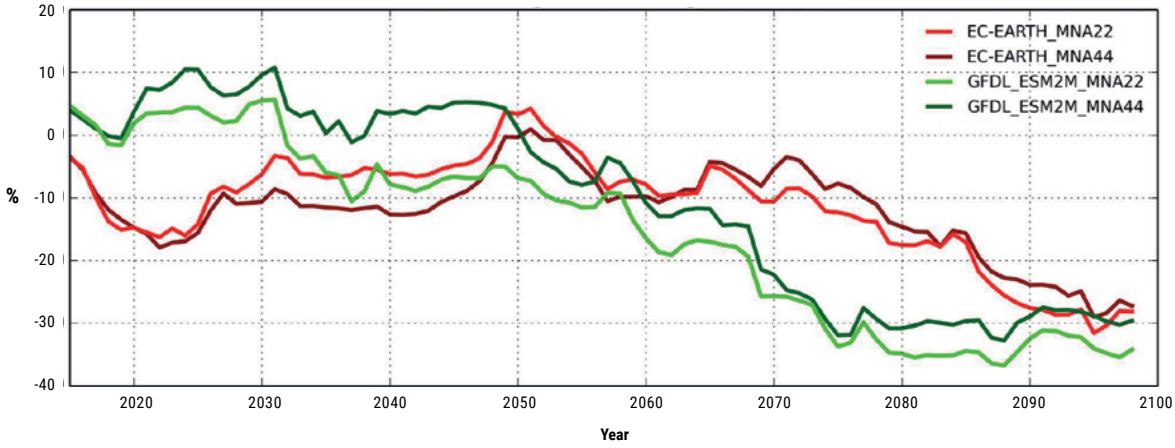
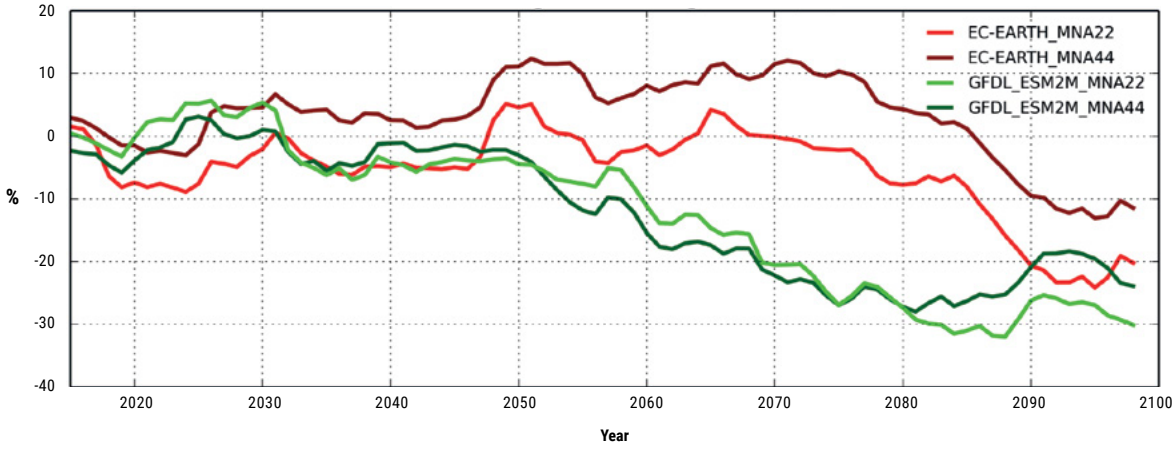



**FIGURE 169**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 8

## MEDJERDA RIVER

8.1. GENERAL PARAMETERS – 8.1.1. TEMPERATURE

**FIGURE 170**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

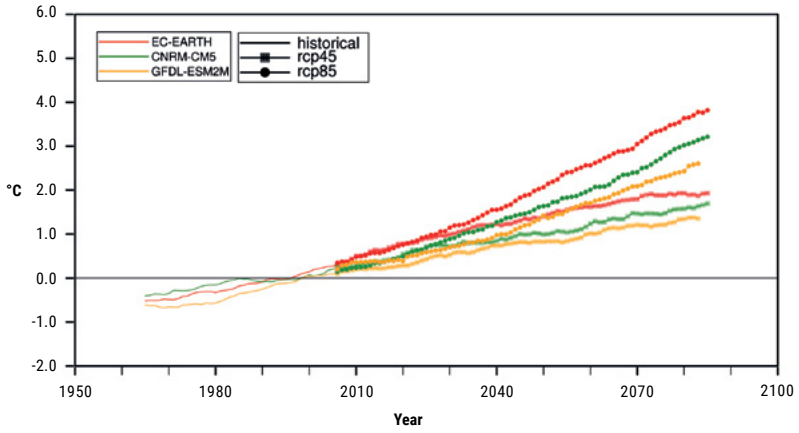



**FIGURE 171**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

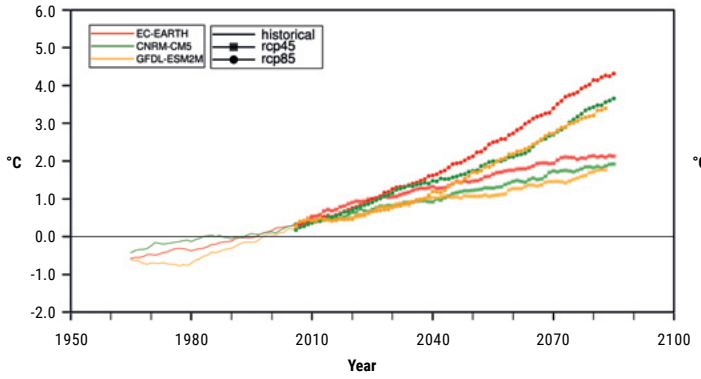



**FIGURE 172**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

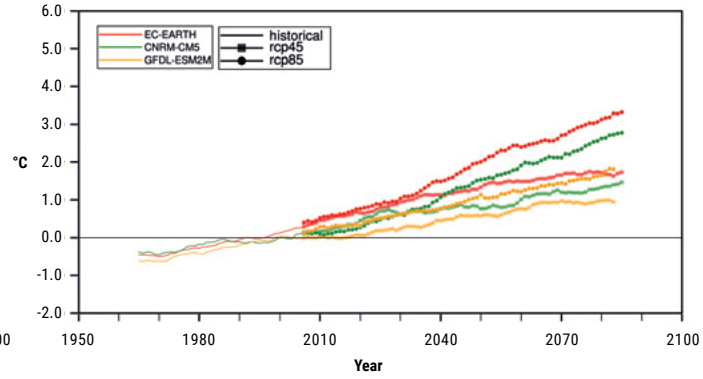



**FIGURE 173**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

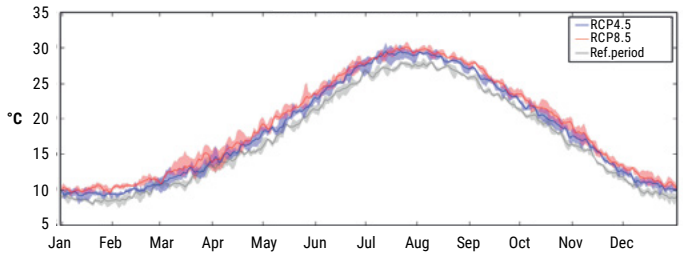
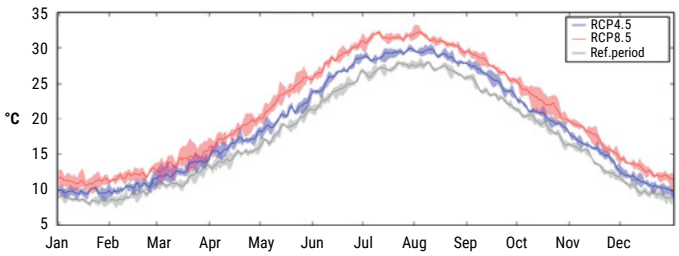



**FIGURE 174**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



8.1. GENERAL PARAMETERS – **8.1.2. PRECIPITATION**

**FIGURE 175**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

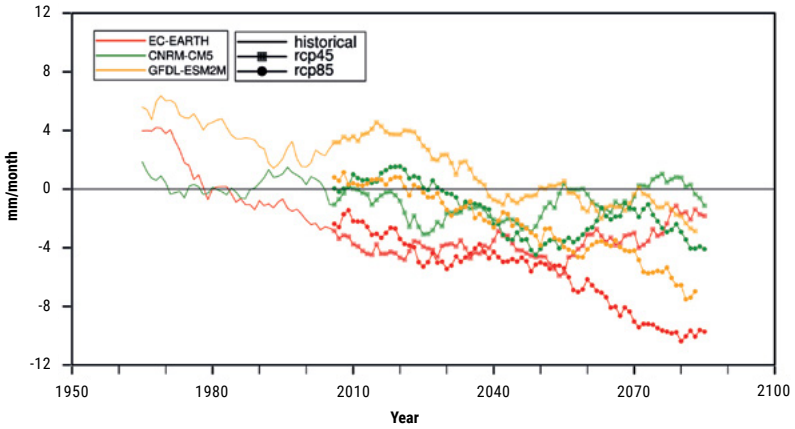



**FIGURE 176**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

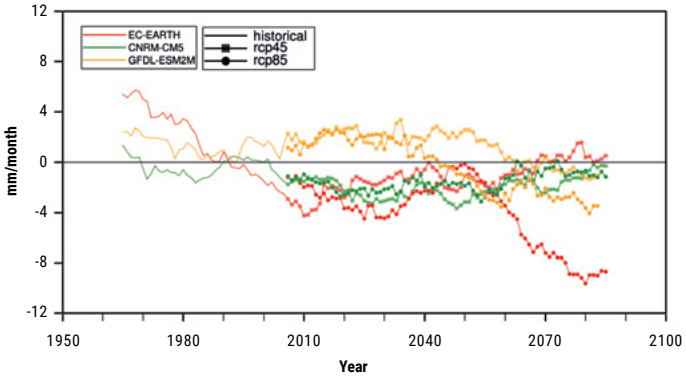



**FIGURE 177**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

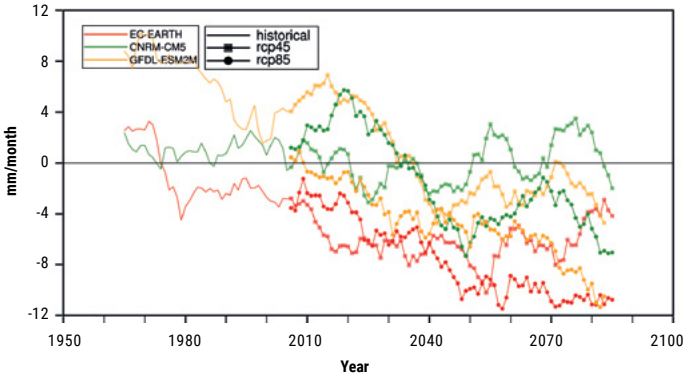



**FIGURE 178**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

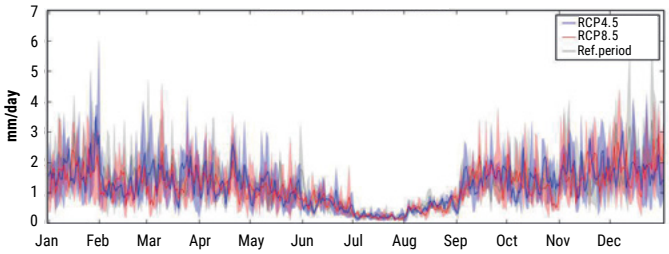
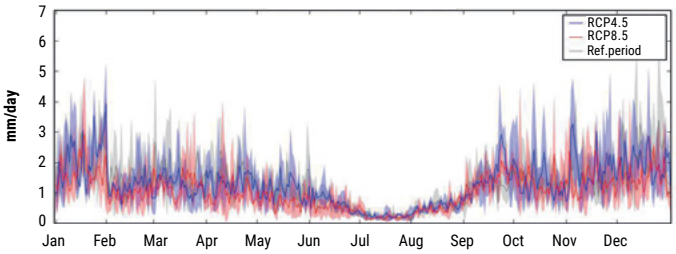



**FIGURE 179**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 8.2. EXTREME EVENTS – 8.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 180**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

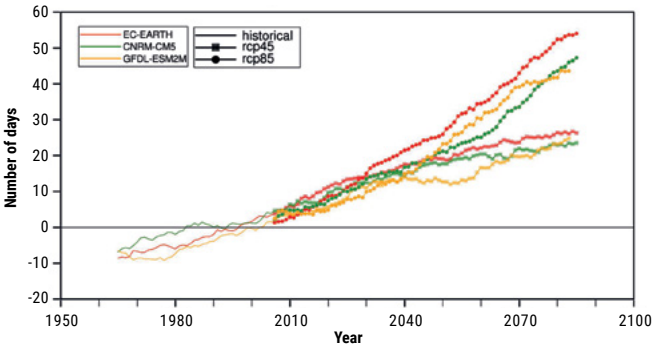



**FIGURE 181**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

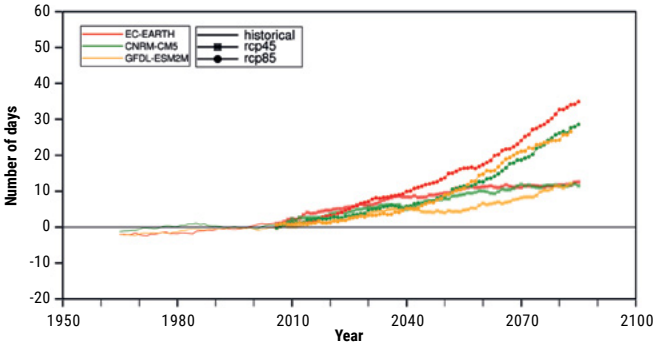
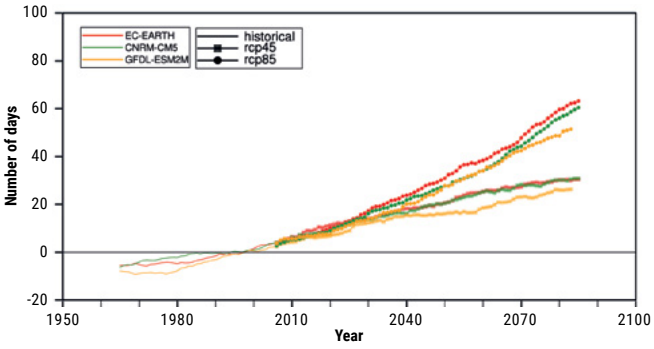



**FIGURE 182**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 8.2. EXTREME EVENTS – 8.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 183**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

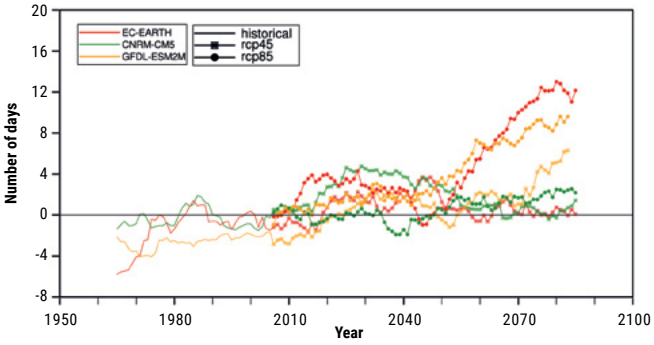



**FIGURE 184**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

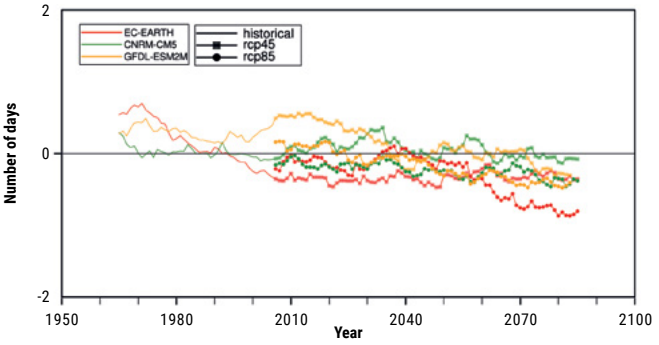



**FIGURE 185**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

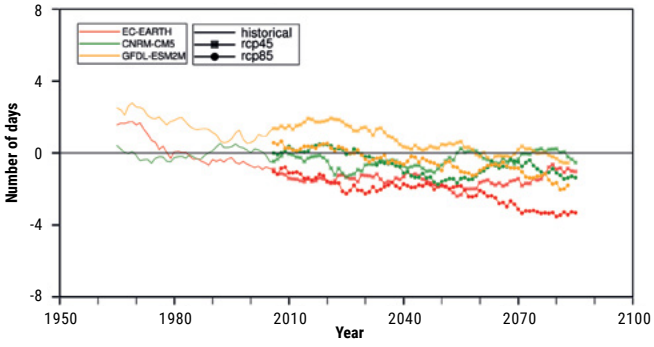
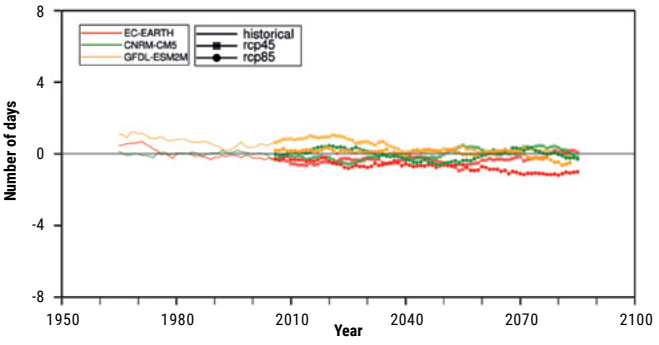



**FIGURE 186**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



8.3. HYDROLOGICAL PARAMETERS – **8.3.1. RUNOFF**

**FIGURE 187**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

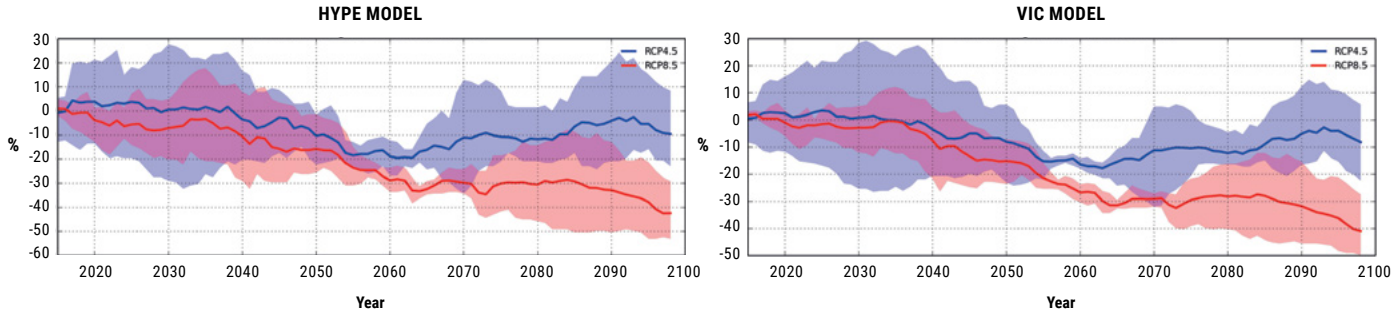



**FIGURE 188**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

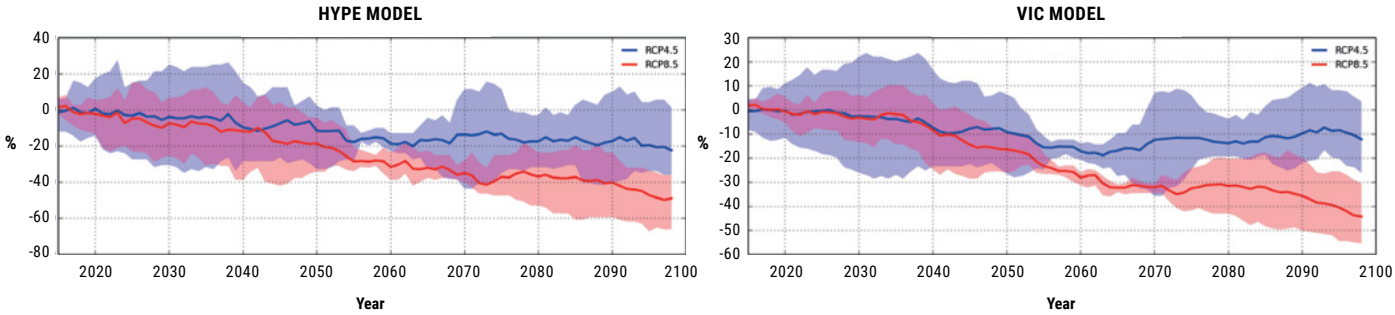
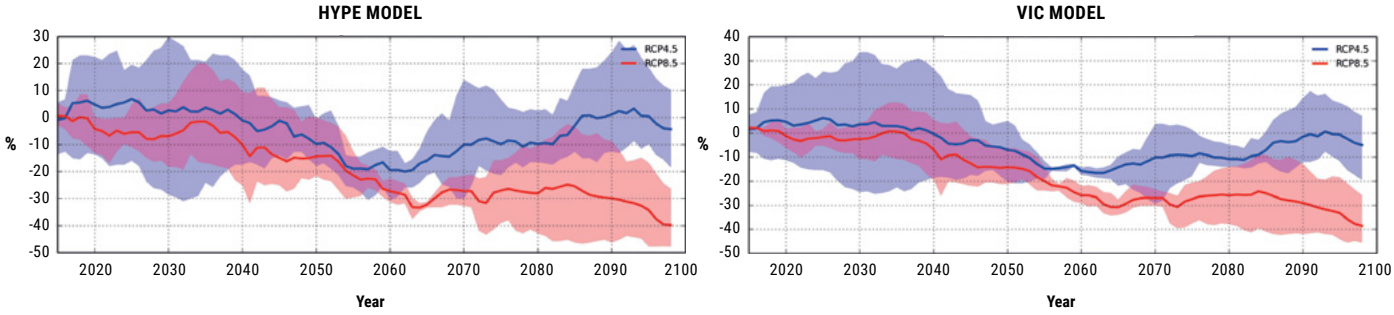



**FIGURE 189**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



8.3. HYDROLOGICAL PARAMETERS – 8.3.2. DISCHARGE

**FIGURE 190**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

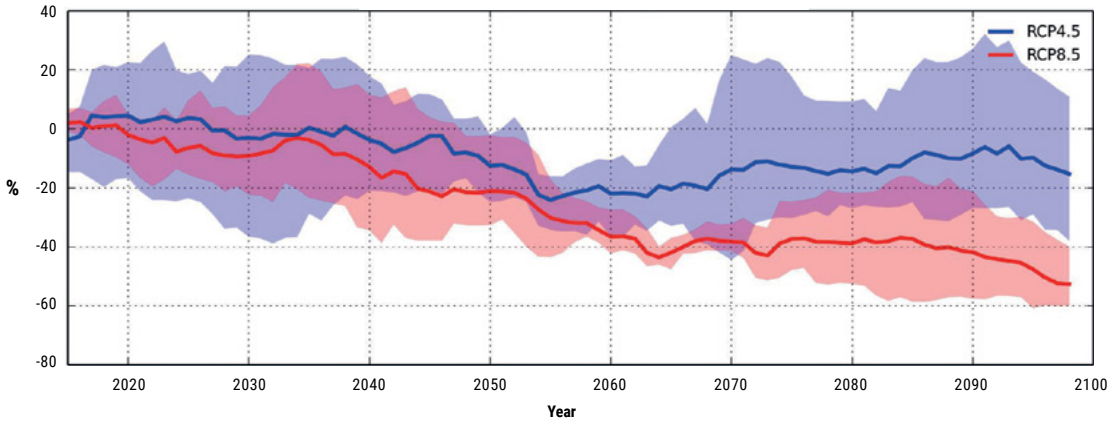



**FIGURE 191**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

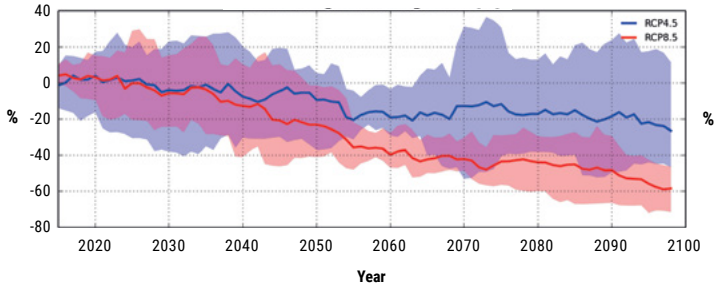
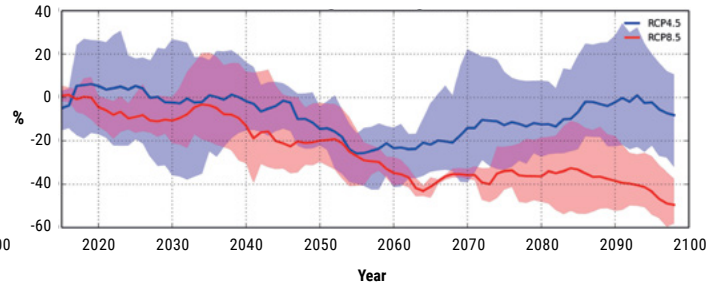
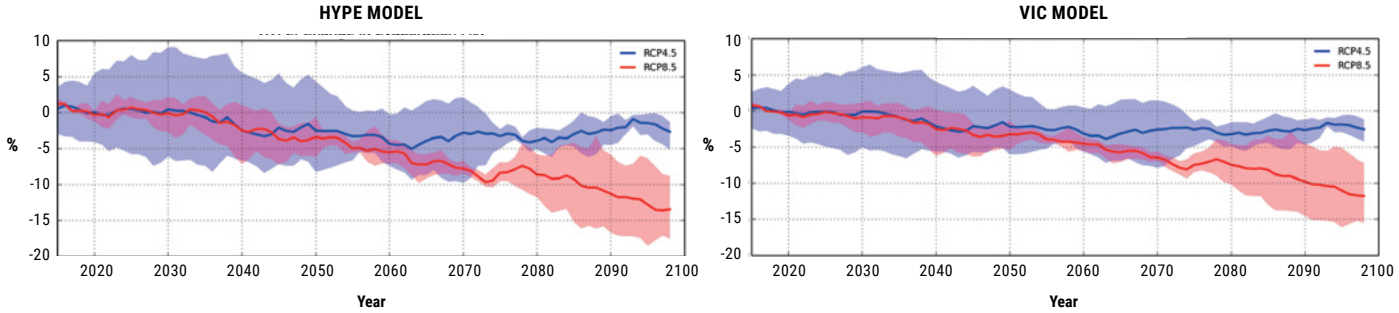



**FIGURE 192**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




8.3. HYDROLOGICAL PARAMETERS – 8.3.3. EVAPOTRANSPIRATION

**FIGURE 193**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



8.3. HYDROLOGICAL PARAMETERS – 8.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **8.3.4.1. RUNOFF**

**FIGURE 194**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

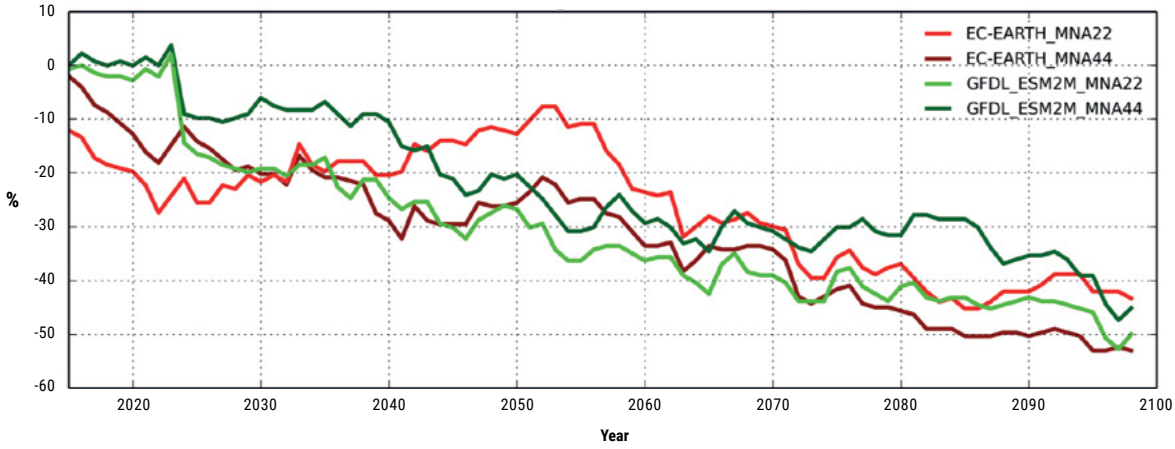



**FIGURE 195**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

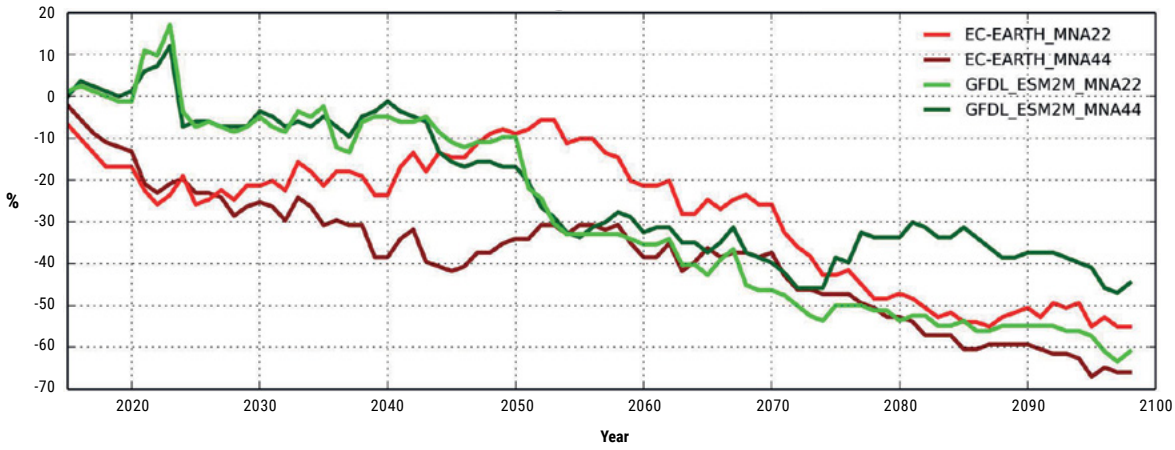
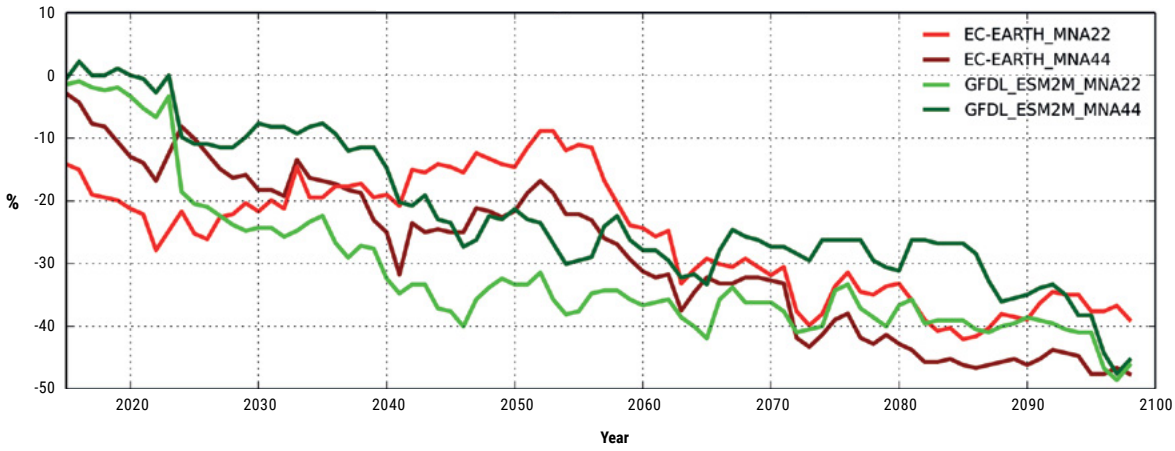



**FIGURE 196**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



8.3. HYDROLOGICAL PARAMETERS – 8.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **8.3.4.2. DISCHARGE**

**FIGURE 197**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

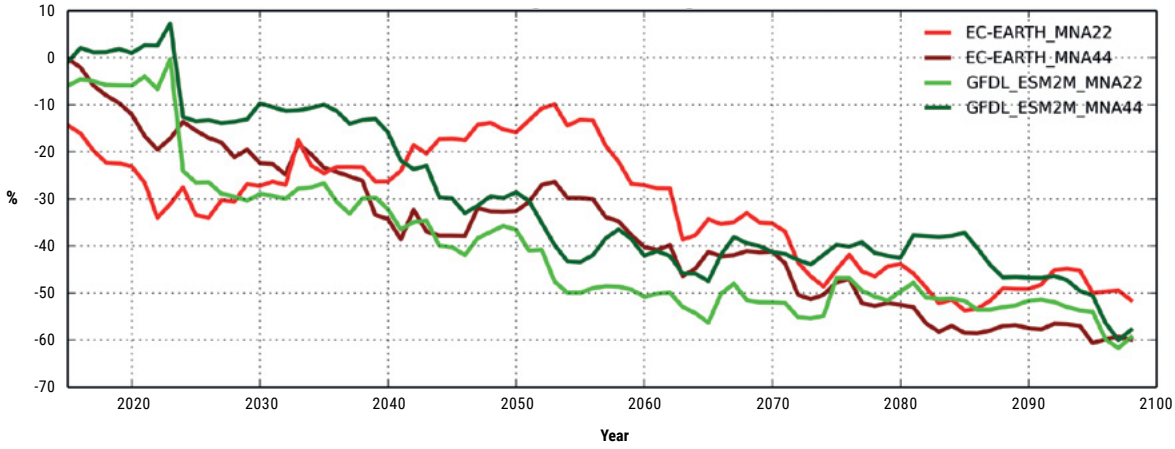



**FIGURE 198**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April-September) over time for two RCP 8.5 projections using HYPE model

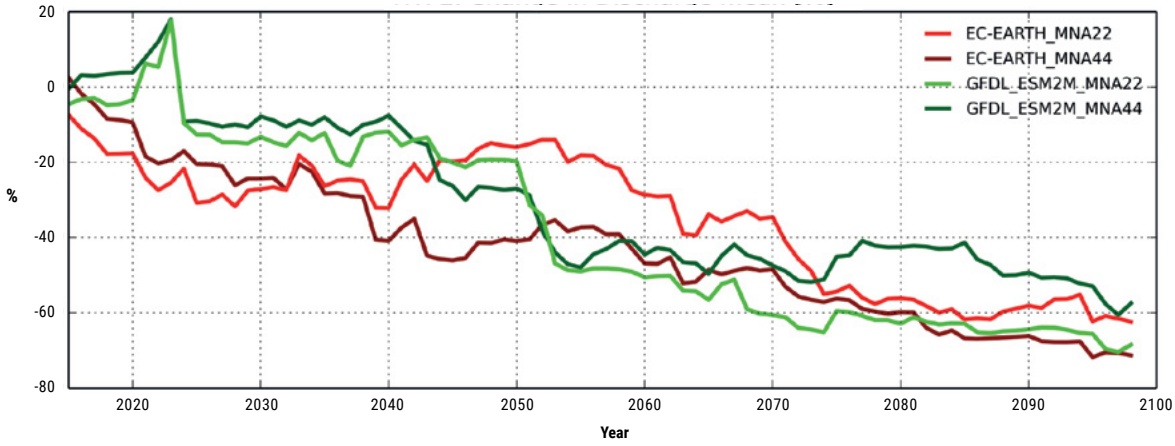
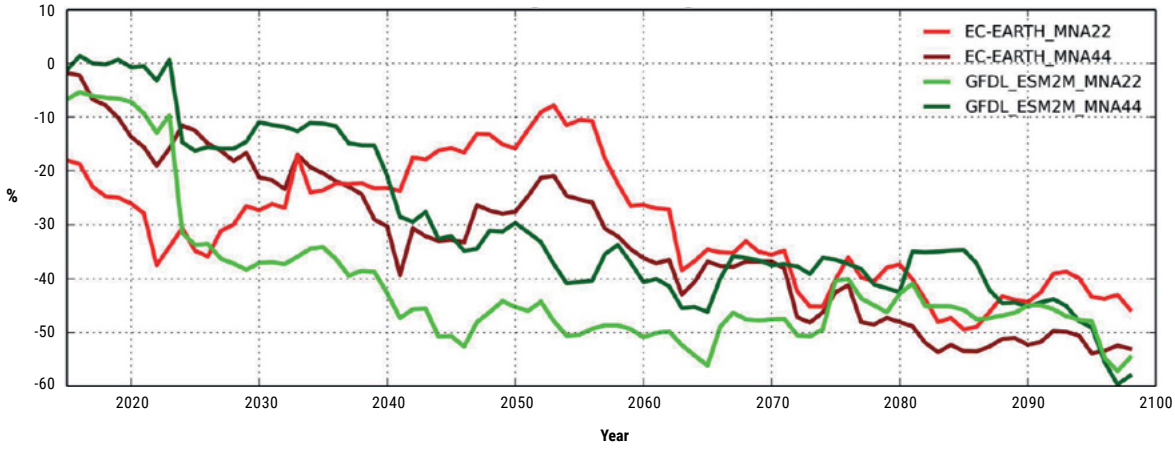



**FIGURE 199**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 9

## JORDAN RIVER

9.1. GENERAL PARAMETERS – 9.1.1. TEMPERATURE

**FIGURE 200**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

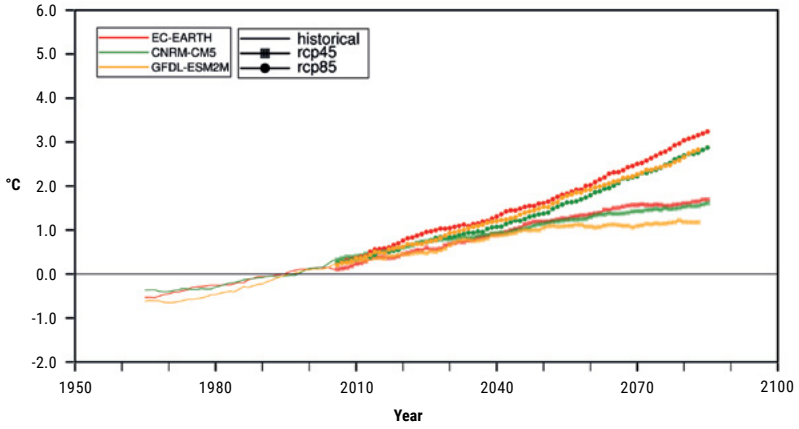



**FIGURE 201**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

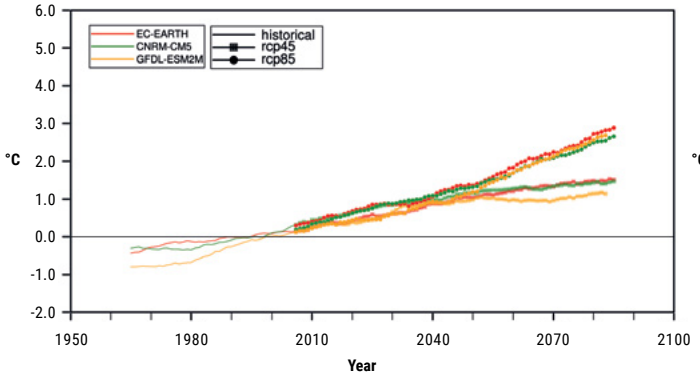



**FIGURE 202**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

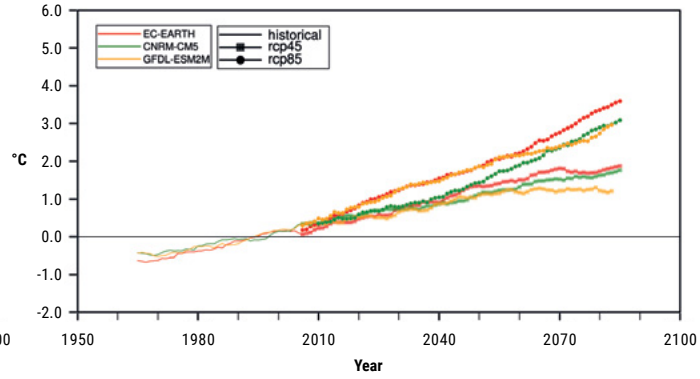



**FIGURE 203**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

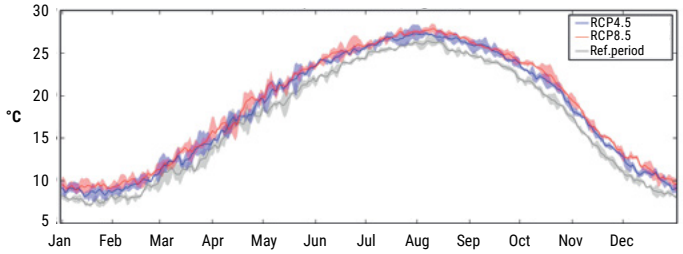
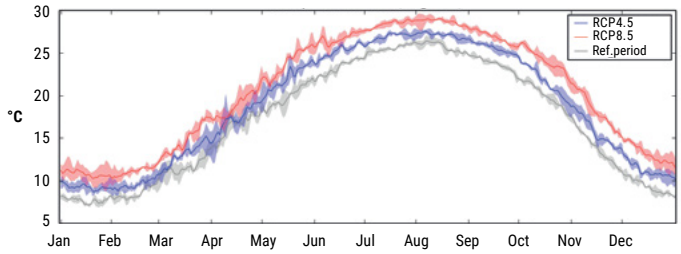



**FIGURE 204**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



9.1. GENERAL PARAMETERS – **9.1.2. PRECIPITATION**

**FIGURE 205**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

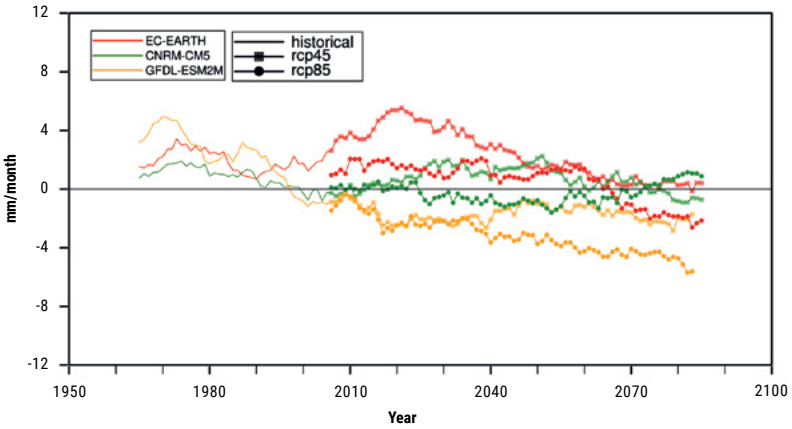



**FIGURE 206**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

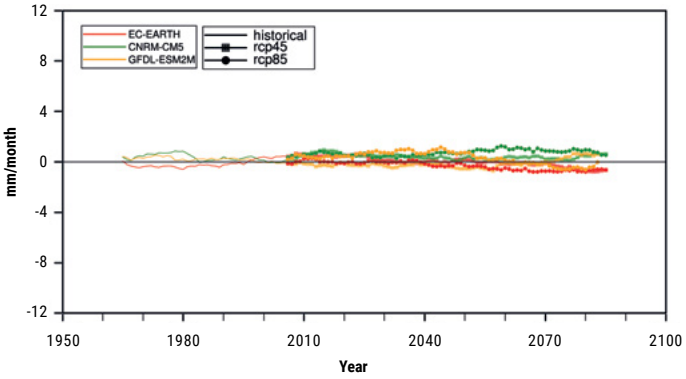



**FIGURE 207**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

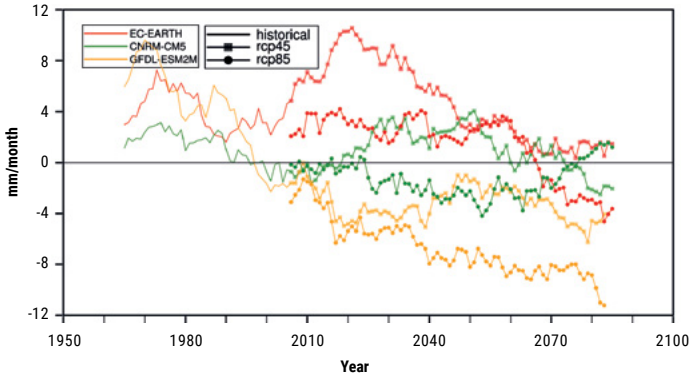



**FIGURE 208**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

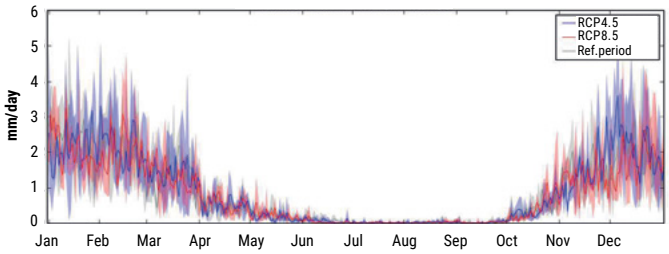
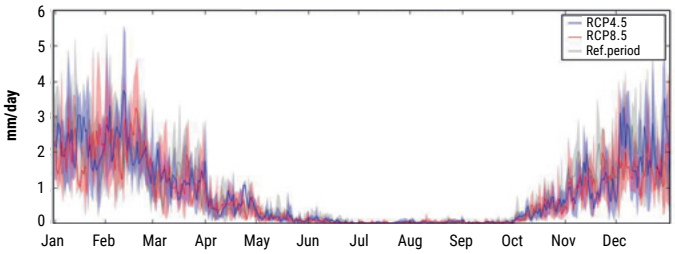



**FIGURE 209**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 9.2. EXTREME EVENTS – 9.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 210**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

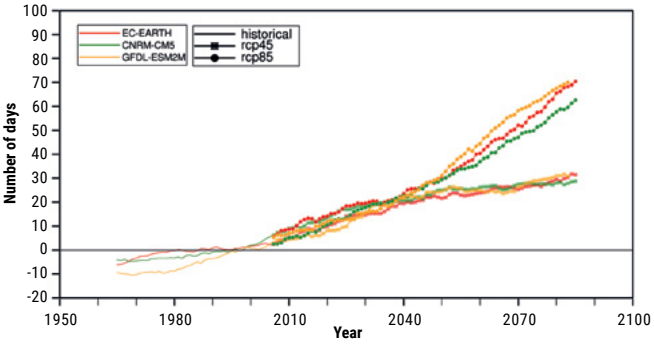



**FIGURE 211**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

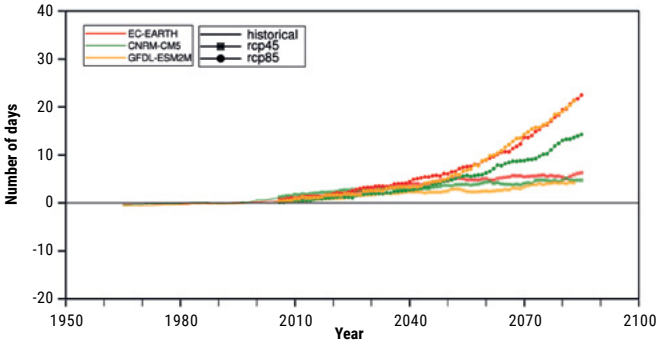
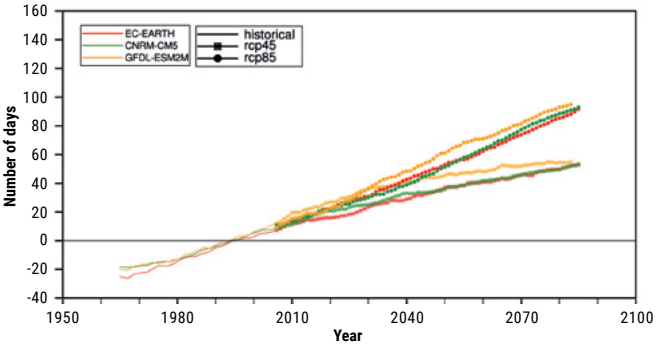



**FIGURE 212**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 9.2. EXTREME EVENTS – 9.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 213**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

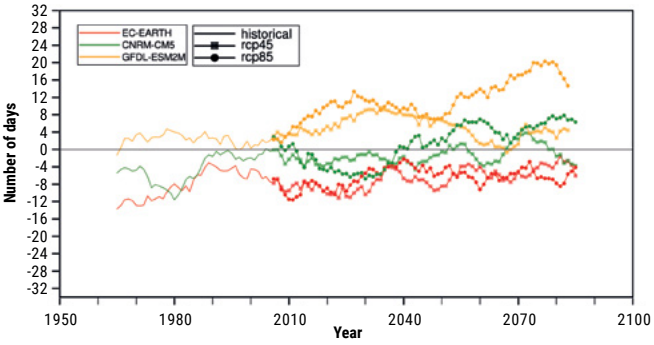



**FIGURE 214**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

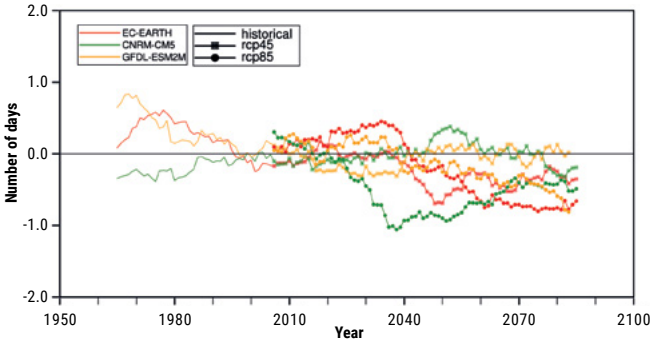



**FIGURE 215**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

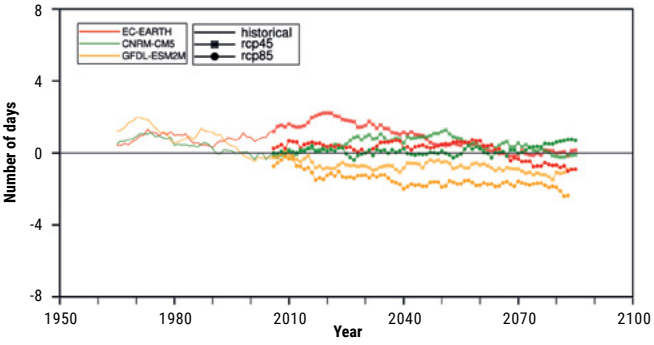
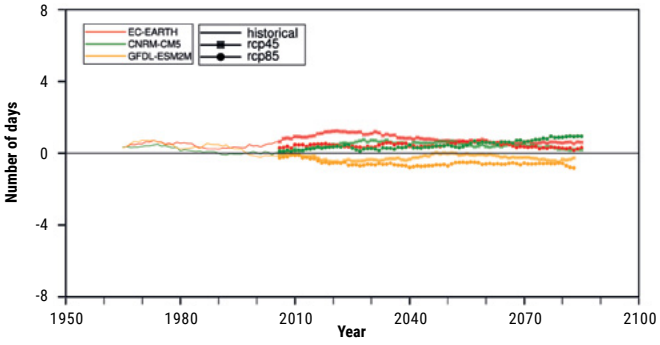



**FIGURE 216**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



9.3. HYDROLOGICAL PARAMETERS – **9.3.1. RUNOFF**

**FIGURE 217**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

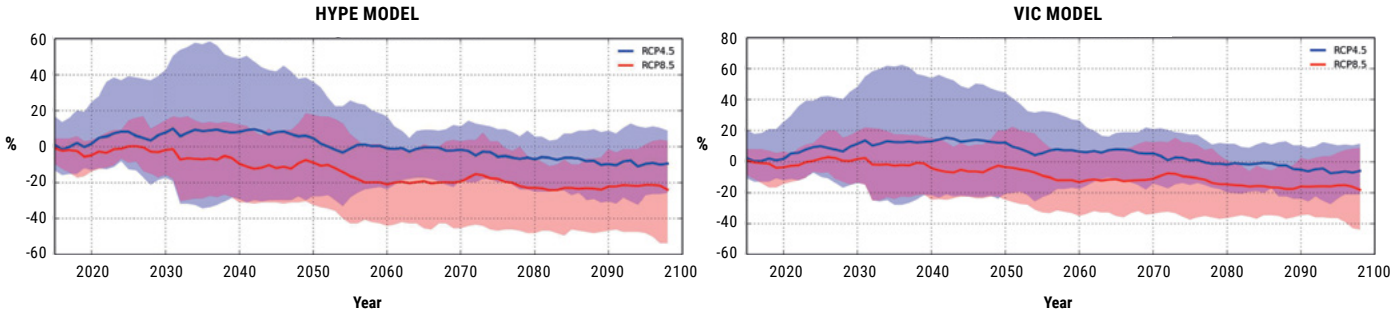



**FIGURE 218**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

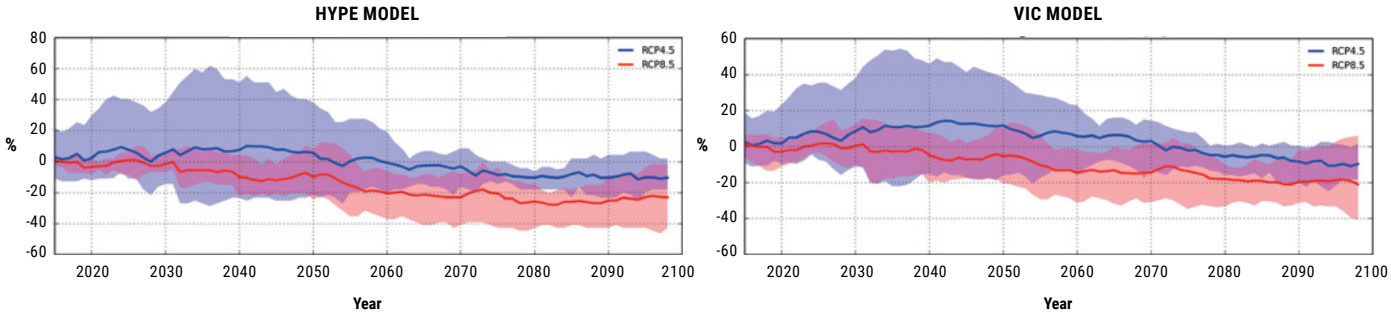
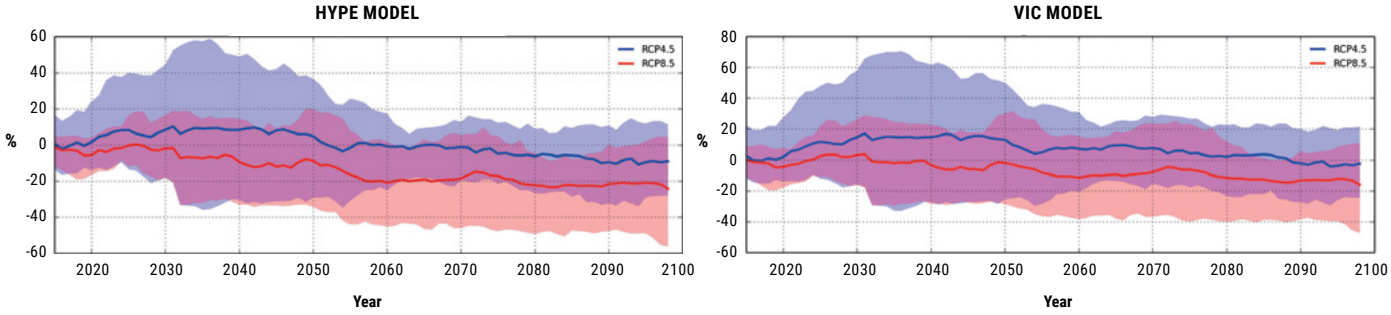



**FIGURE 219**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



9.3. HYDROLOGICAL PARAMETERS – 9.3.2. DISCHARGE

**FIGURE 220**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

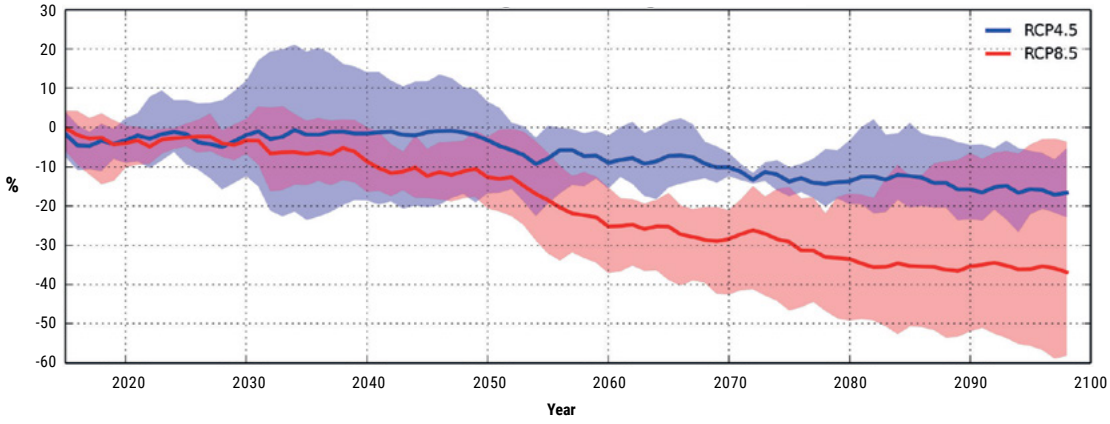



**FIGURE 221**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

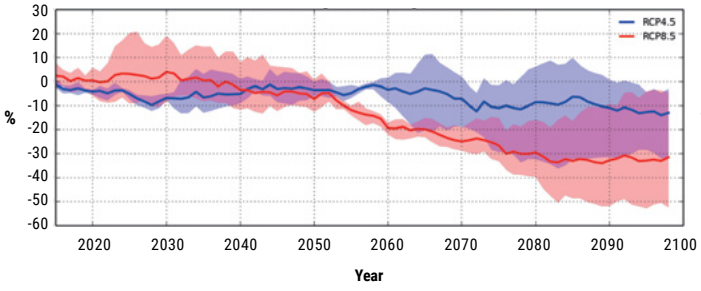
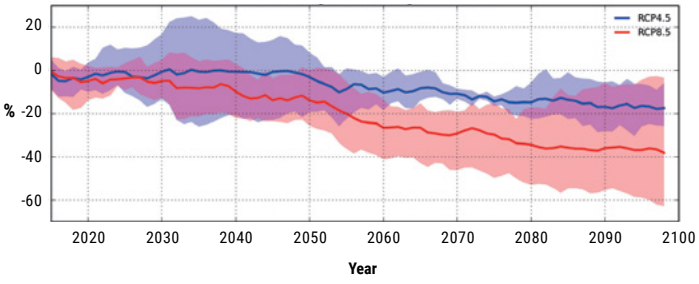
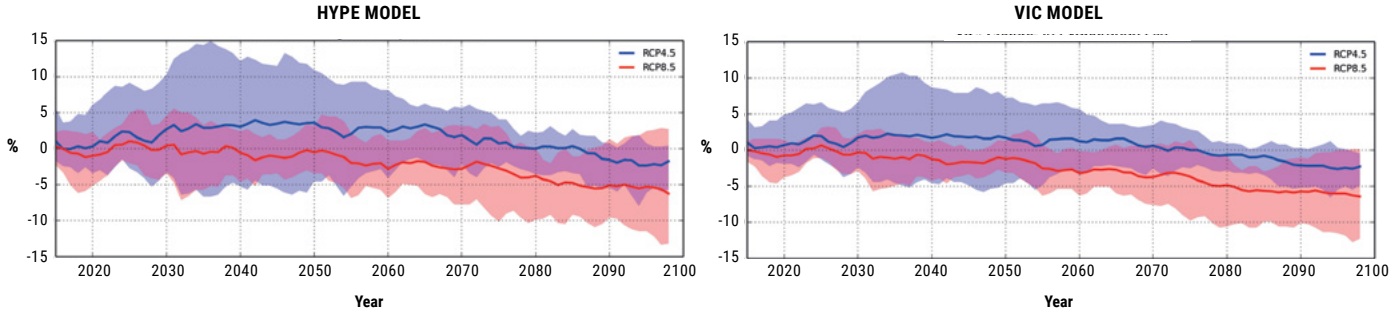



**FIGURE 222**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




9.3. HYDROLOGICAL PARAMETERS – 9.3.3. EVAPOTRANSPIRATION

**FIGURE 223**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



9.3. HYDROLOGICAL PARAMETERS – 9.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **9.3.4.1. RUNOFF**

**FIGURE 224**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

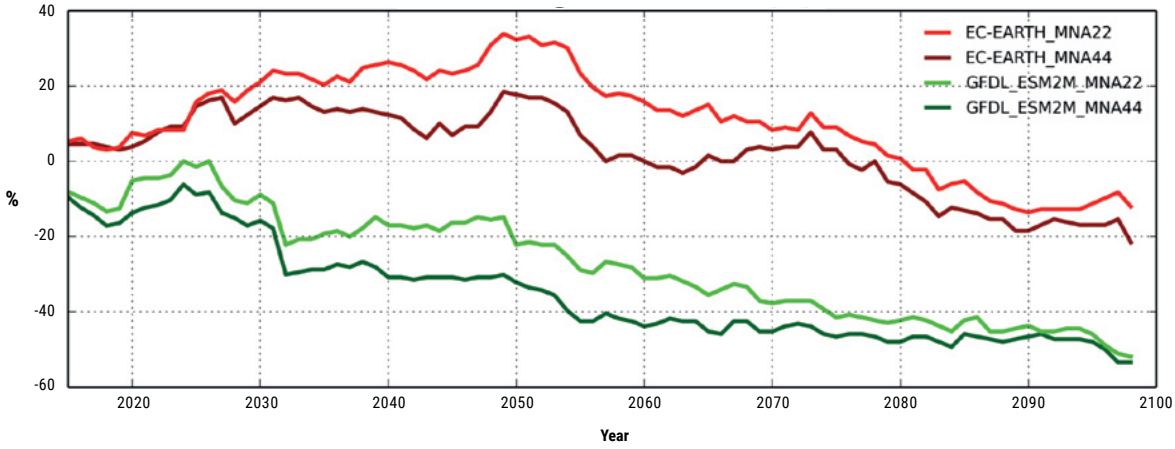



**FIGURE 225**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

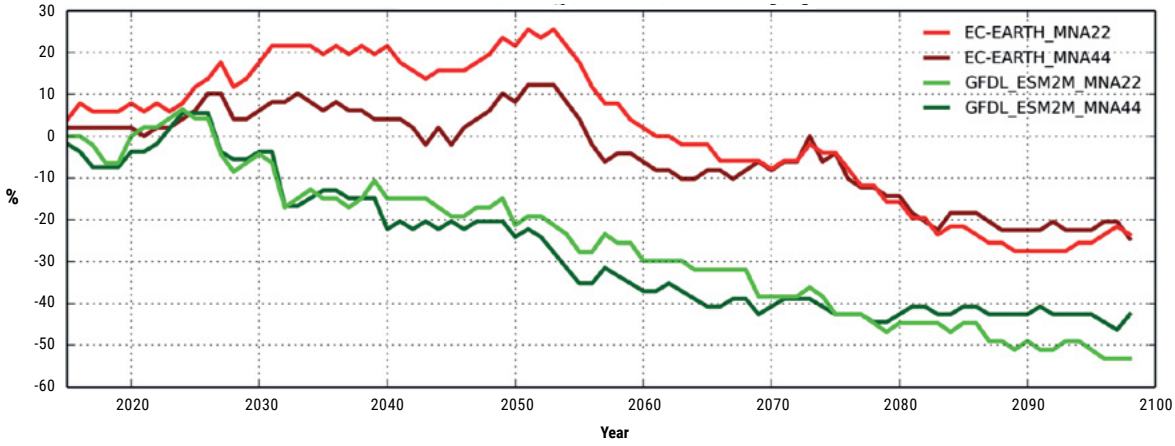
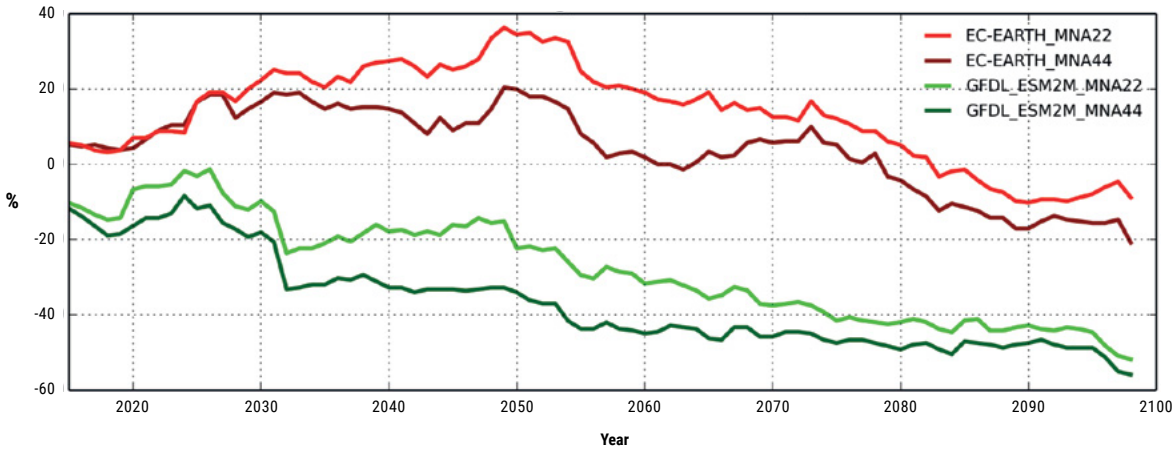



**FIGURE 226**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



9.3. HYDROLOGICAL PARAMETERS – 9.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 9.3.4.2. DISCHARGE

**FIGURE 227**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

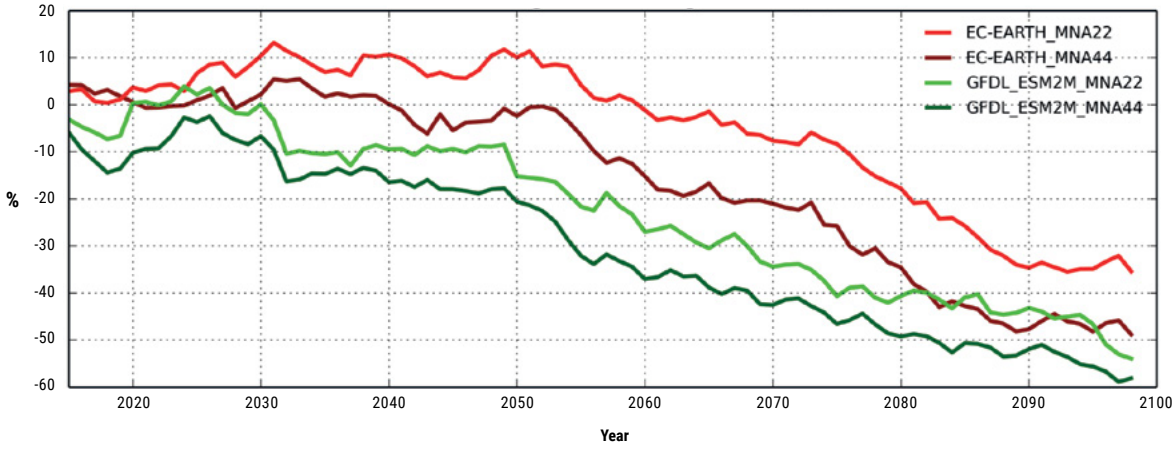



**FIGURE 228**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April-September) over time for two RCP 8.5 projections using HYPE model

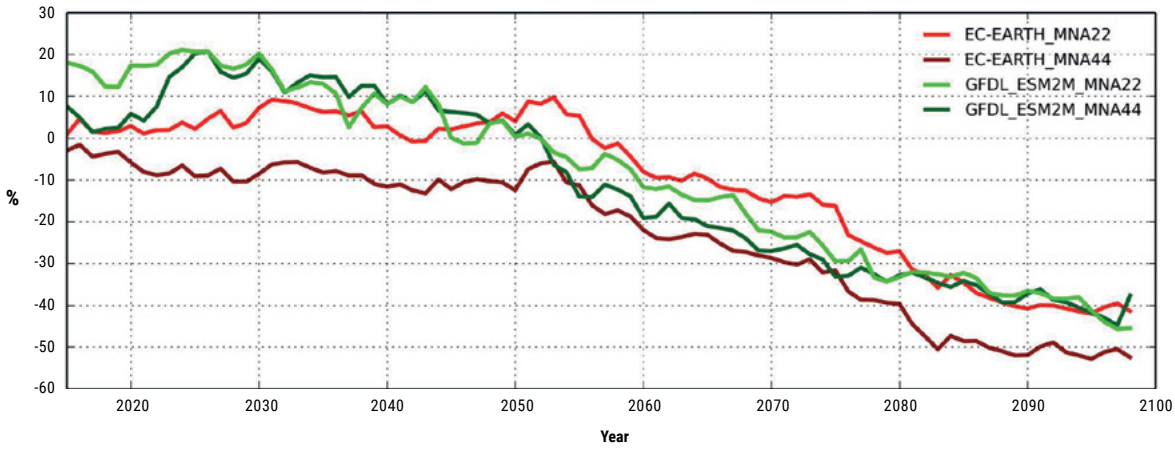
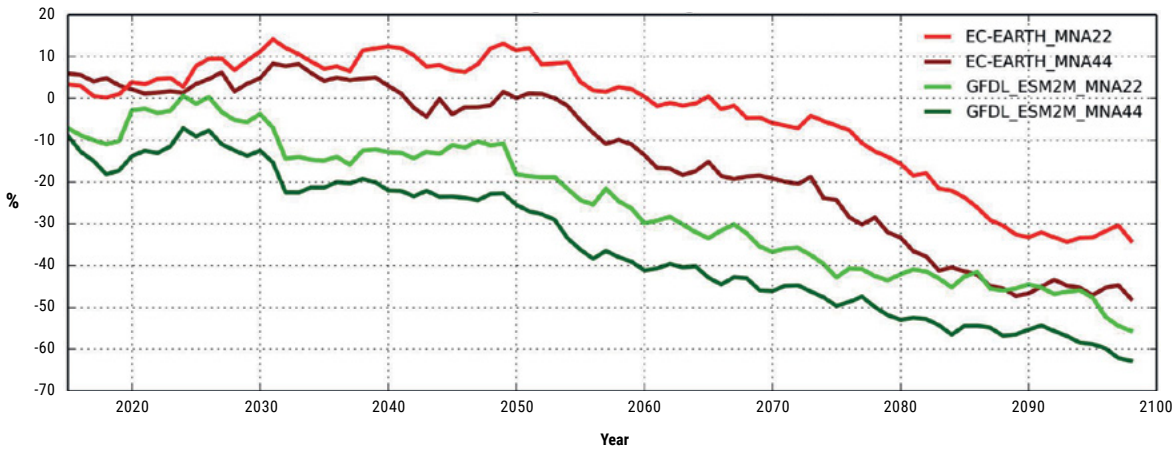



**FIGURE 229**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# CHAPTER 10

## SENEGAL RIVER: SENEGAL HEADWATERS

10.1. GENERAL PARAMETERS – 10.1.1. TEMPERATURE

**FIGURE 230**
Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections

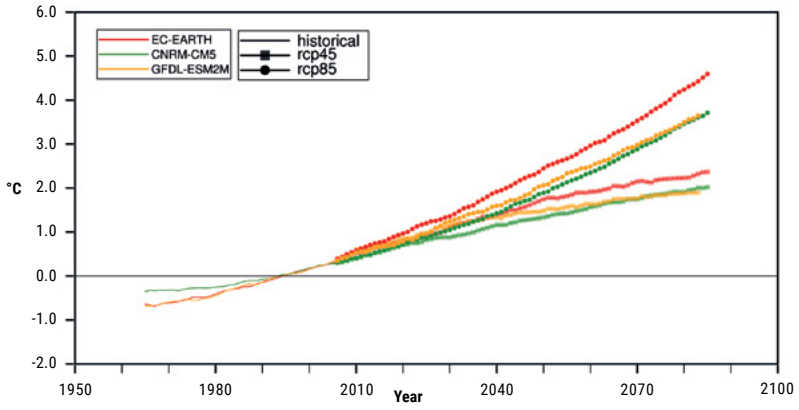



**FIGURE 231**
Mean change in seasonal temperature (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

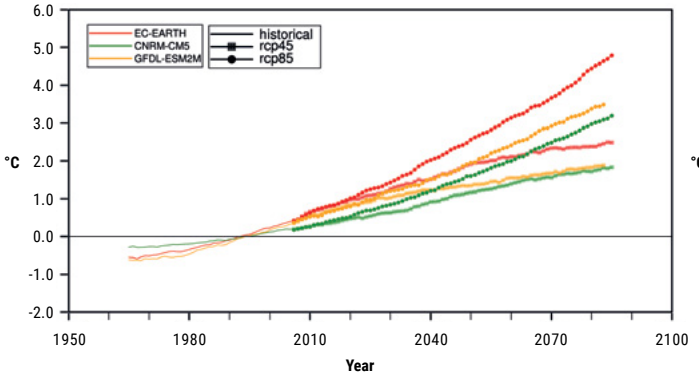



**FIGURE 232**
Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

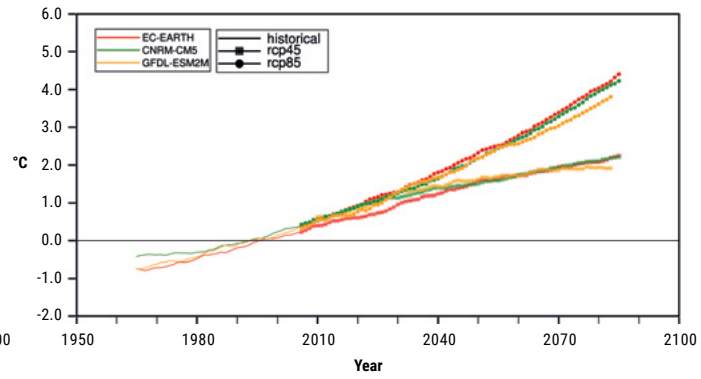



**FIGURE 233**
Mean change in monthly temperature for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

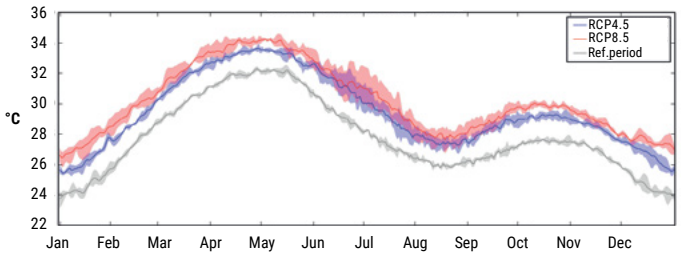
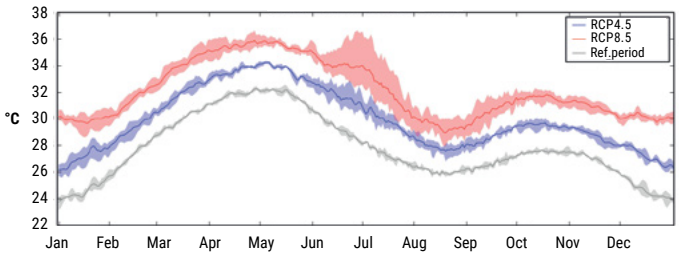



**FIGURE 234**
Mean change in monthly temperature for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



10.1. GENERAL PARAMETERS – **10.1.2. PRECIPITATION**

**FIGURE 235**
Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections

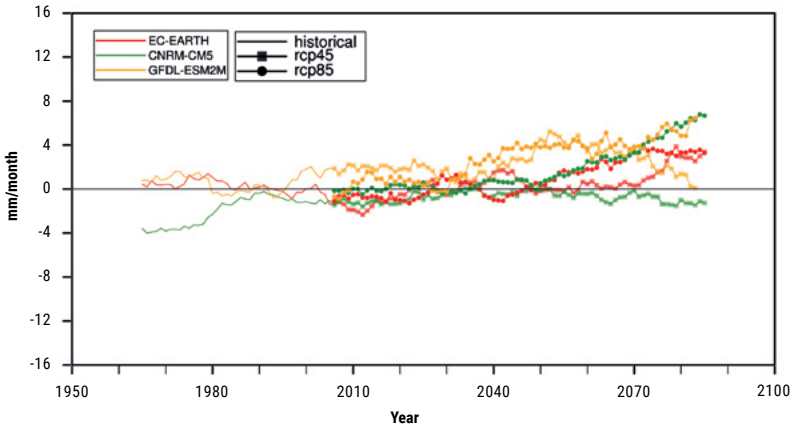



**FIGURE 236**
Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

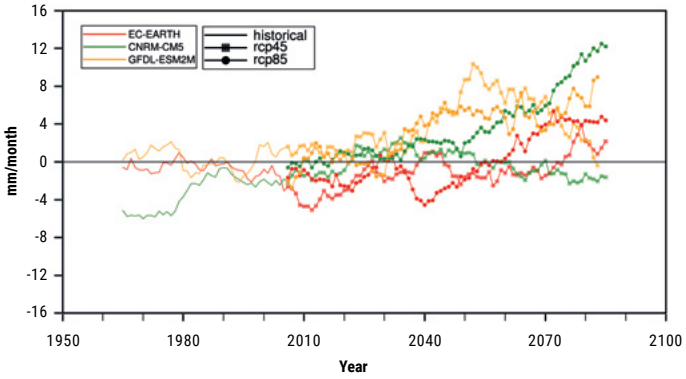



**FIGURE 237**
Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections

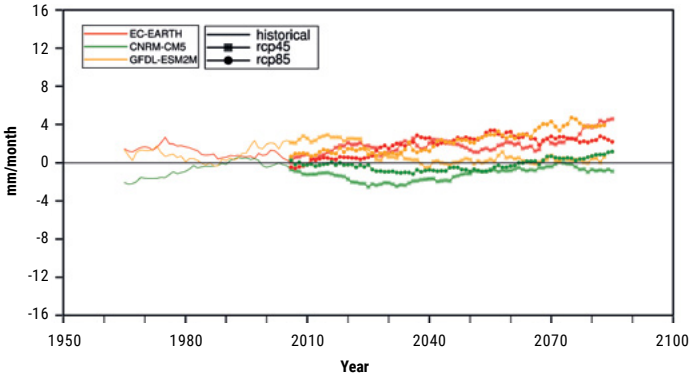



**FIGURE 238**
Mean change in monthly precipitation for mid-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period

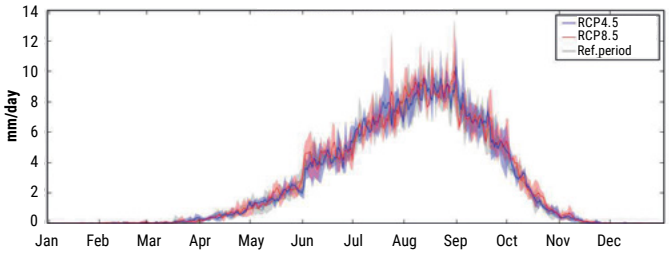
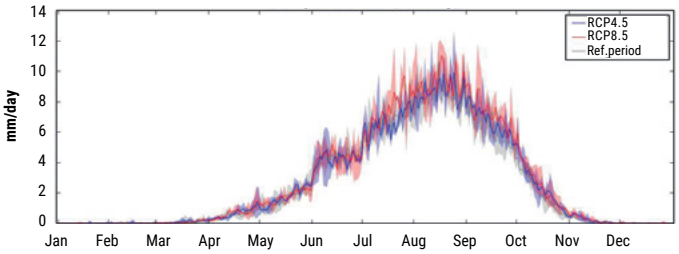



**FIGURE 239**
Mean change in monthly precipitation for end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period



## 10.2. EXTREME EVENTS – 10.2.1. CHANGES IN EXTREME TEMPERATURE

**FIGURE 240**
Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

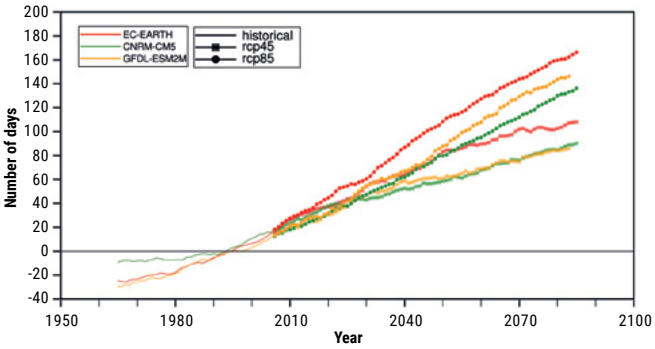



**FIGURE 241**
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

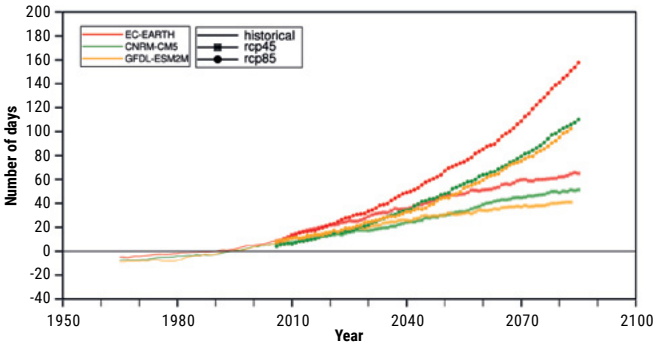
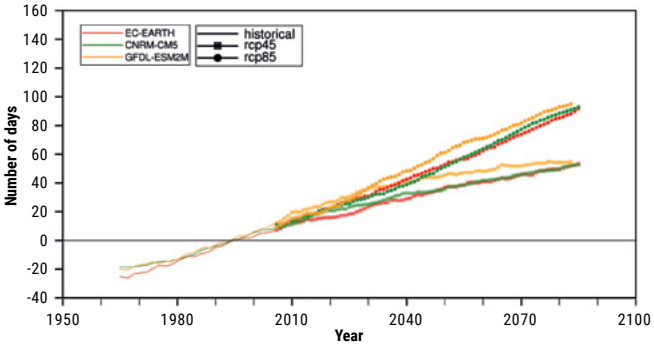



**FIGURE 242**
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections




## 10.2. EXTREME EVENTS – 10.2.2. CHANGES IN EXTREME PRECIPITATION

**FIGURE 243**
Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

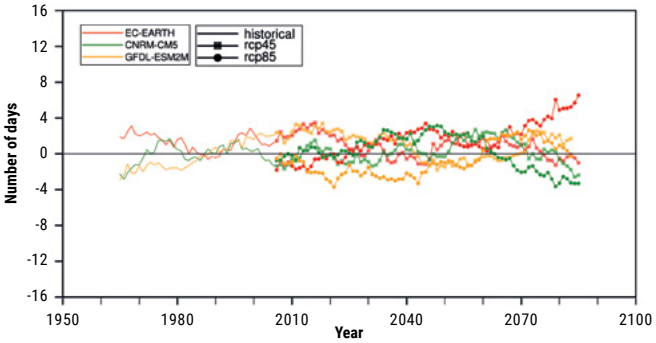



**FIGURE 244**
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

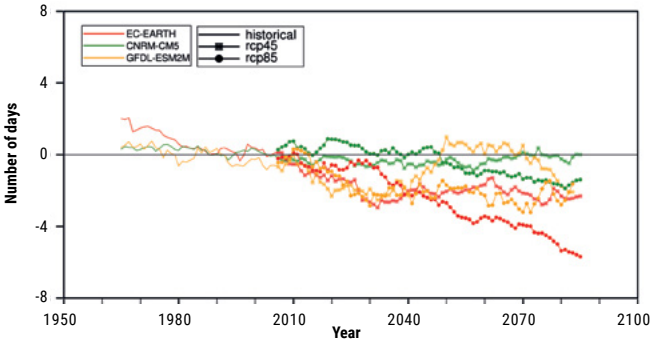



**FIGURE 245**
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

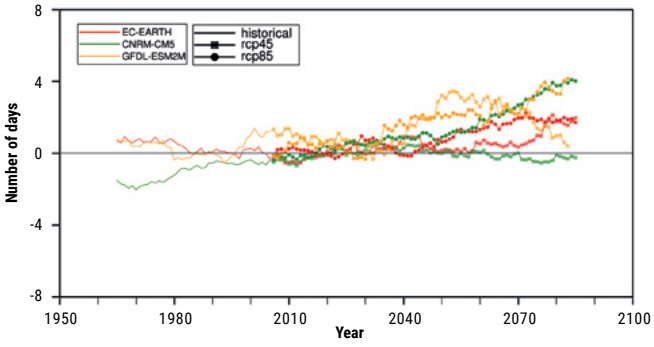
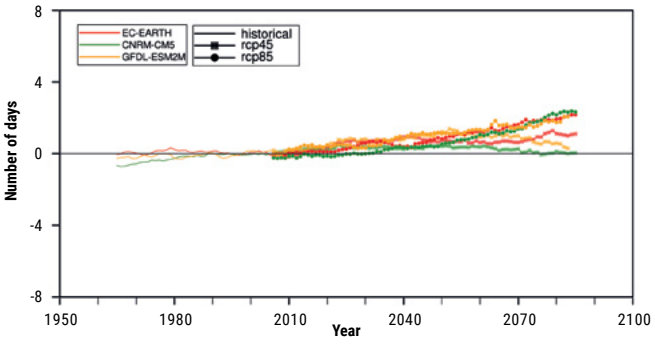



**FIGURE 246**
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



10.3. HYDROLOGICAL PARAMETERS – **10.3.1. RUNOFF**

**FIGURE 247**
Mean change in annual runoff over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

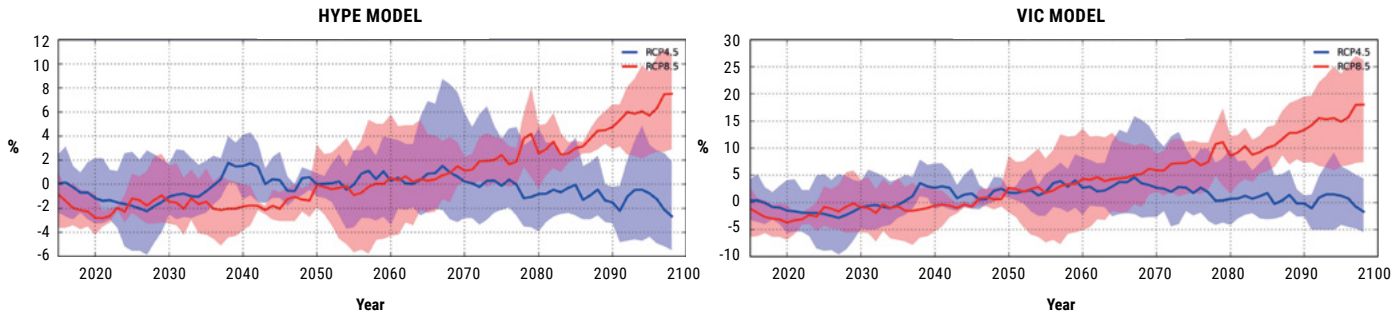



**FIGURE 248**
Mean change in seasonal runoff (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models

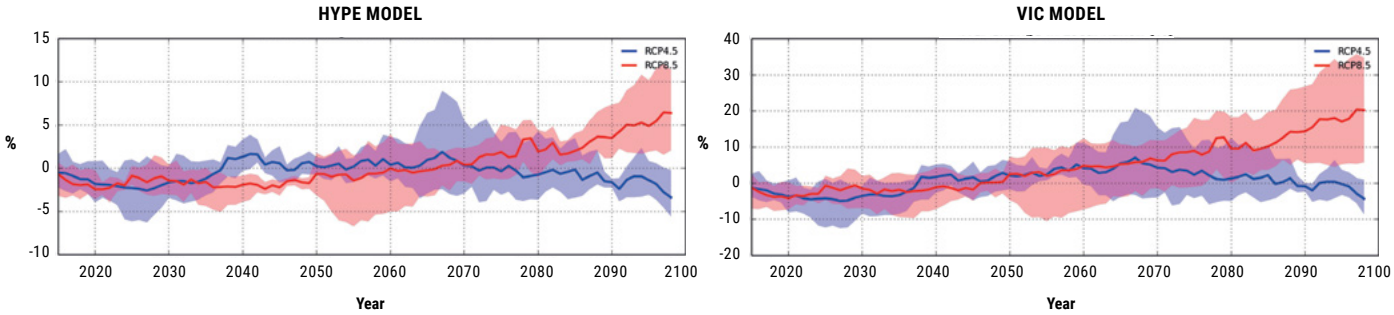
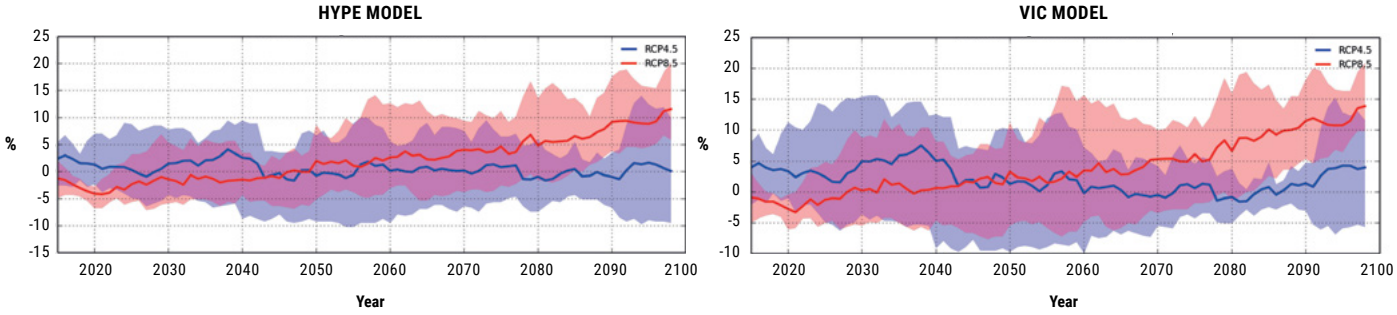



**FIGURE 249**
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



10.3. HYDROLOGICAL PARAMETERS – 10.3.2. DISCHARGE

**FIGURE 250**
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

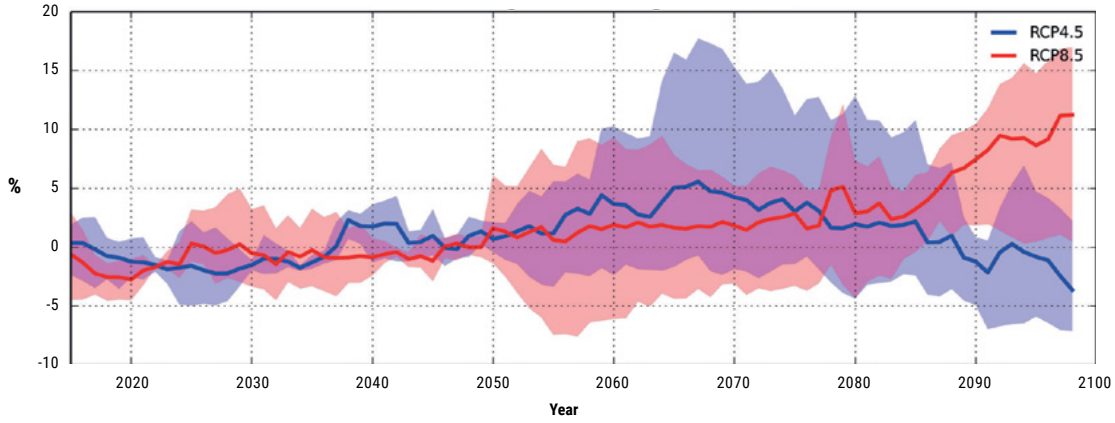



**FIGURE 251**
Mean change in seasonal discharge (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

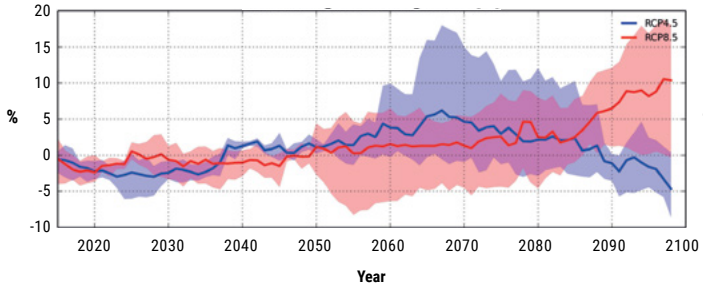
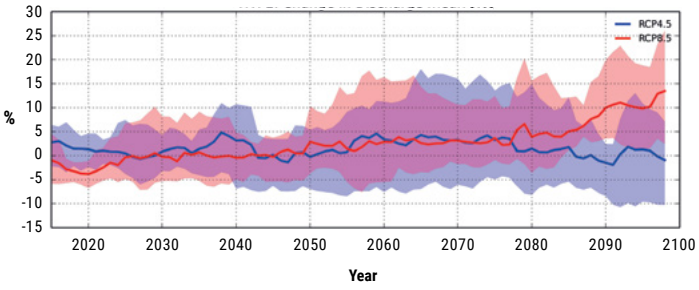
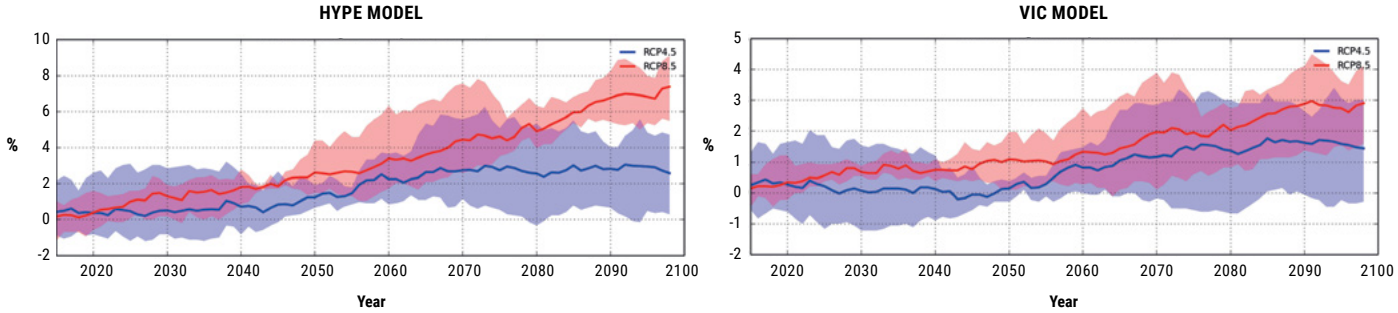



**FIGURE 252**
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model




10.3. HYDROLOGICAL PARAMETERS – 10.3.3. EVAPOTRANSPIRATION

**FIGURE 253**
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



10.3. HYDROLOGICAL PARAMETERS – 10.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – **10.3.4.1. RUNOFF**

**FIGURE 254**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

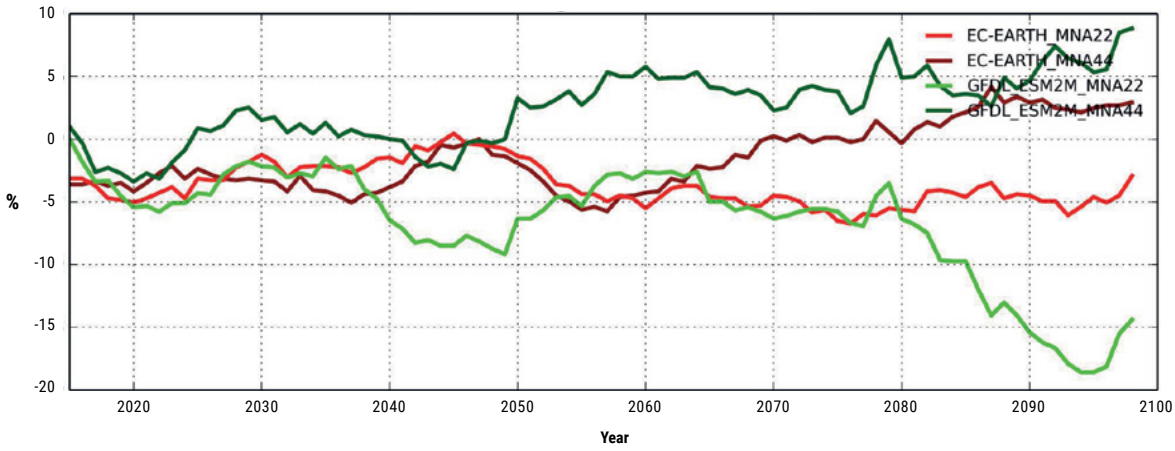



**FIGURE 255**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

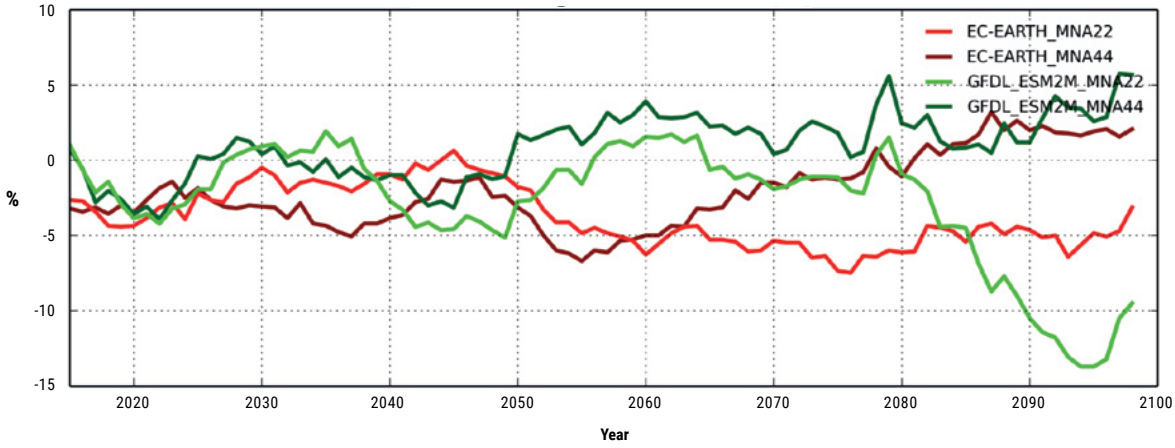



**FIGURE 256**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model

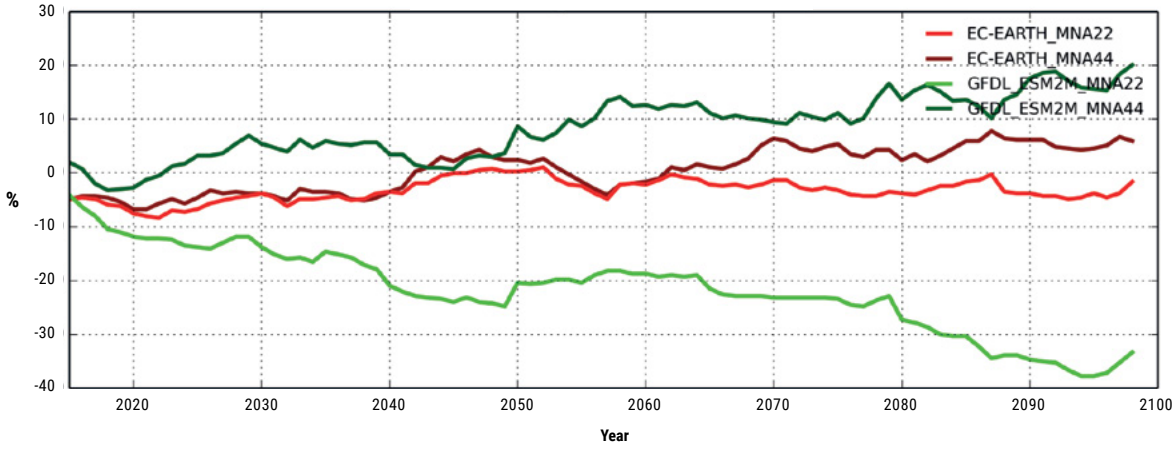


**FIGURE 257**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

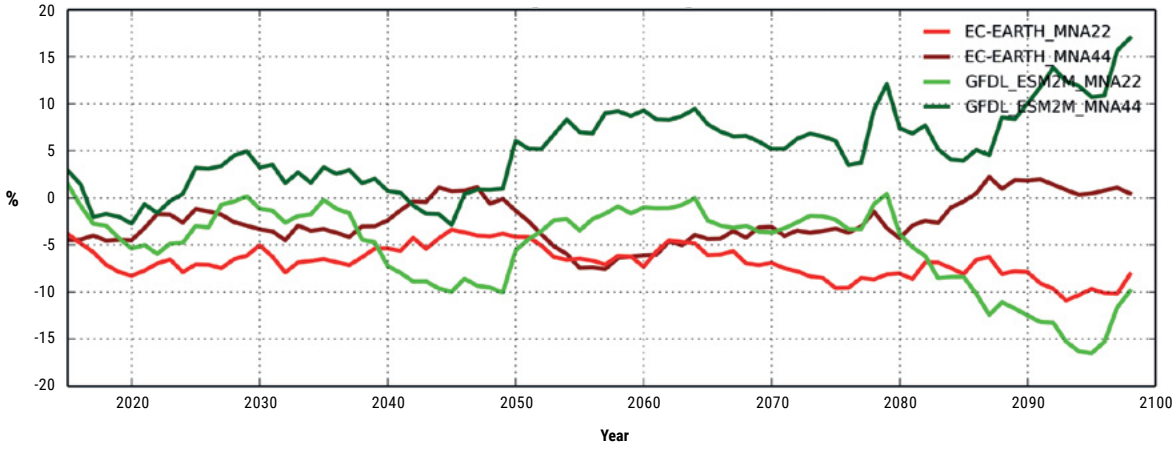



**FIGURE 258**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (April-September) over time for two RCP 8.5 projections using HYPE model

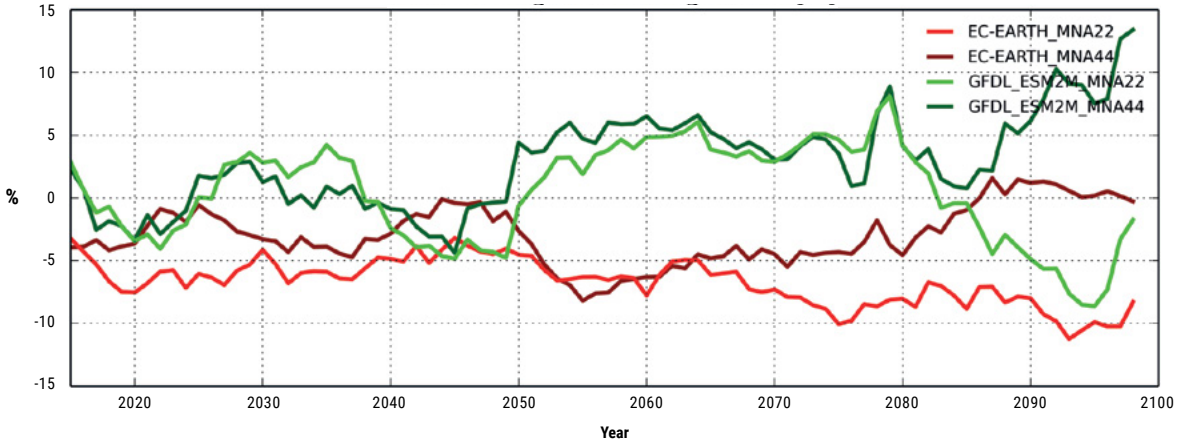
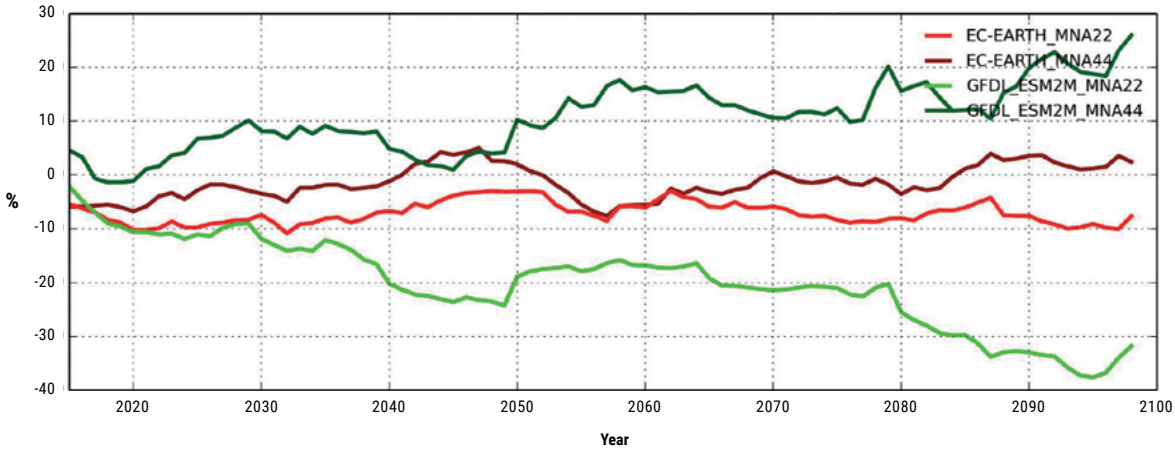



**FIGURE 259**
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal discharge (October-March) over time for two RCP 8.5 projections using HYPE model



# PART II

# INTEGRATED VULNERABILITY ASSESSMENT

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## CHAPTER 11
WATER SECTOR



## CHAPTER 12
BIODIVERSITY AND ECOSYSTEMS SECTOR

## CHAPTER 13
AGRICULTURE SECTOR

## CHAPTER 14

INFRASTRUCTURE AND HUMAN SETTLEMENTS SECTOR



## CHAPTER 15

PEOPLE SECTOR

# **Integrated Vulnerability Assessment** Explanatory Note

Results presented include impact chains and maps for each of the sectors studied, namely: Water (Chapter 11); Biodiversity and ecosystems (Chapter 12); Agriculture (Chapter 13); Infrastructure and human settlements (Chapter 14), and People (Chapter 15), along with their associated subsectors.

Results for each subsector were derived from indicators and their impact chains. Impact chains illustrate cause-effect relationships between identified indicators from each vulnerability component (exposure, sensitivity, and adaptive capacity), and the relevant climate change impact. The aggregated results are presented on maps representing exposure, sensitivity, adaptive capacity composite indicators, potential impact, and vulnerability, all of which are provided for the reference period. For future periods, only the exposure composite indicator, potential impact and vulnerability are presented since the sensitivity and adaptive capacity components are based on static data and remain the same as the reference period. Solely vulnerability maps are provided for each sector due to integrating vulnerability outputs from the pertinent subsectors directly. In cases where only one subsector is identified under a given sector, no sector maps are included due to the resultant output being the same. It is important to highlight that all maps pertaining to the future periods represent the change in specific components relative to the reference period.

With regard to exposure, please note that data corresponding to exposure for RHM data was based on the outputs from the hydrological model VIC. It is assumed that classified values obtained from the HYPE hydrological model will be the same. Also note that classified values for the exposure component for the reference period are based on the actual values, while they are based upon the change in value (compared to the reference period) for the future periods; thus caution is advised when comparing results.

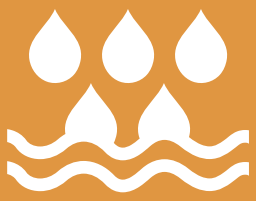
Some considerations were made with regard to map presentation. Maps only reveal the area of interest for the given sector or subsector. For example, for the area covered by forests subsector, only forested areas are shown. Also, as a reminder, all results are based on classified data (not value based). Because the resultant range of aggregated results was limited, the final classification was based on the minimum and maximum values obtained for each sector or subsector and divided into equal intervals from 1 to 10. This classification scheme was applied for all provided maps for a given sector or subsector to facilitate ease of comparison between the composite indicators and the vulnerability. Lastly, the colour scheme utilized was based on a “stoplight” such that green is representative of low vulnerability and red is representative of high vulnerability. A similar colour scheme was applied for the differing components.

Selected maps showing vulnerability hotspots, representing areas which are especially vulnerable to climate change impacts, are only presented in the main report. Such areas are intended to draw special attention in terms of vulnerability for a particular sector or subsector. For RICCAR, hotspots were identified based on the top percentage of vulnerability among the two time periods and two scenarios for each climate change impact. Conceptual and methodological methods to define hotspots are varied among studies conducted elsewhere and are affected by spatial scale and uncertainties in data and outputs.

Further details on the methodology and data sources used for the vulnerability assessment are found in the RICCAR Technical Note ‘Integrated Vulnerability Assessment: Arab Regional Application.

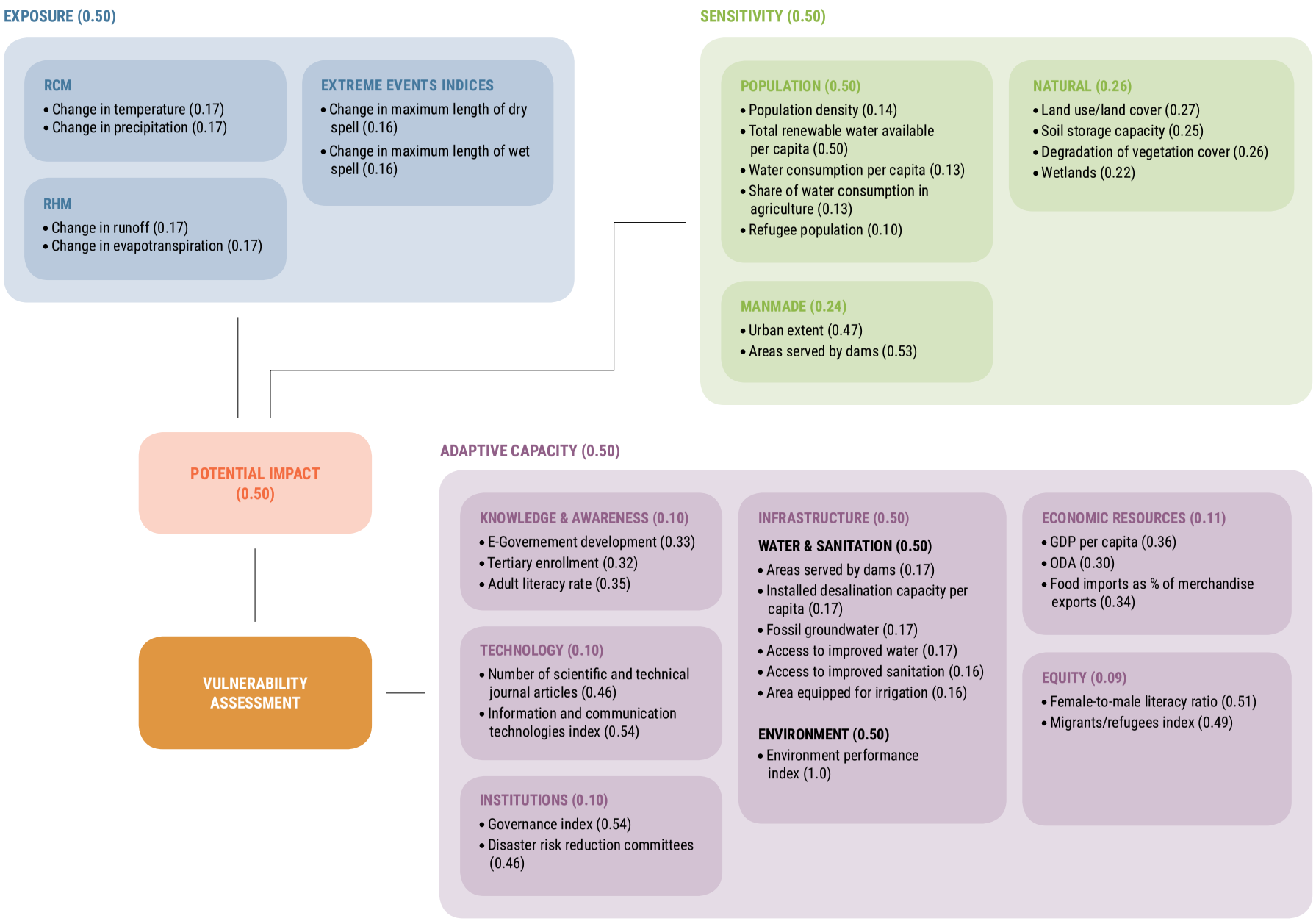
Finally, it is essential to note that assumptions, further considerations and detailed observations specific to each output are mentioned in the main report, and it is therefore advised to refer to it consistently while reading through this annex.

# CHAPTER 11



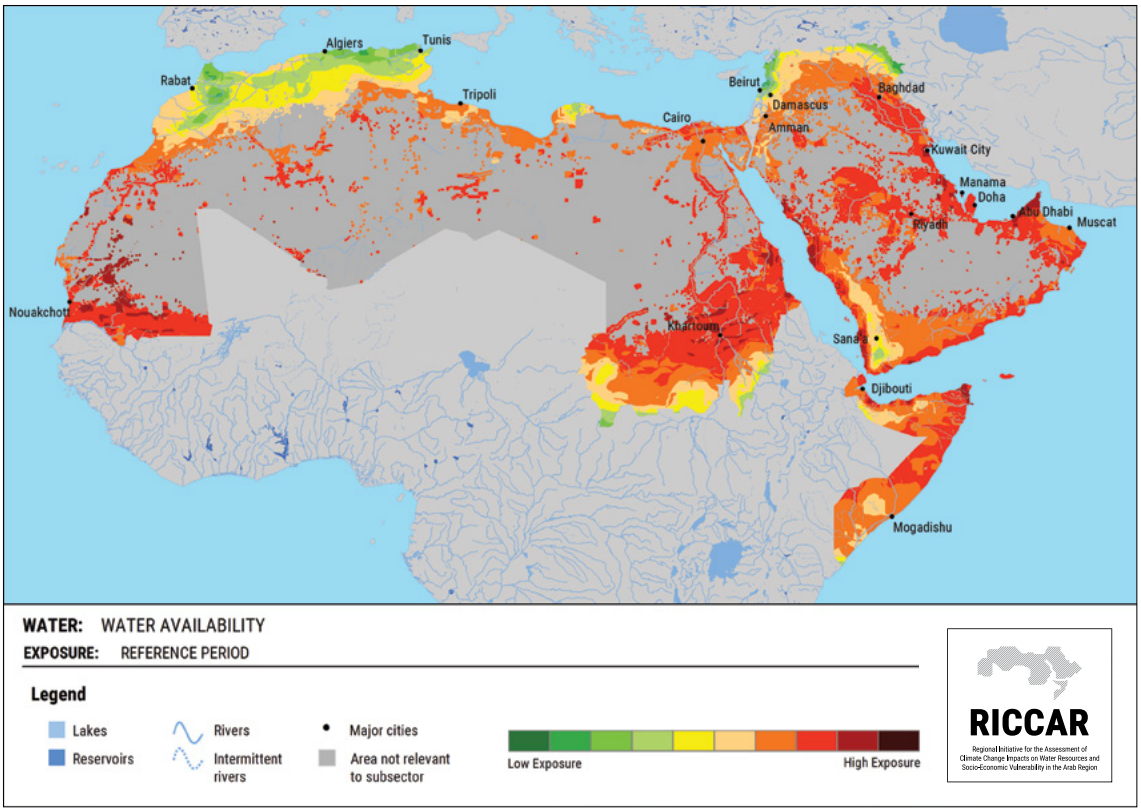
## WATER SECTOR

FIGURE 260


EXPOSURE (0.50)
RCM
• Change in temperature (0.17)
• Change in precipitation (0.17)
RHM
• Change in runoff (0.17)
• Change in evapotranspiration (0.17)
EXTREME EVENTS INDICES
• Change in maximum length of dry spell (0.16)
• Change in maximum length of wet spell (0.16)
SENSITIVITY (0.50)
POPULATION (0.50)
• Population density (0.14)
• Total renewable water available per capita (0.50)
• Water consumption per capita (0.13)
• Share of water consumption in agriculture (0.13)
• Refugee population (0.10)
MANMADE (0.24)
• Urban extent (0.47)
• Areas served by dams (0.53)
NATURAL (0.26)
• Land use/land cover (0.27)
• Soil storage capacity (0.25)
• Degradation of vegetation cover (0.26)
• Wetlands (0.22)
POTENTIAL IMPACT (0.50)
VULNERABILITY ASSESSMENT
ADAPTIVE CAPACITY (0.50)
KNOWLEDGE & AWARENESS (0.10)
• E-Governement development (0.33)
• Tertiary enrollment (0.32)
• Adult literacy rate (0.35)
TECHNOLOGY (0.10)
• Number of scientific and technical journal articles (0.46)
• Information and communication technologies index (0.54)
INSTITUTIONS (0.10)
• Governance index (0.54)
• Disaster risk reduction committees (0.46)
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 (0.50)
• Environment performance index (1.0)
ECONOMIC RESOURCES (0.11)
• GDP per capita (0.36)
• ODA (0.30)
• Food imports as % of merchandise exports (0.34)
EQUITY (0.09)
• Female-to-male literacy ratio (0.51)
• Migrants/refugees index (0.49)

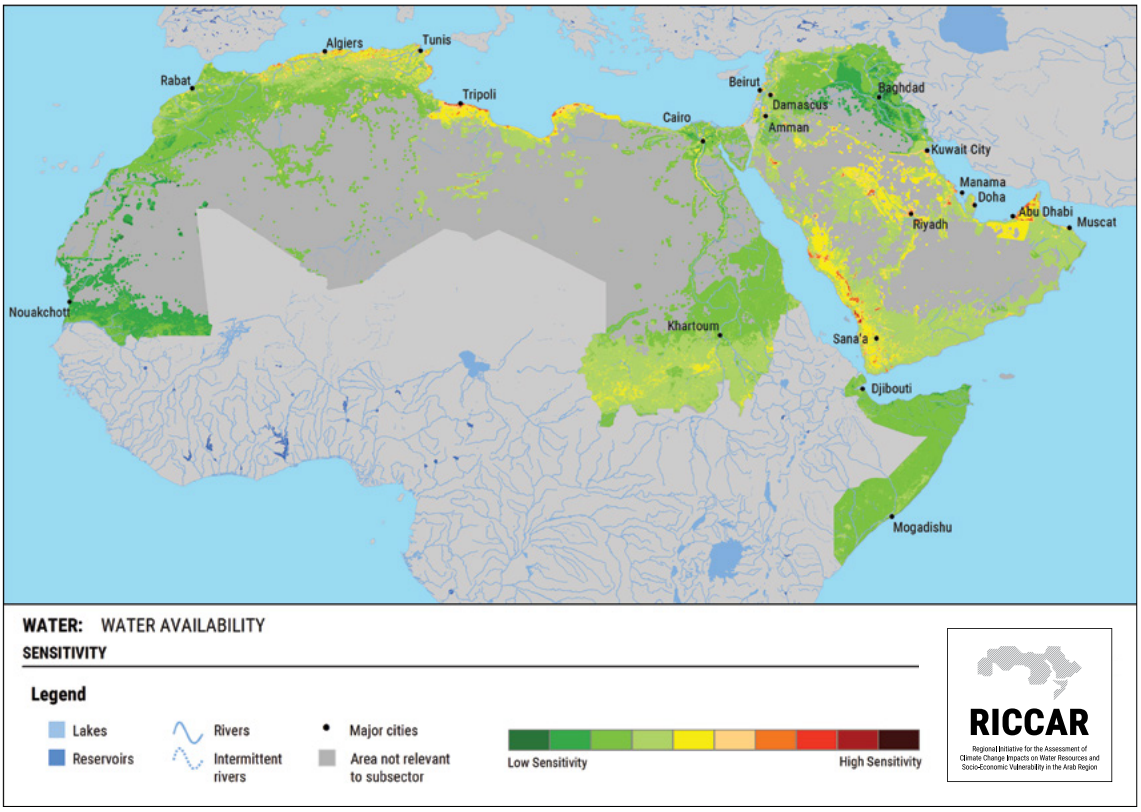
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – **11.1.2.1. EXPOSURE**

**FIGURE 261**



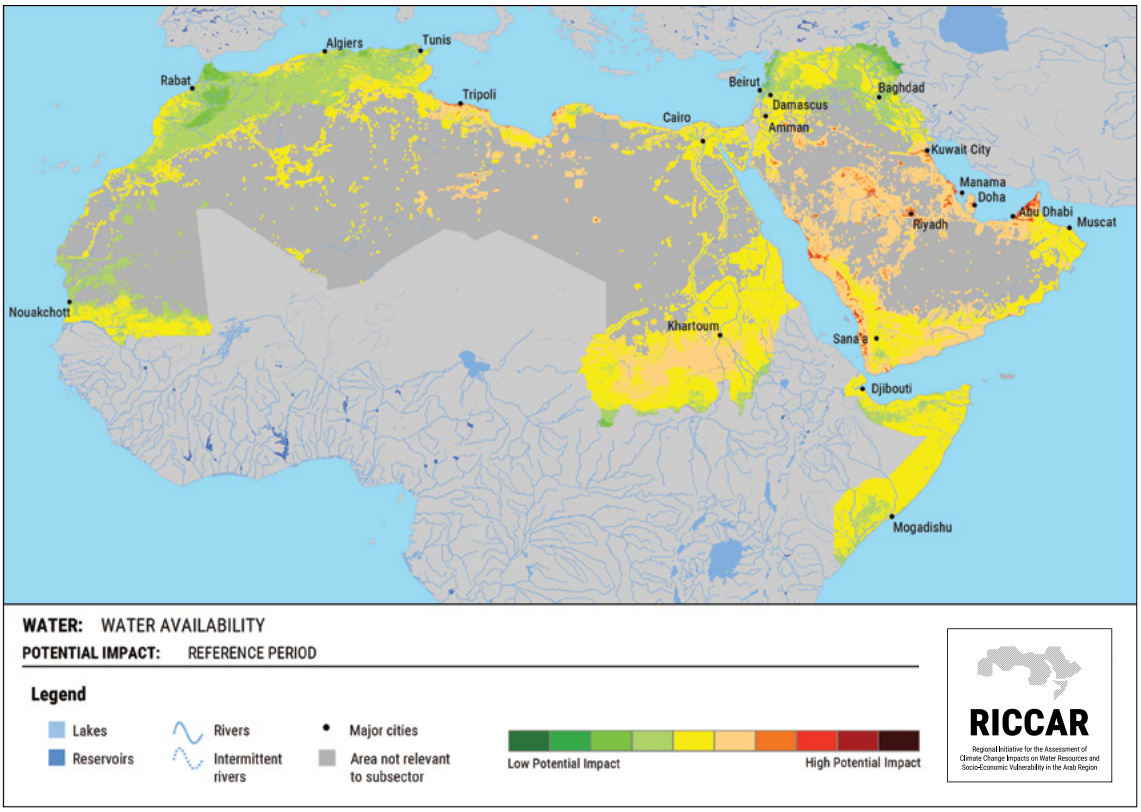

11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – **11.1.2.2. SENSITIVITY**

**FIGURE 262**



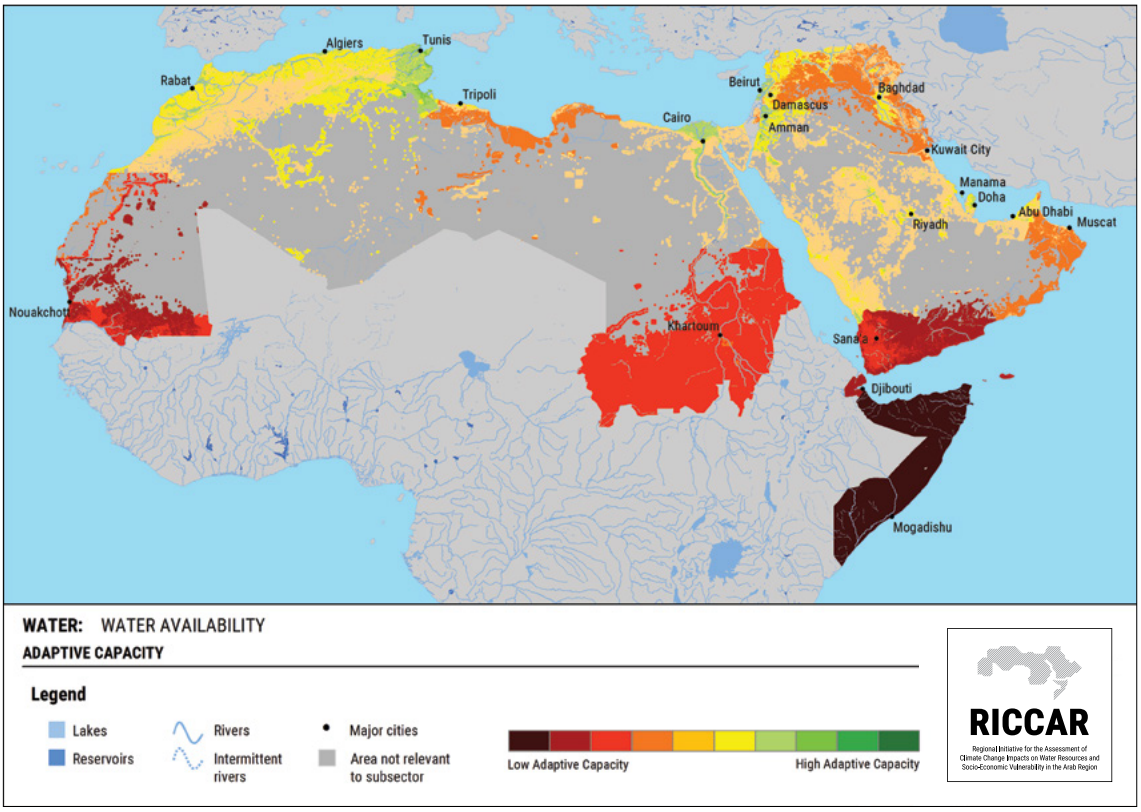
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – **11.1.2.3. POTENTIAL IMPACT**

**FIGURE 263**




11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – **11.1.2.4. ADAPTIVE CAPACITY**

**FIGURE 264**



11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – **11.1.2.5. VULNERABILTY**

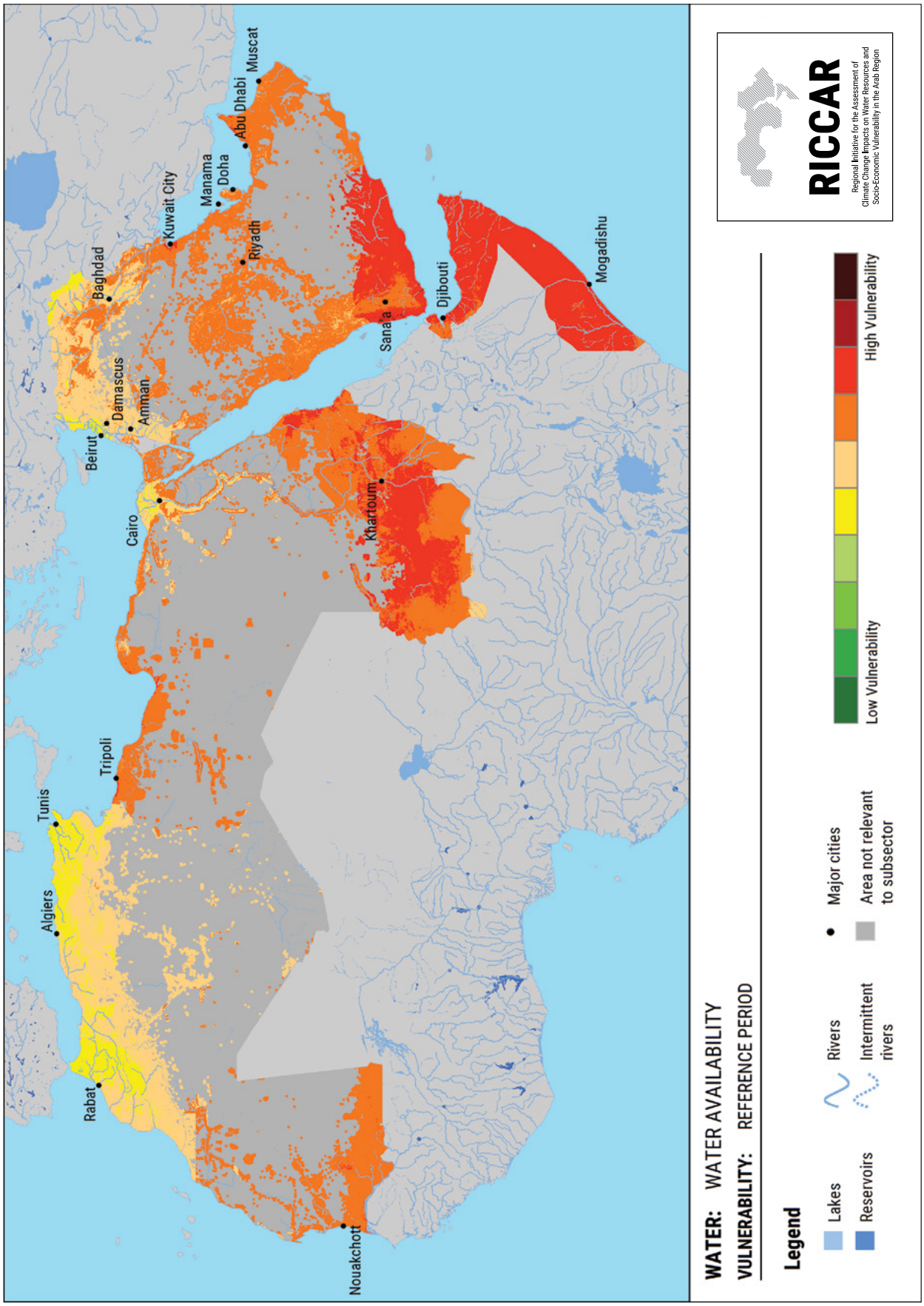
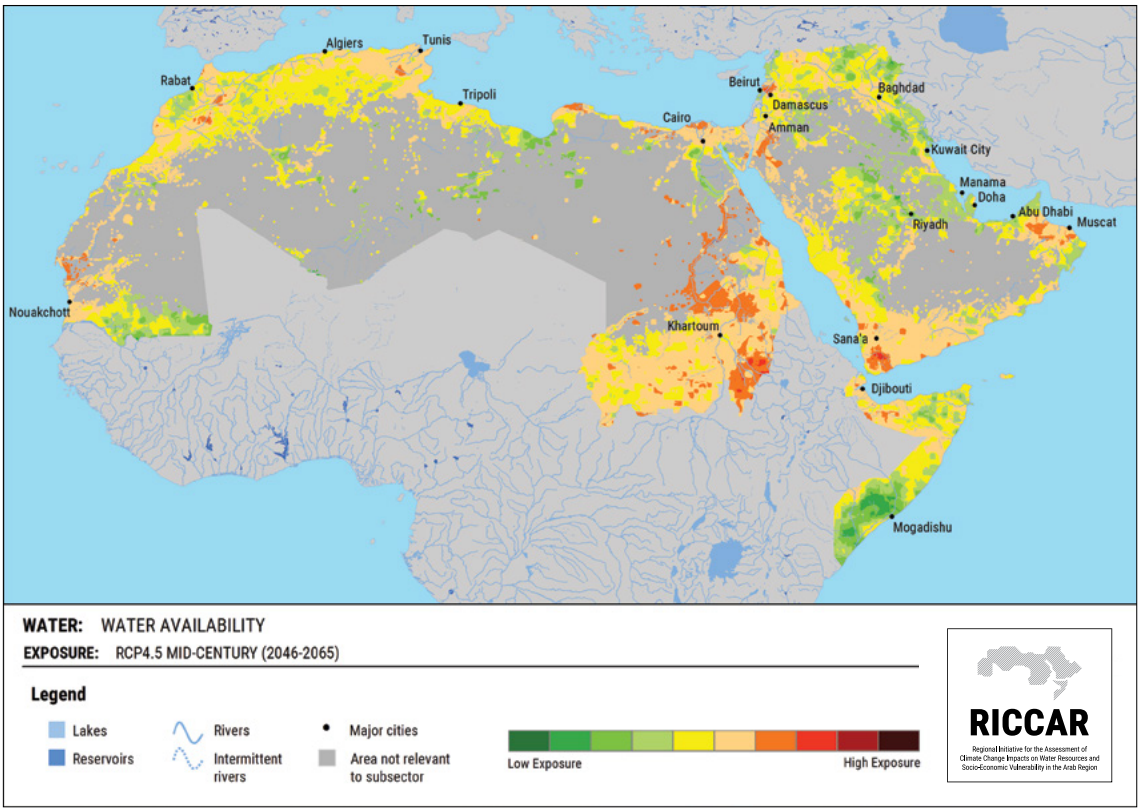



FIGURE 265

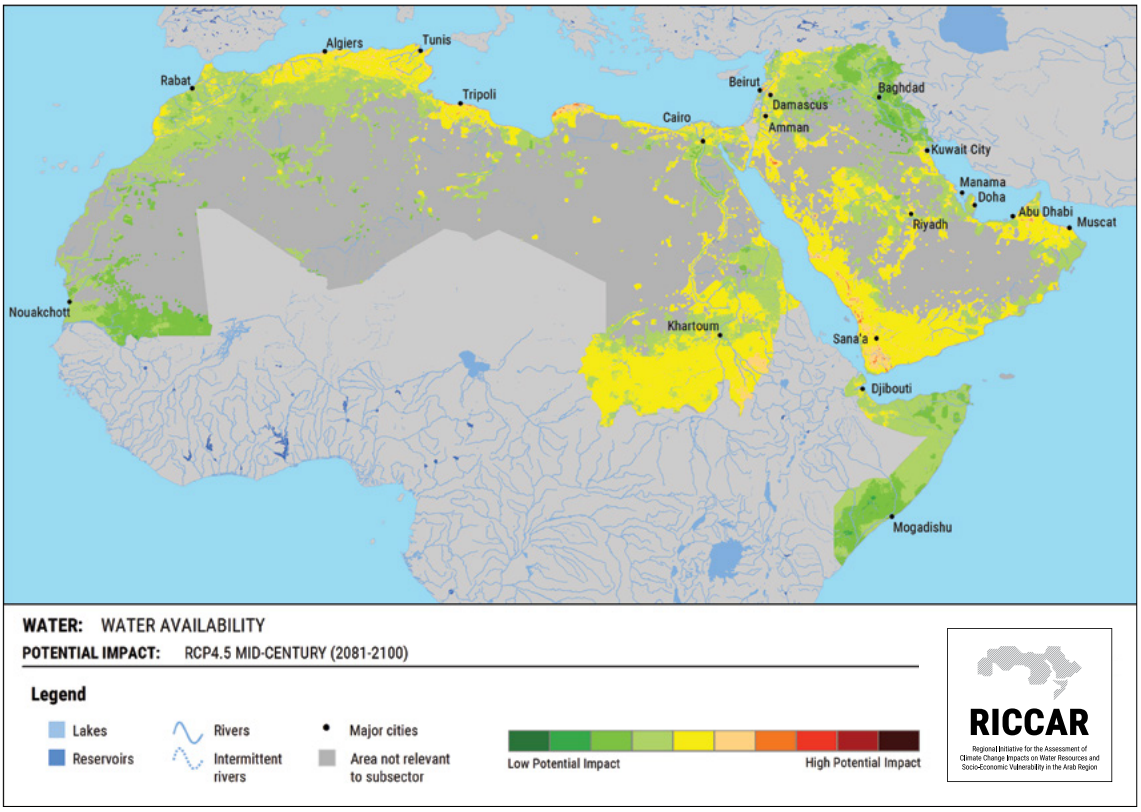
11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – 11.1.3.1. EXPOSURE

FIGURE 266




11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – 11.1.3.2. POTENTIAL IMPACT

FIGURE 267



11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – **11.1.3.3. VULNERABILITY**

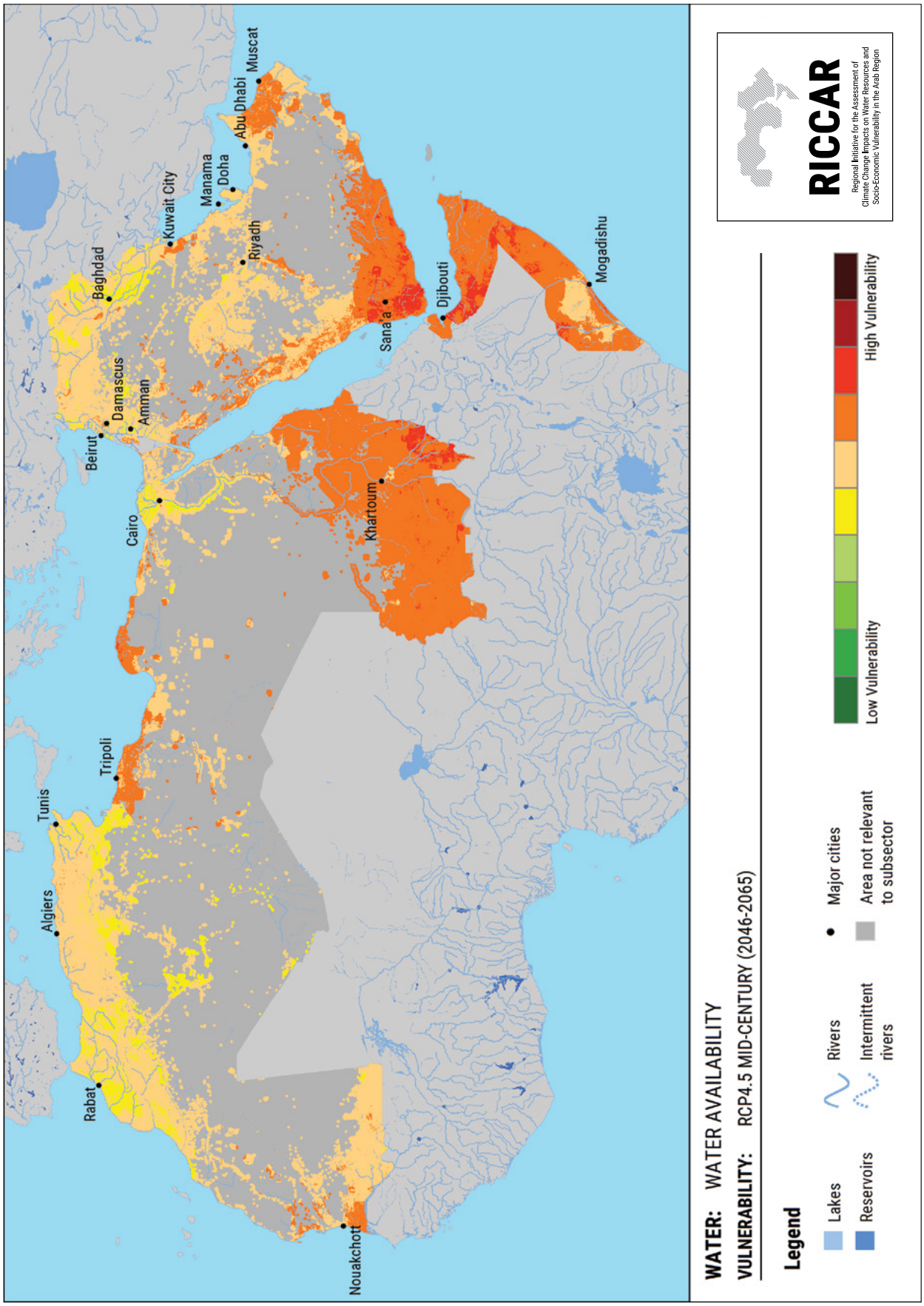
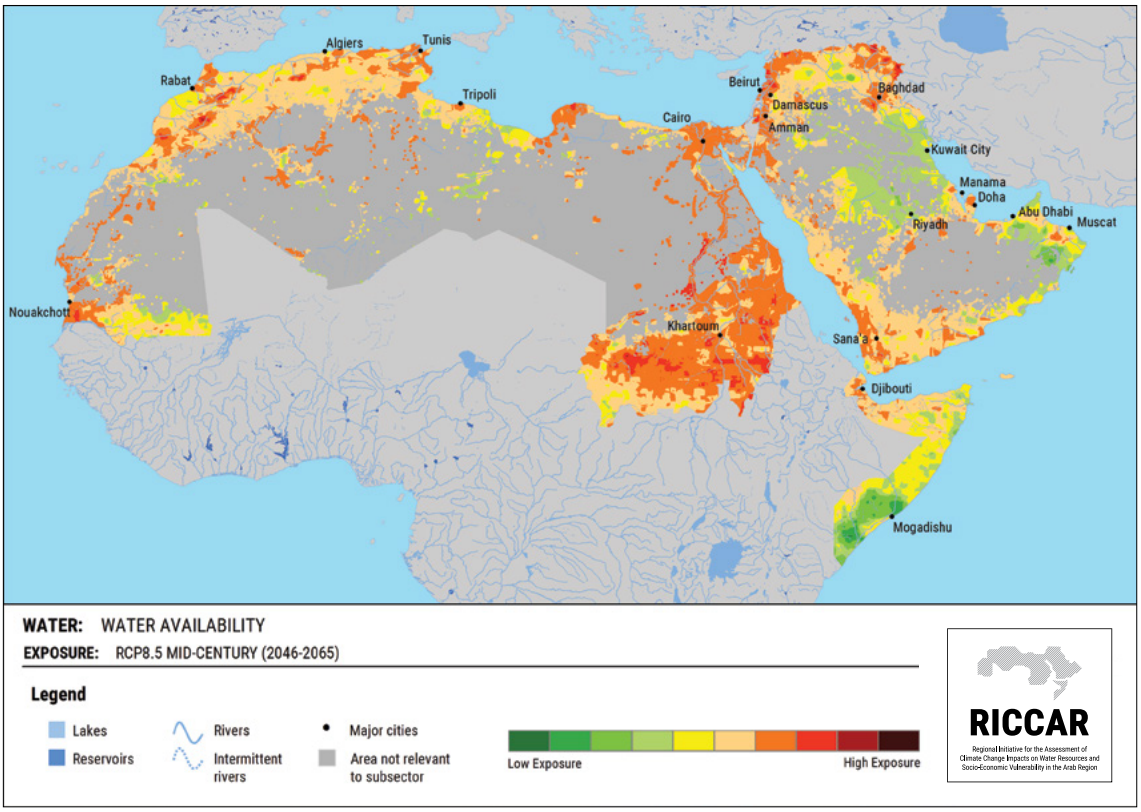



FIGURE 268

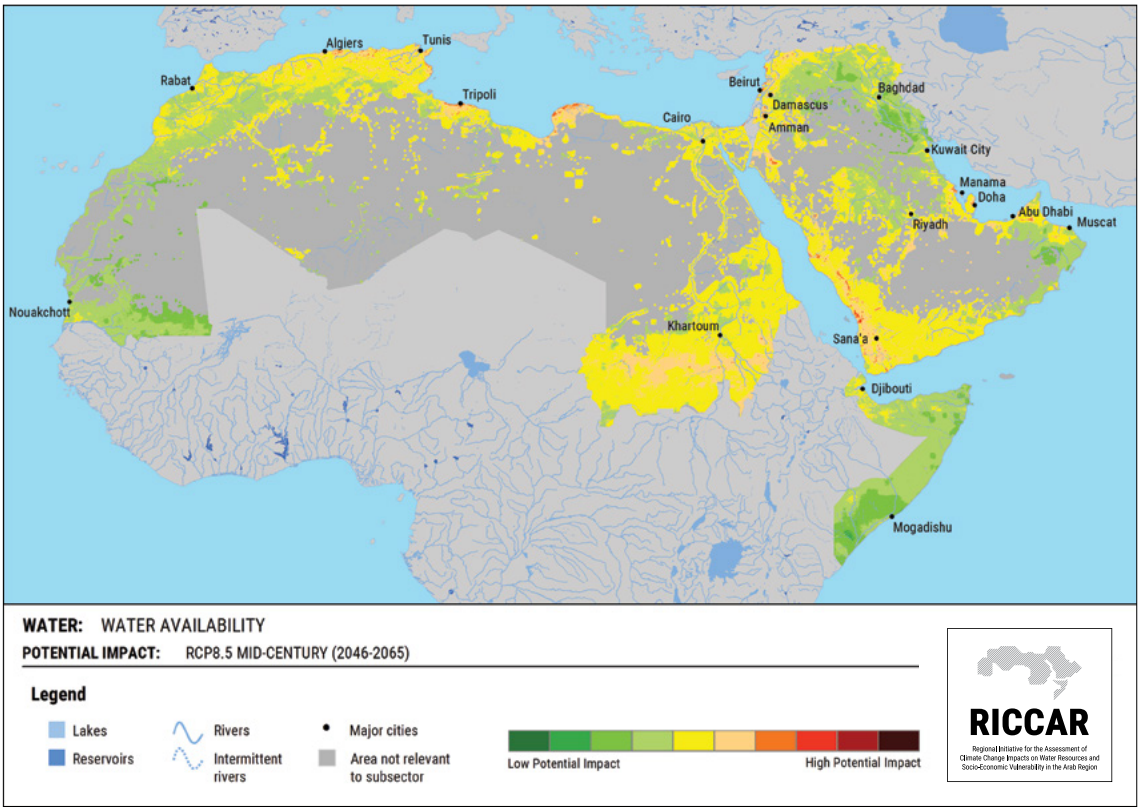
11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – 11.1.4.1. EXPOSURE

FIGURE 269




11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – 11.1.4.2. POTENTIAL IMPACT

FIGURE 270



11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – **11.1.4.3. VULNERABILITY**

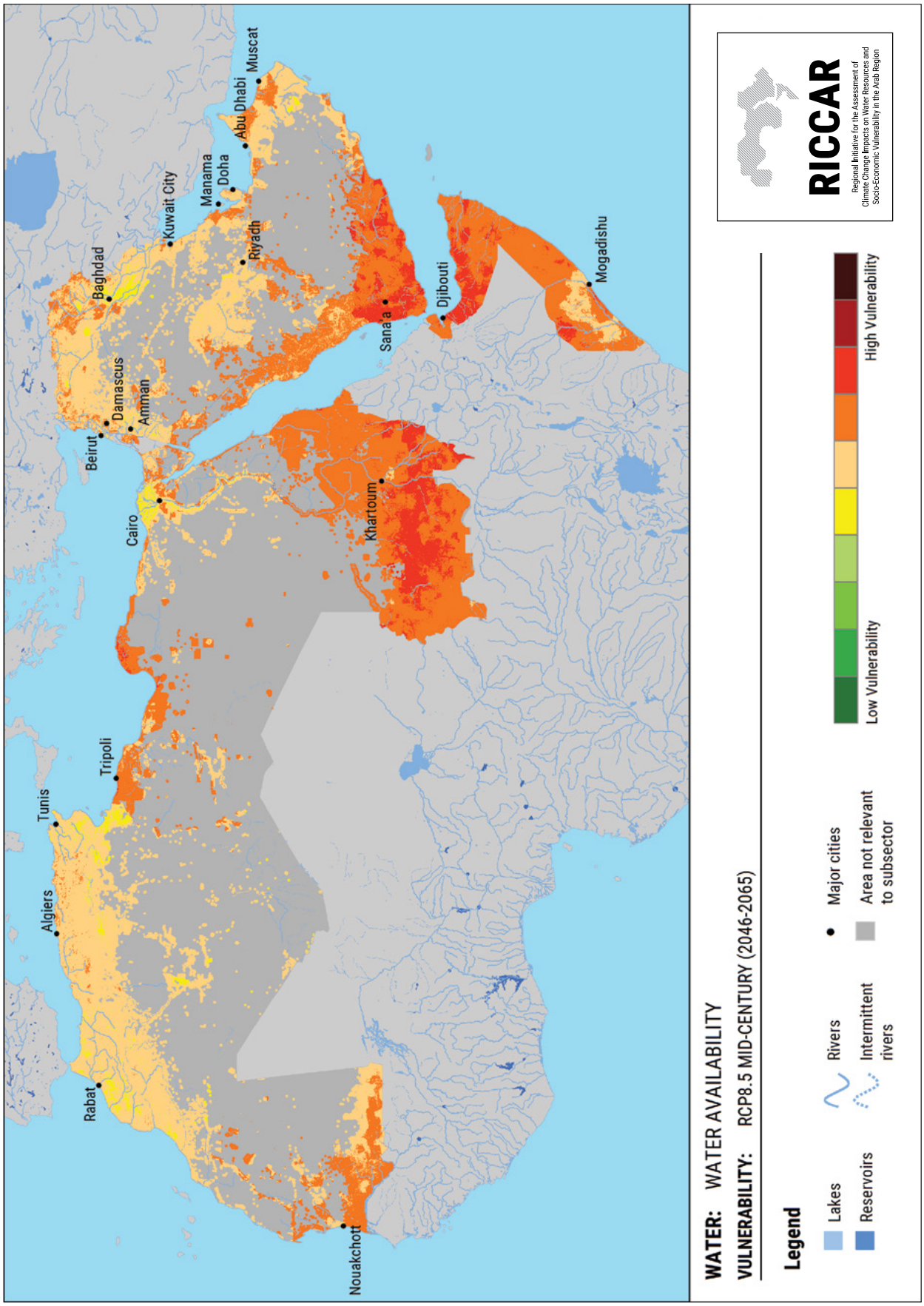
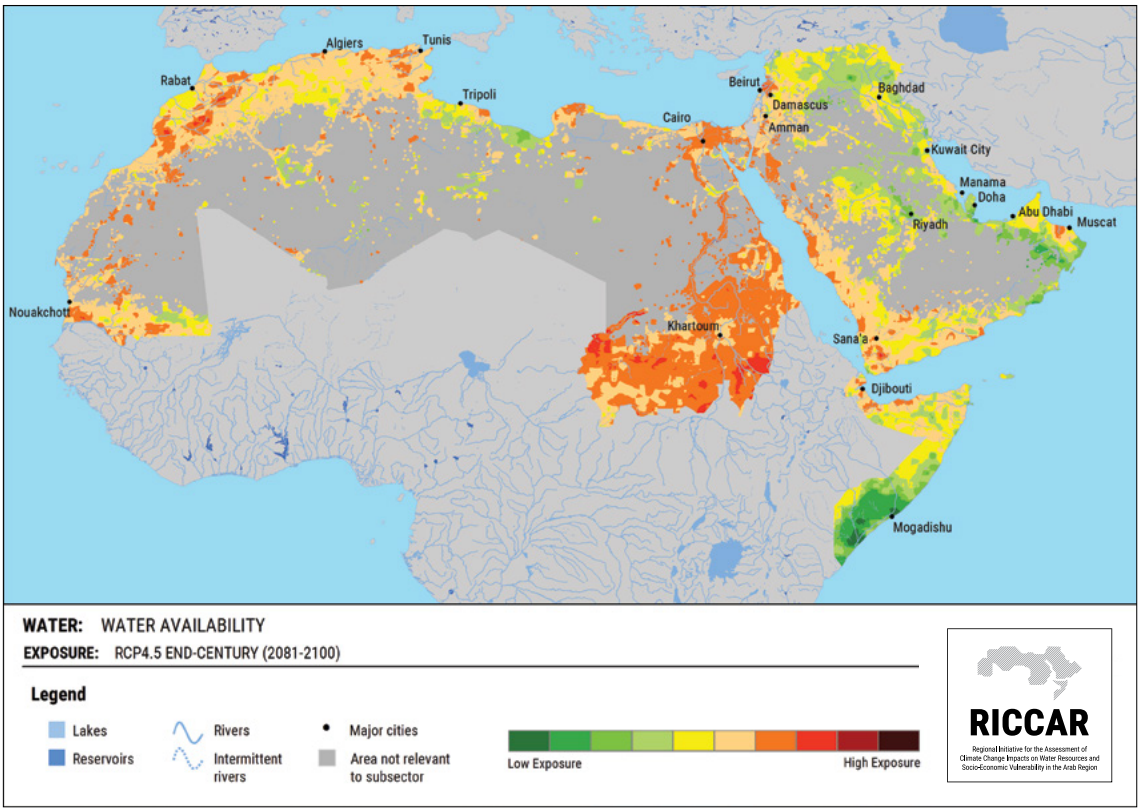



FIGURE 271

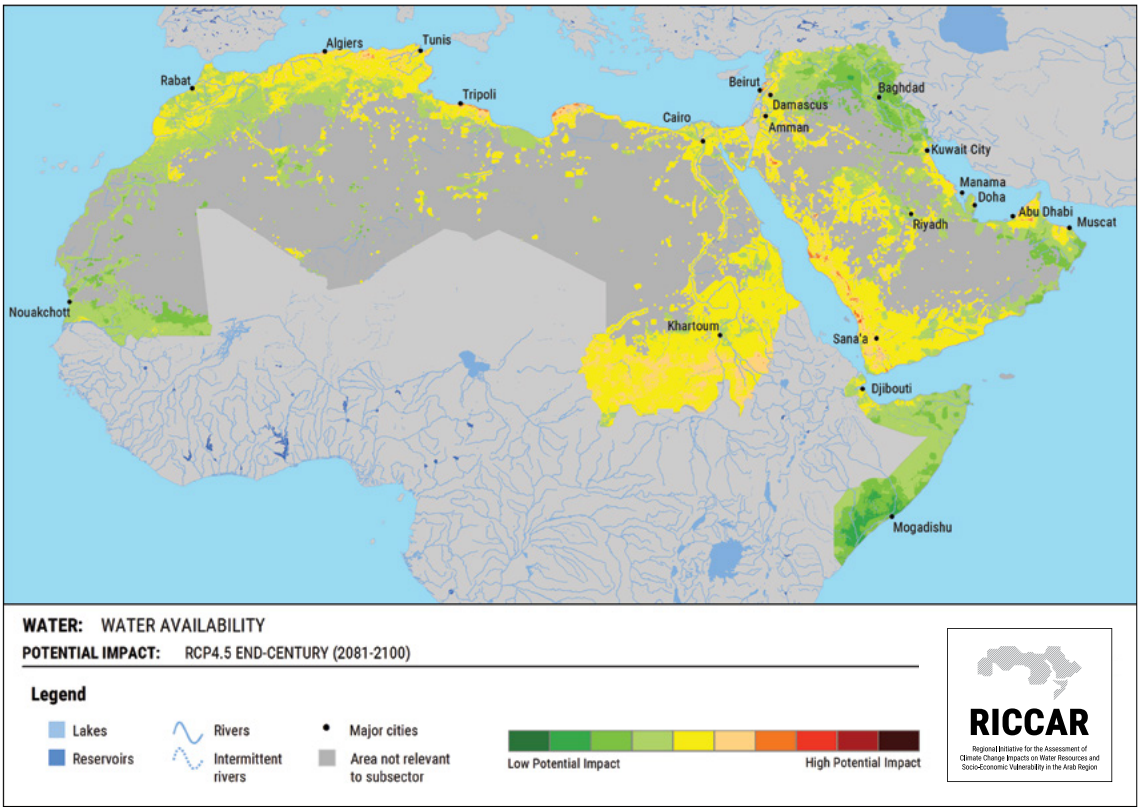
11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – 11.1.5.1. EXPOSURE

FIGURE 272




11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – 11.1.5.2. POTENTIAL IMPACT

FIGURE 273



11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – **11.1.5.3. VULNERABILTY**

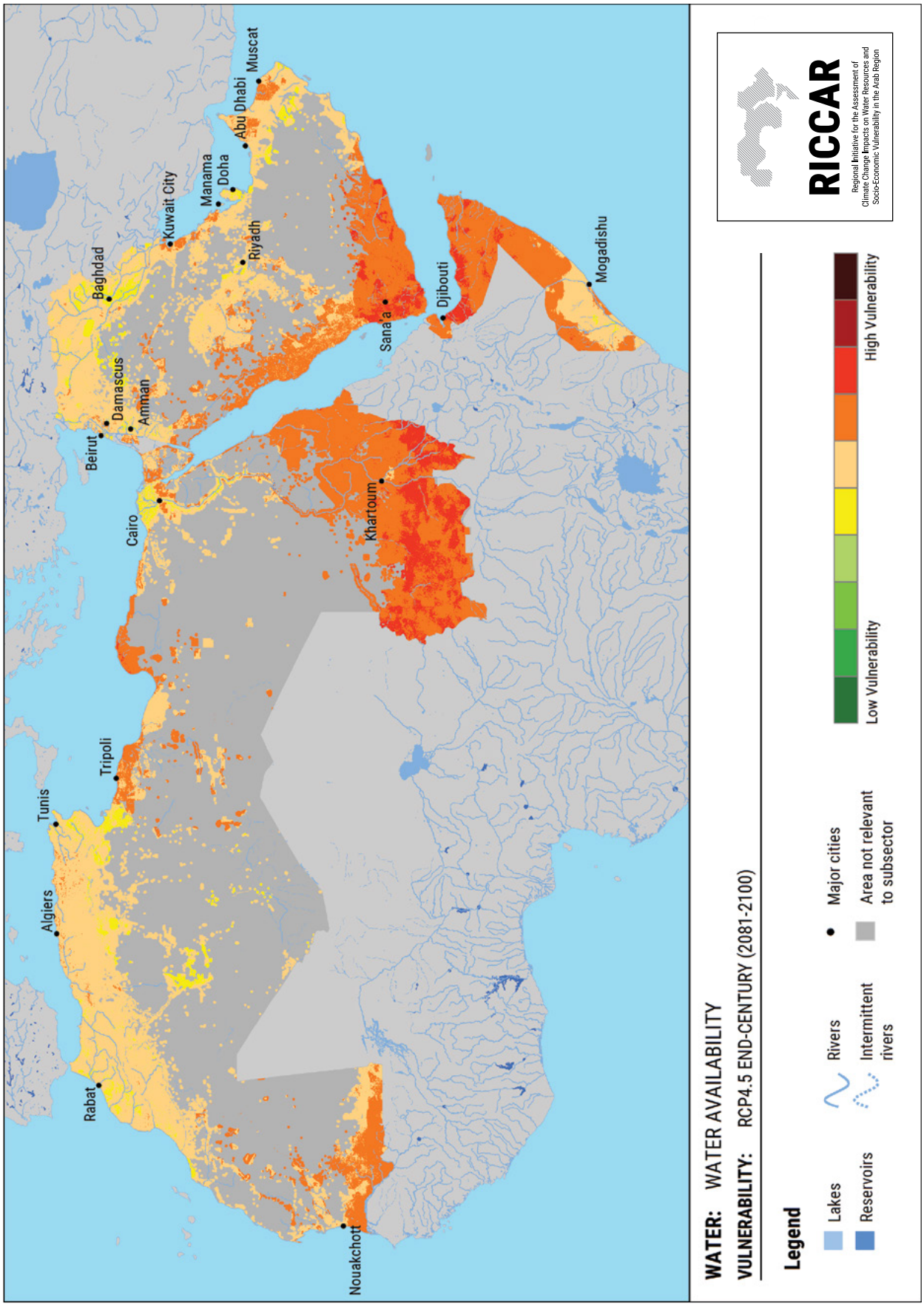
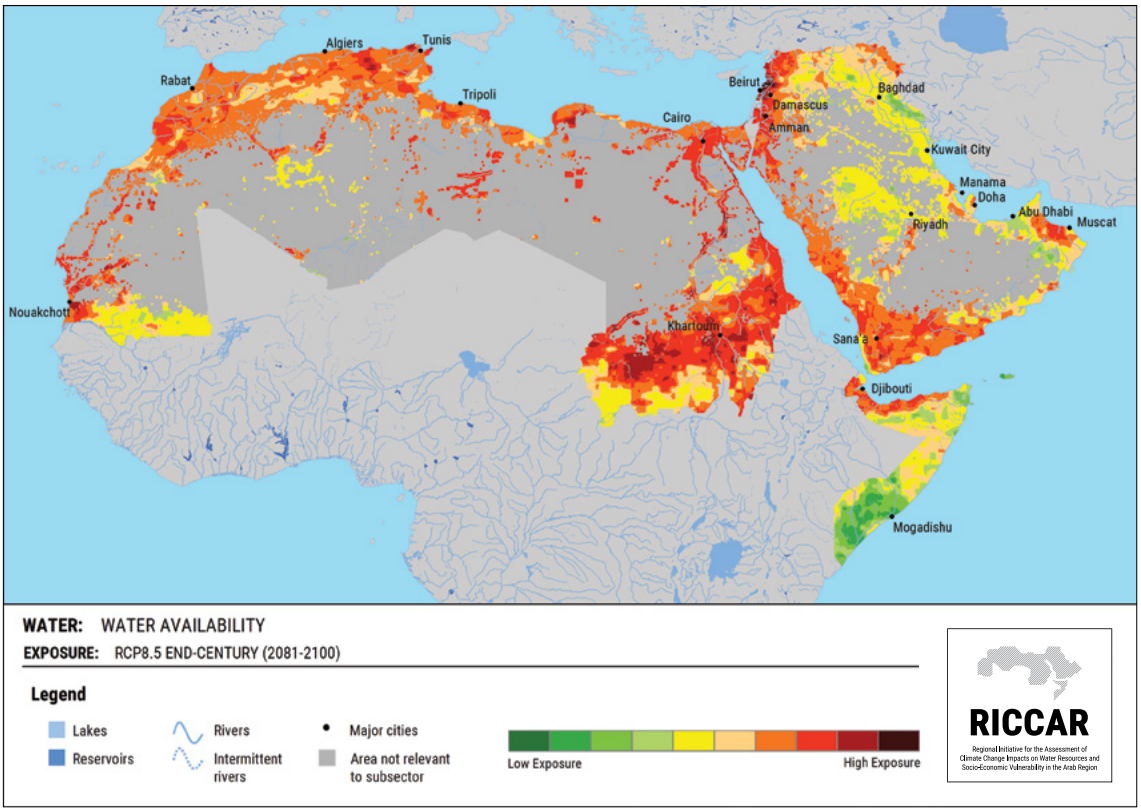



FIGURE 274

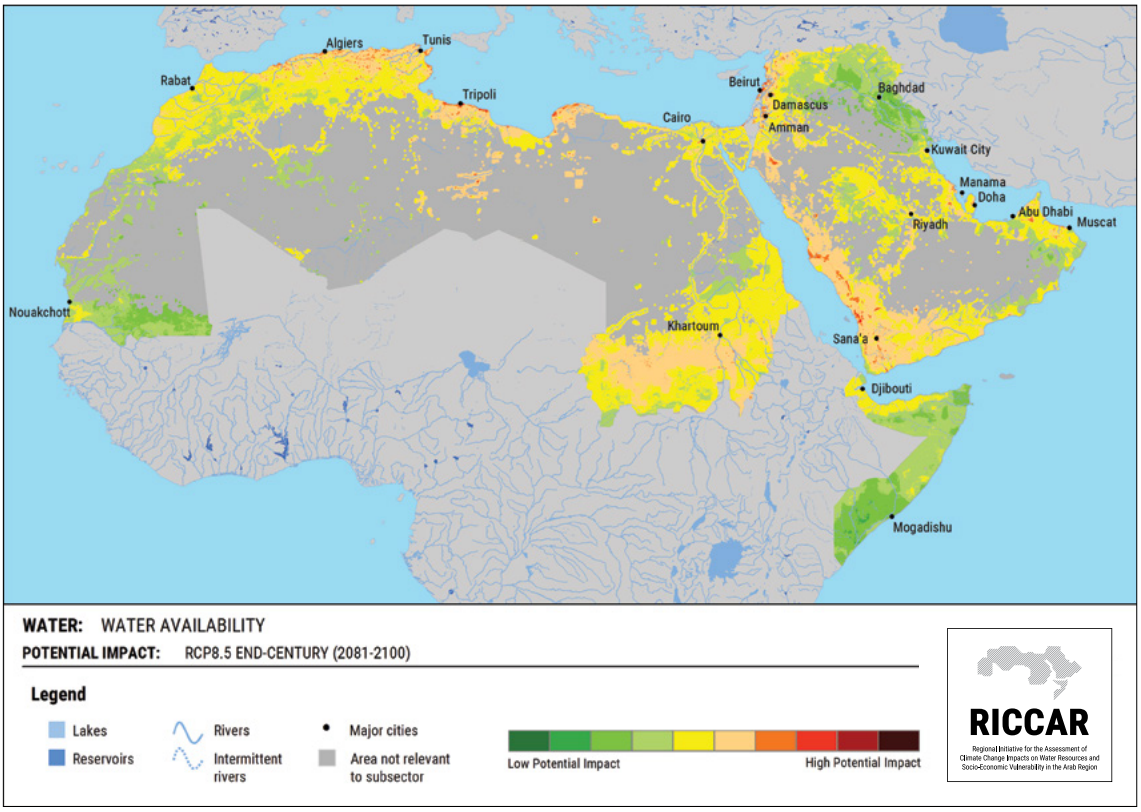
11.1. WATER AVAILABILITY – 11.1.6. END-CENTURY RCP 8.5 – 11.1.6.1. EXPOSURE

FIGURE 275




11.1. WATER AVAILABILITY – 11.1.6. END-CENTURY RCP 8.5 – 11.1.6.2. POTENTIAL IMPACT

FIGURE 276



11.1. WATER AVAILABILITY – 11.1.6. END-CENTURY RCP 8.5 – **11.1.6.3. VULNERABILTY**

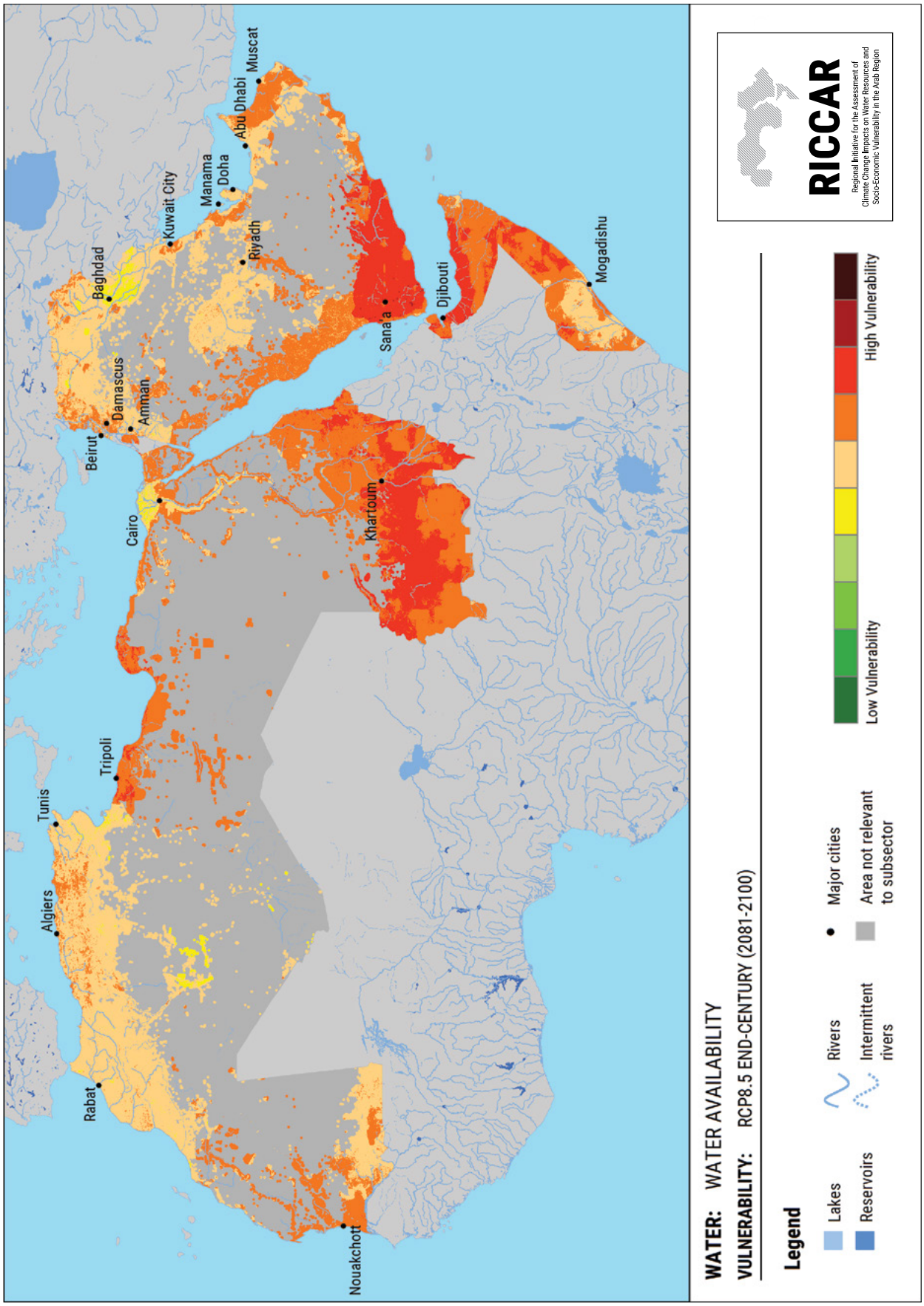
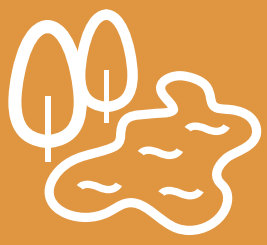



FIGURE 277

# CHAPTER 12



## BIODIVERSITY AND ECOSYSTEMS SECTOR

12.1. AREA COVERED BY FORESTS – 12.1.1. IMPACT CHAIN

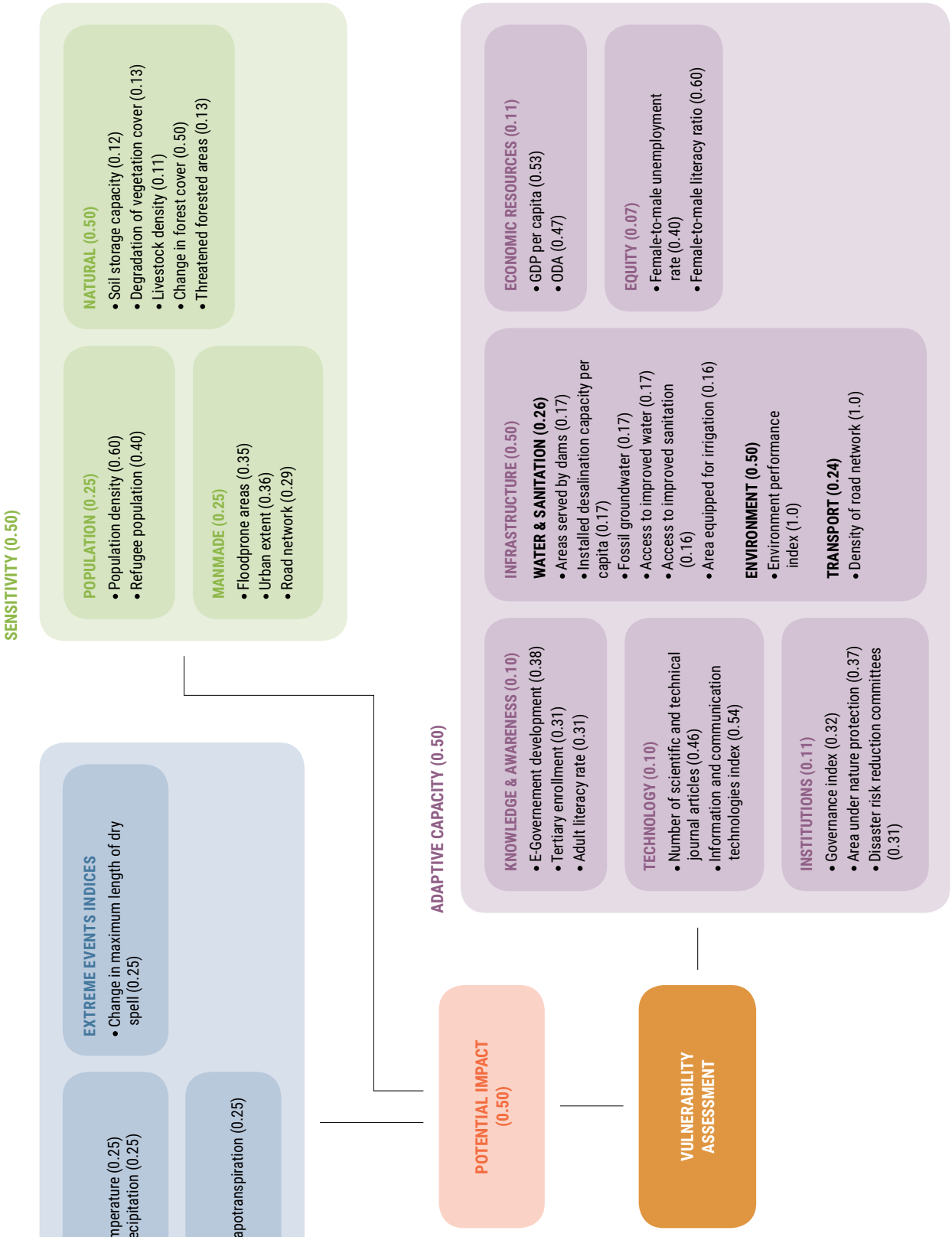
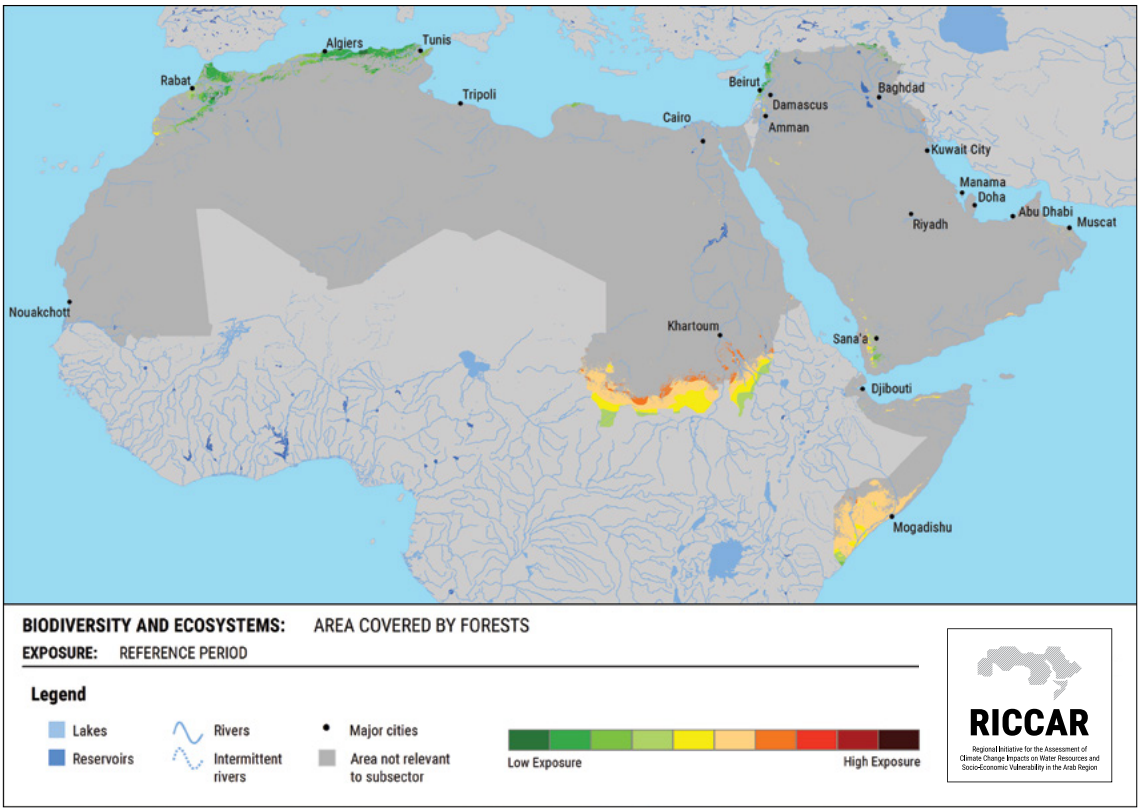



FIGURE 278

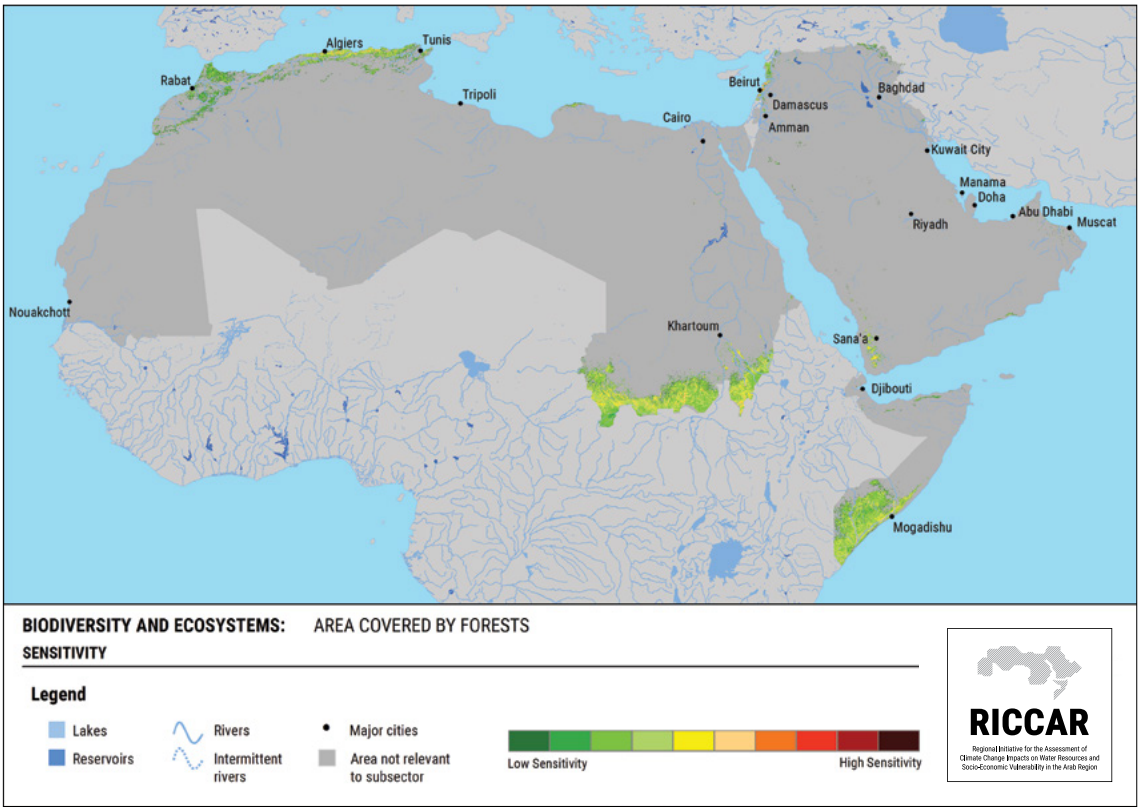
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – **12.1.2.1. EXPOSURE**

**FIGURE 279**



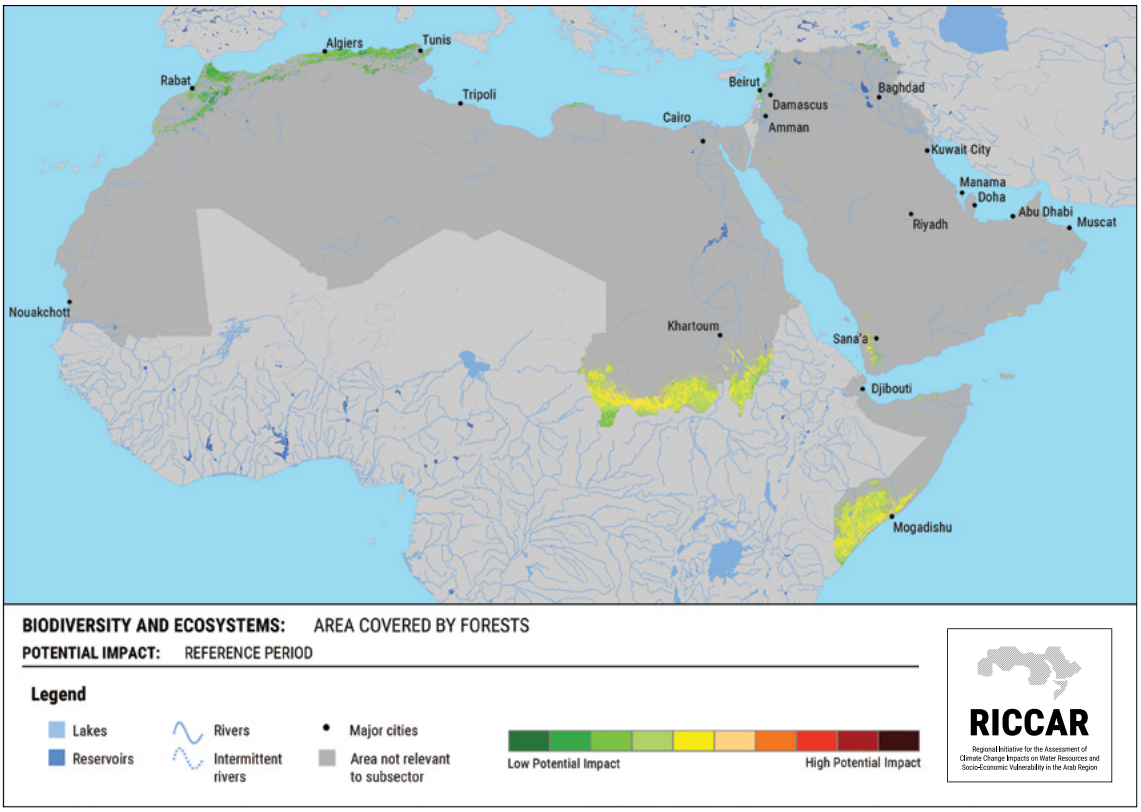

12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – **12.1.2.2. SENSITIVITY**

**FIGURE 280**



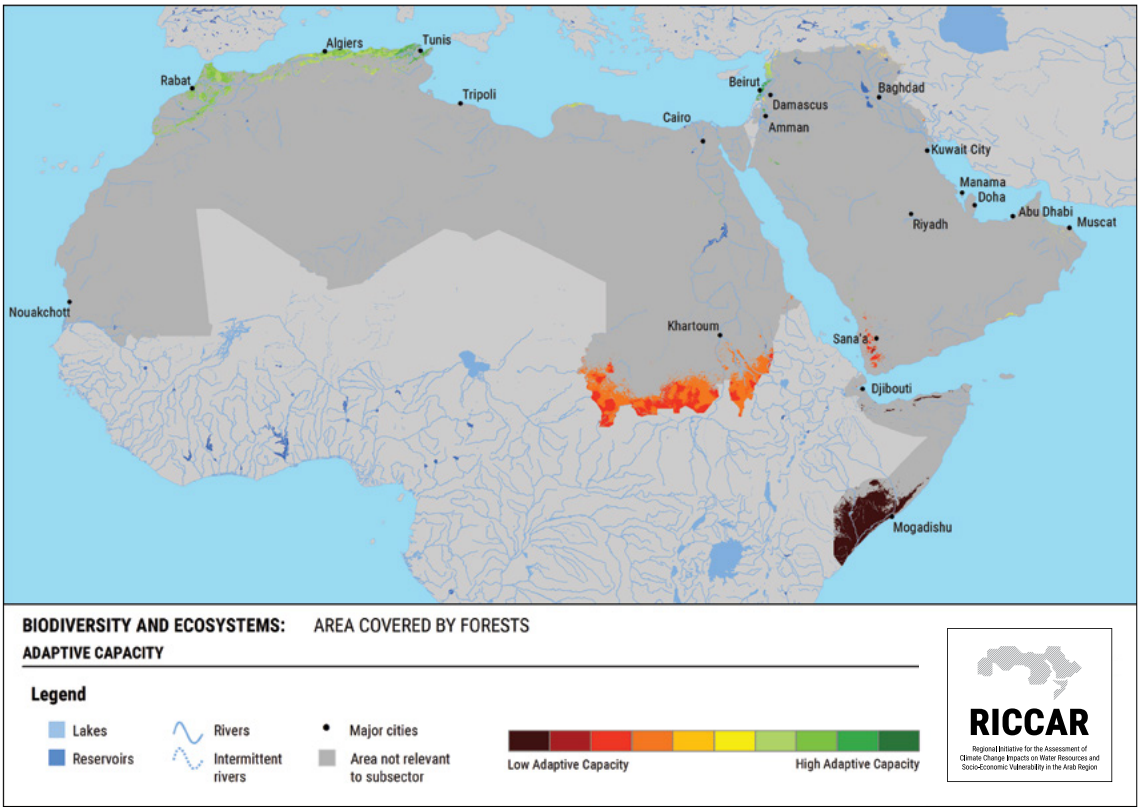
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – **12.1.2.3. POTENTIAL IMPACT**

**FIGURE 281**




12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – **12.1.2.4. ADAPTIVE CAPACITY**

**FIGURE 282**



12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – **12.1.2.5. VULNERABILITY**

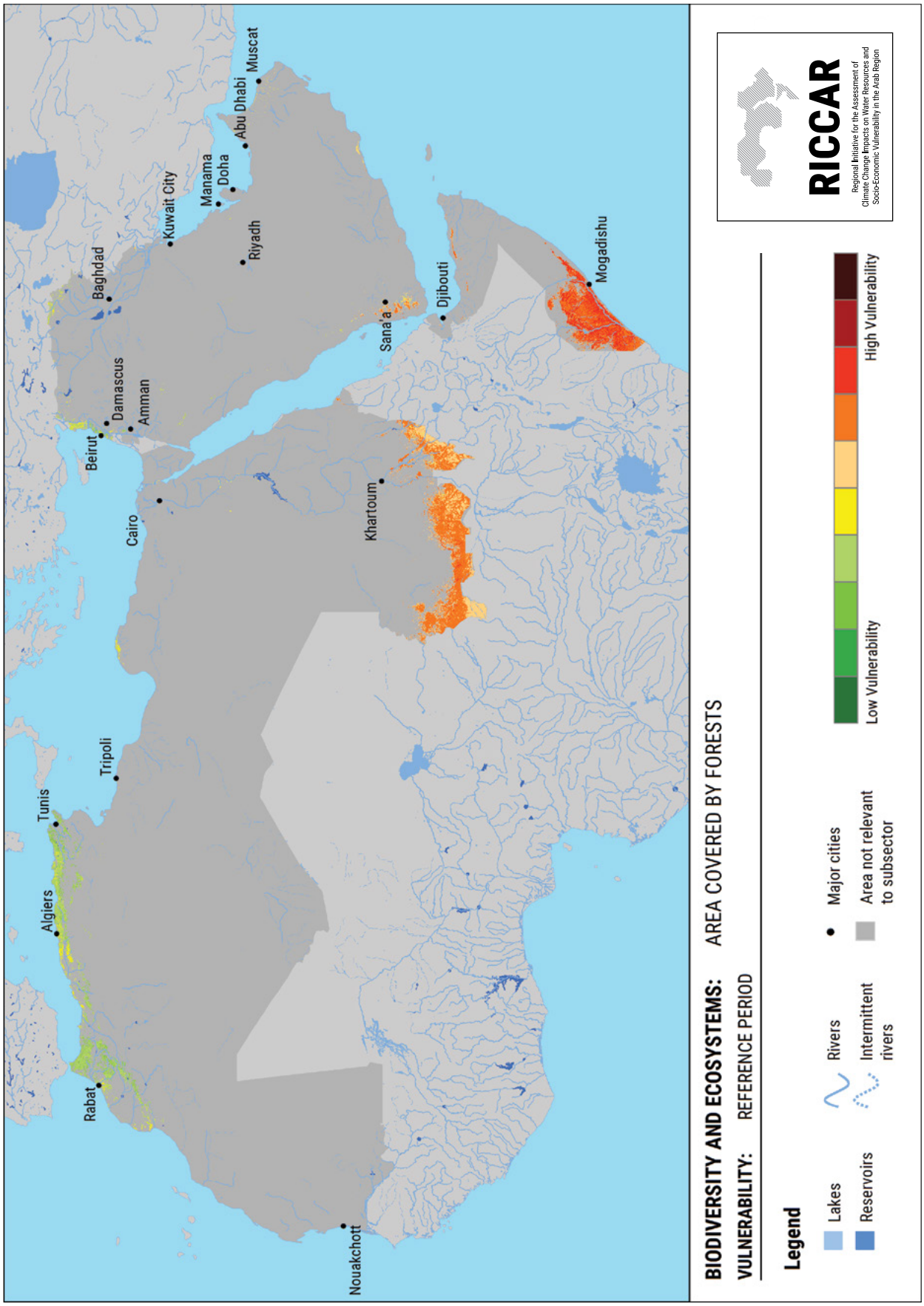
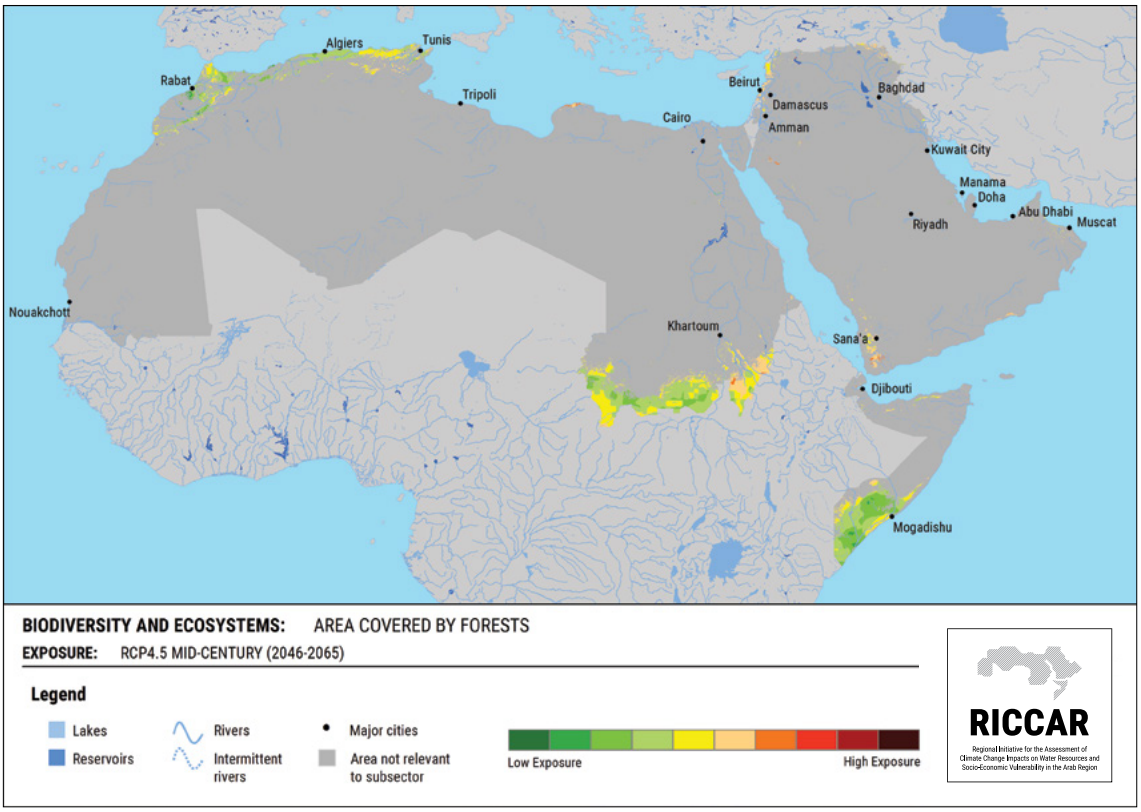



FIGURE 283

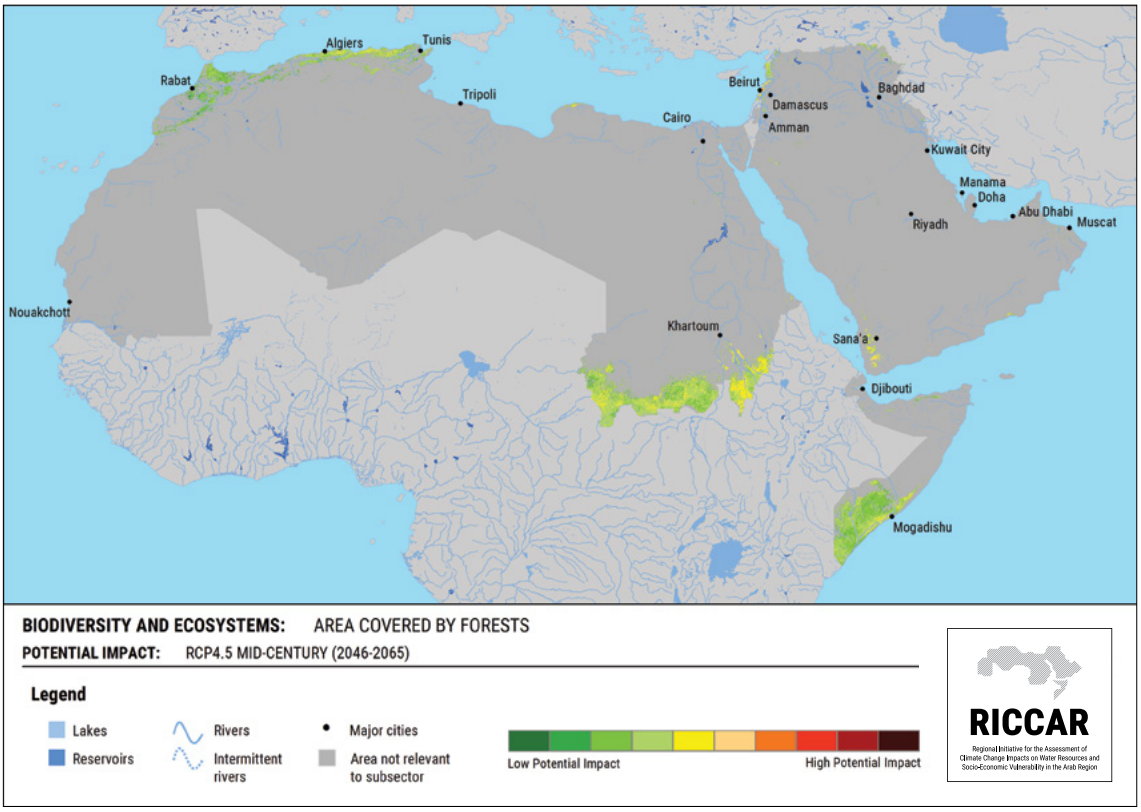
12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – 12.1.3.1. EXPOSURE

FIGURE 284




12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – 12.1.3.2. POTENTIAL IMPACT

FIGURE 285



12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – **12.1.3.3. VULNERABILITY**

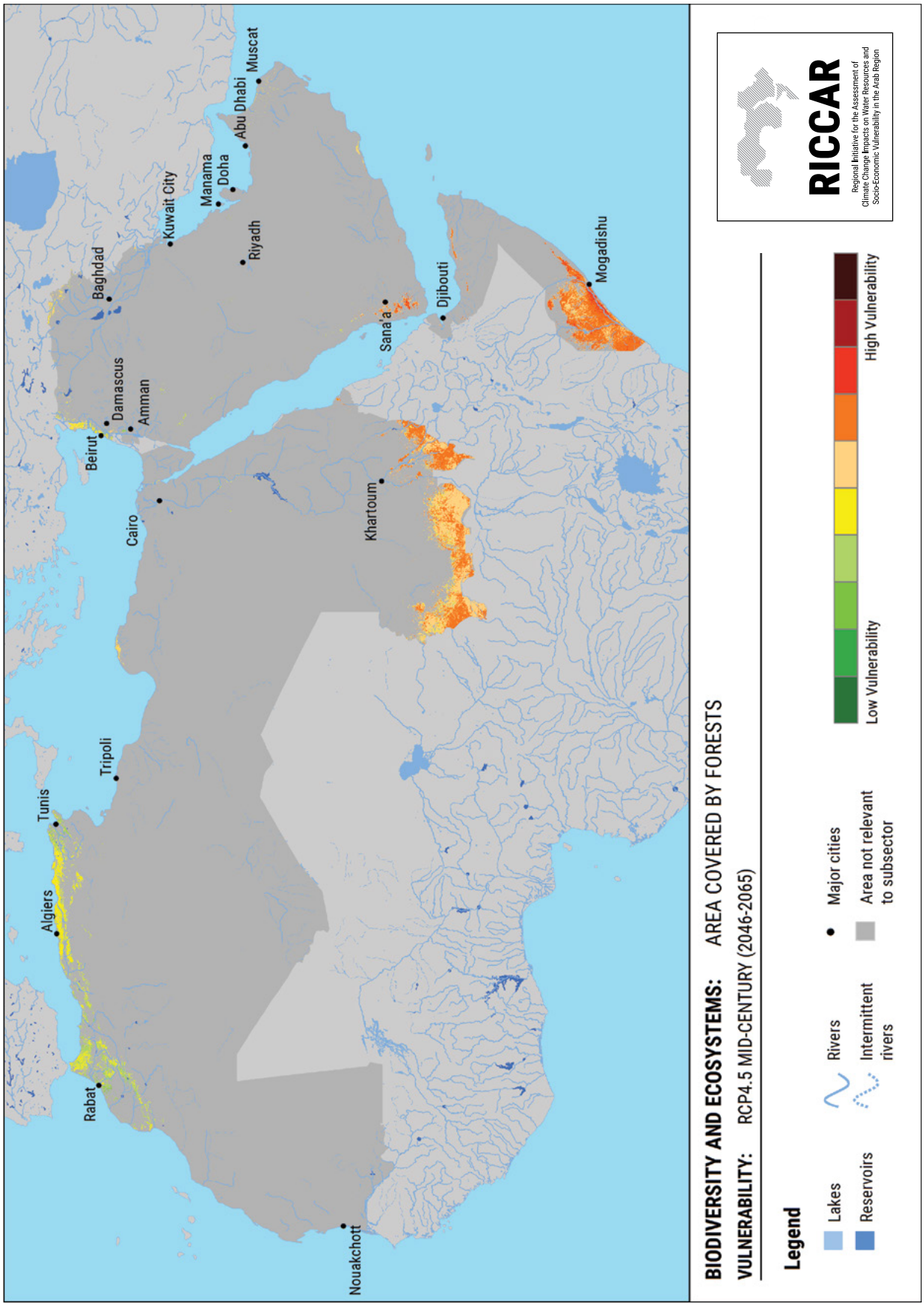
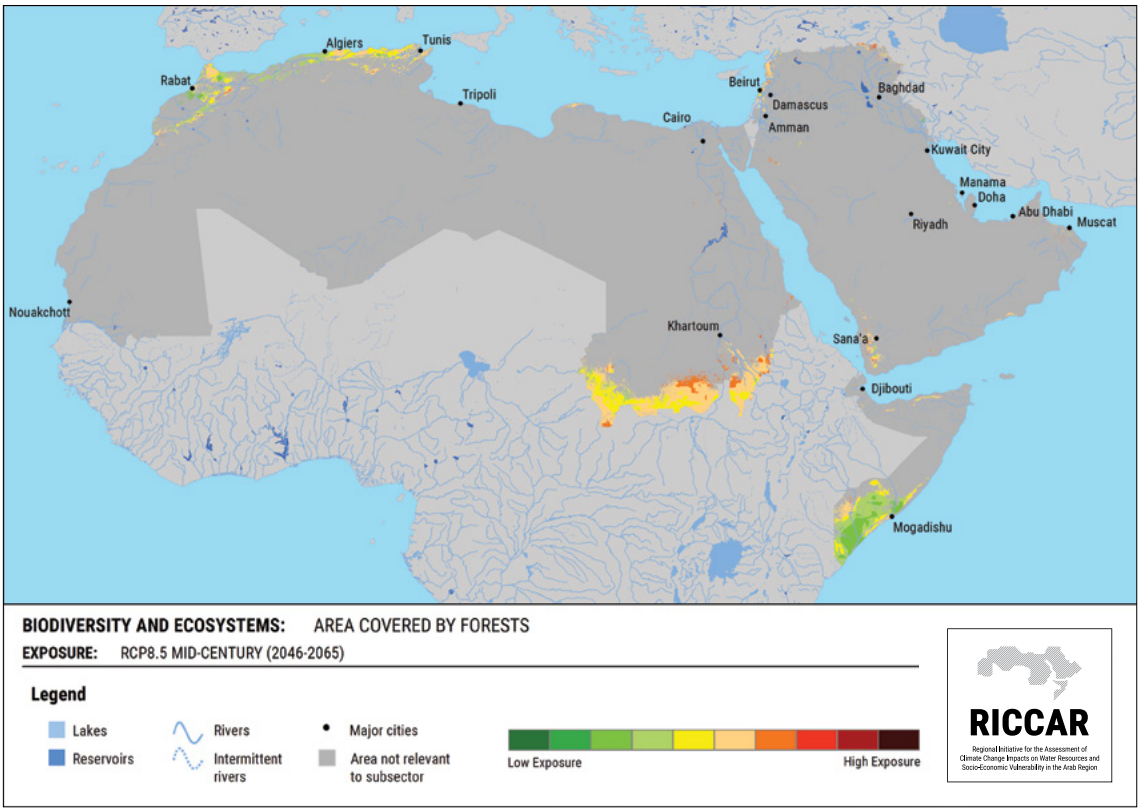



FIGURE 286

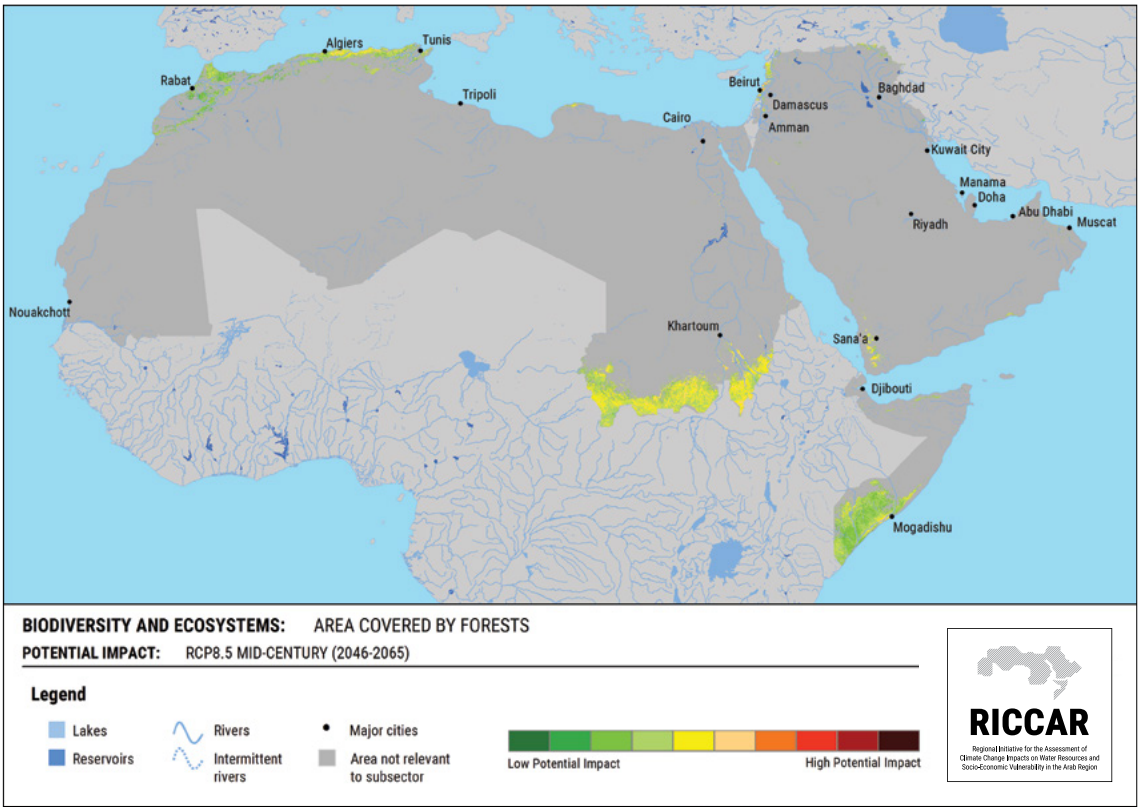
12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – 12.1.4.1. EXPOSURE

FIGURE 287




12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – 12.1.4.2. POTENTIAL IMPACT

FIGURE 288



12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – **12.1.4.3. VULNERABILITY**

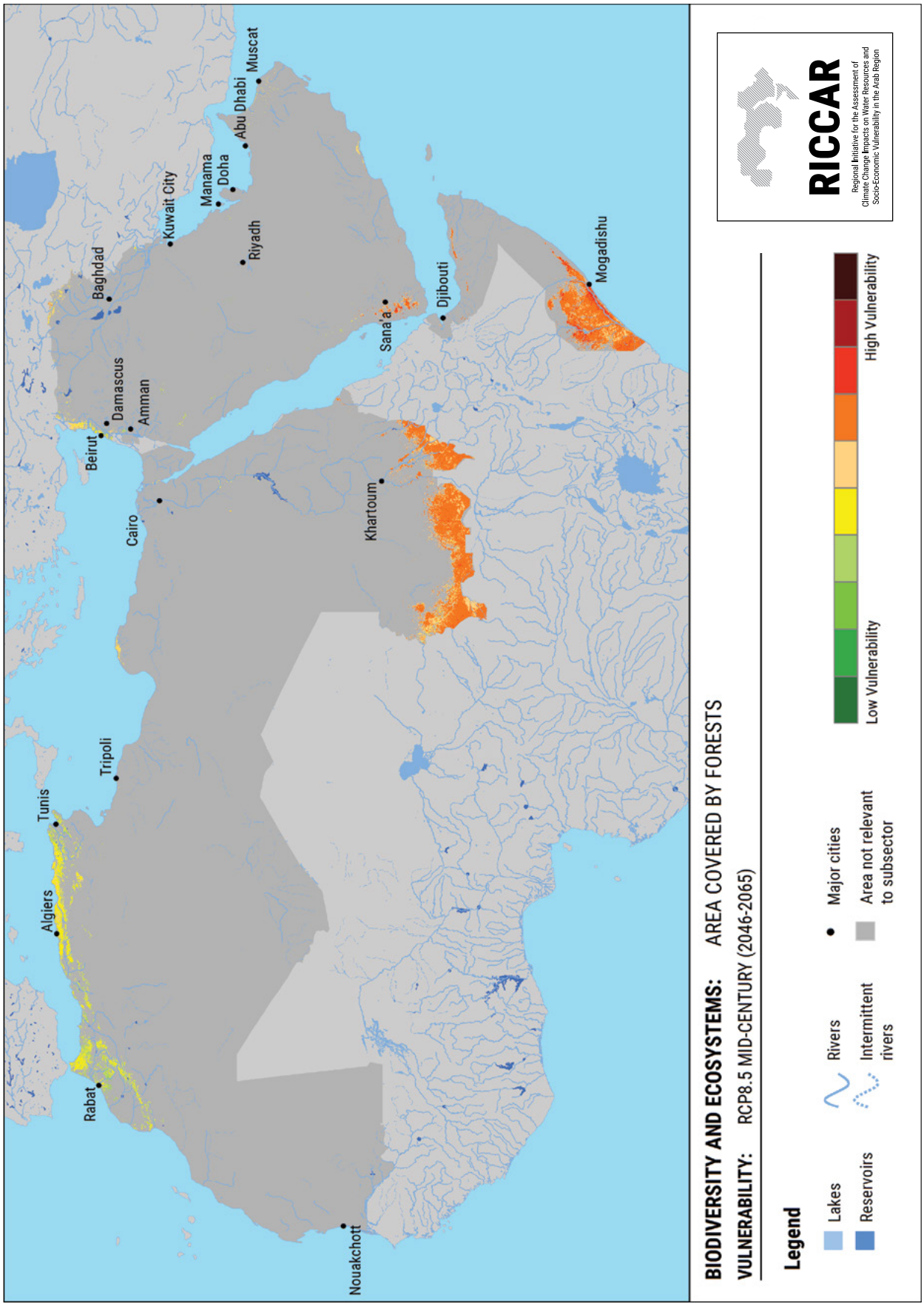
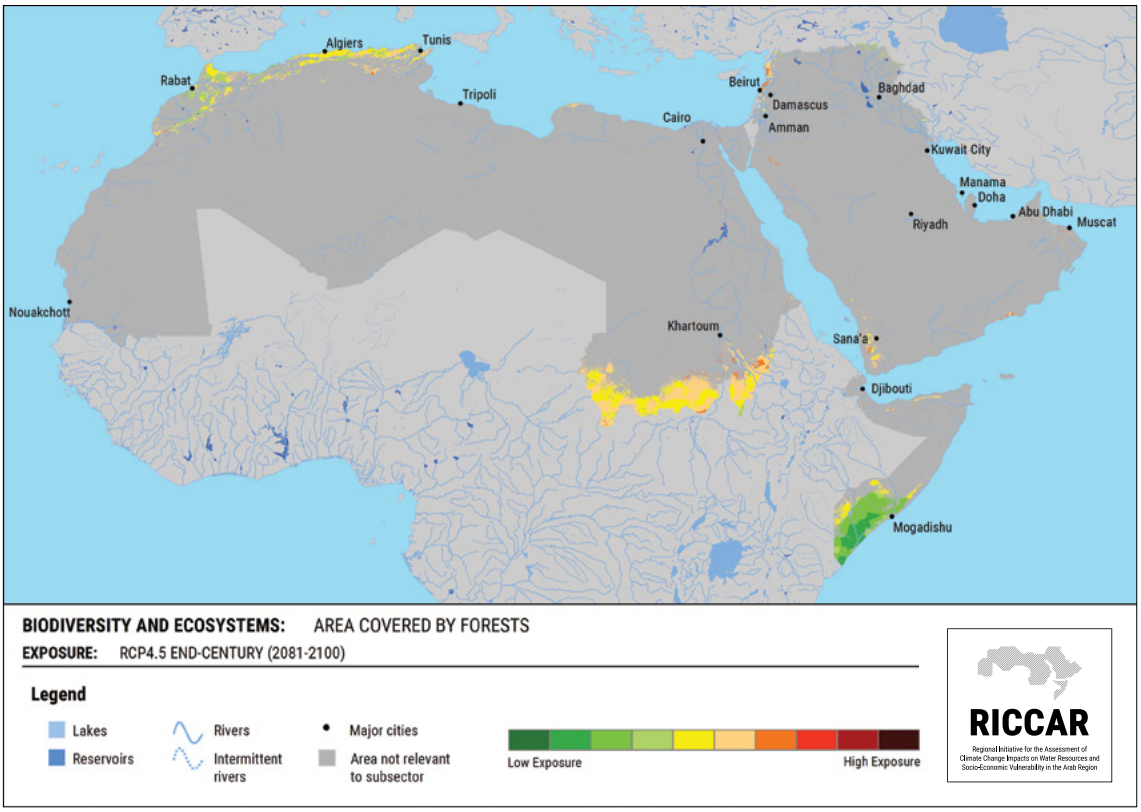



FIGURE 289

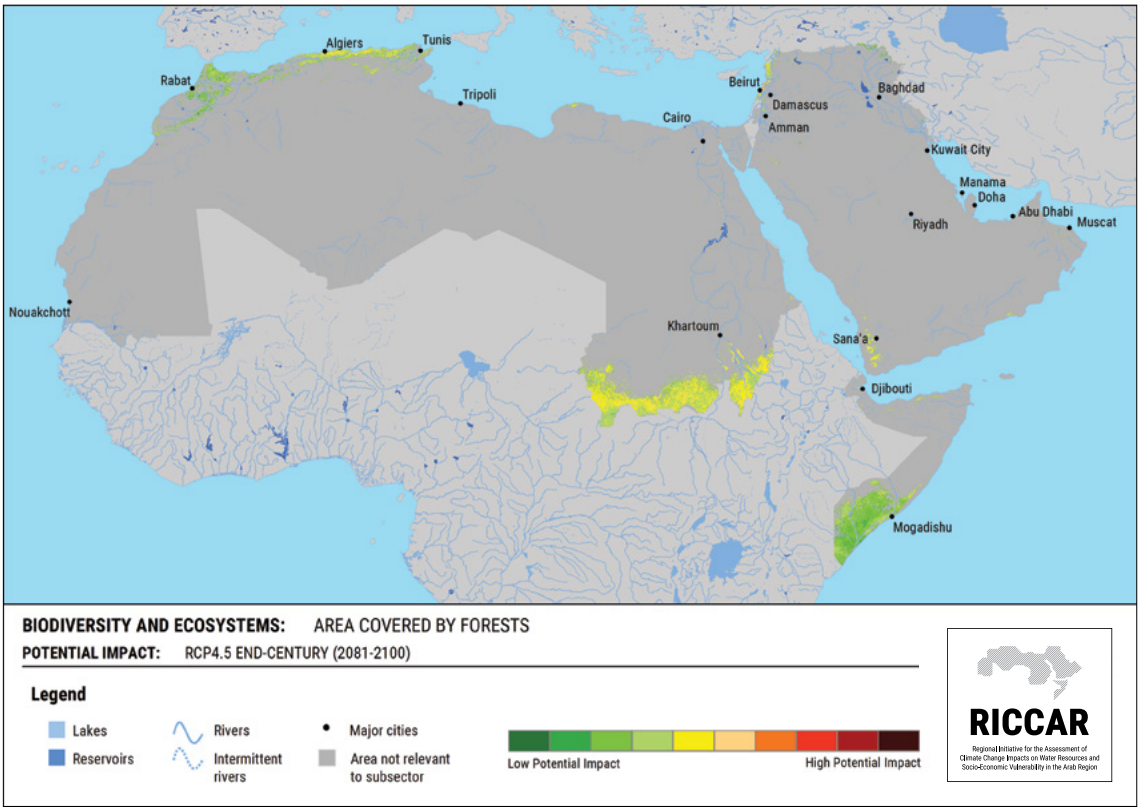
12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – 12.1.5.1. EXPOSURE

FIGURE 290




12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – 12.1.5.2. POTENTIAL IMPACT

FIGURE 291



12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – **12.1.5.3. VULNERABILITY**

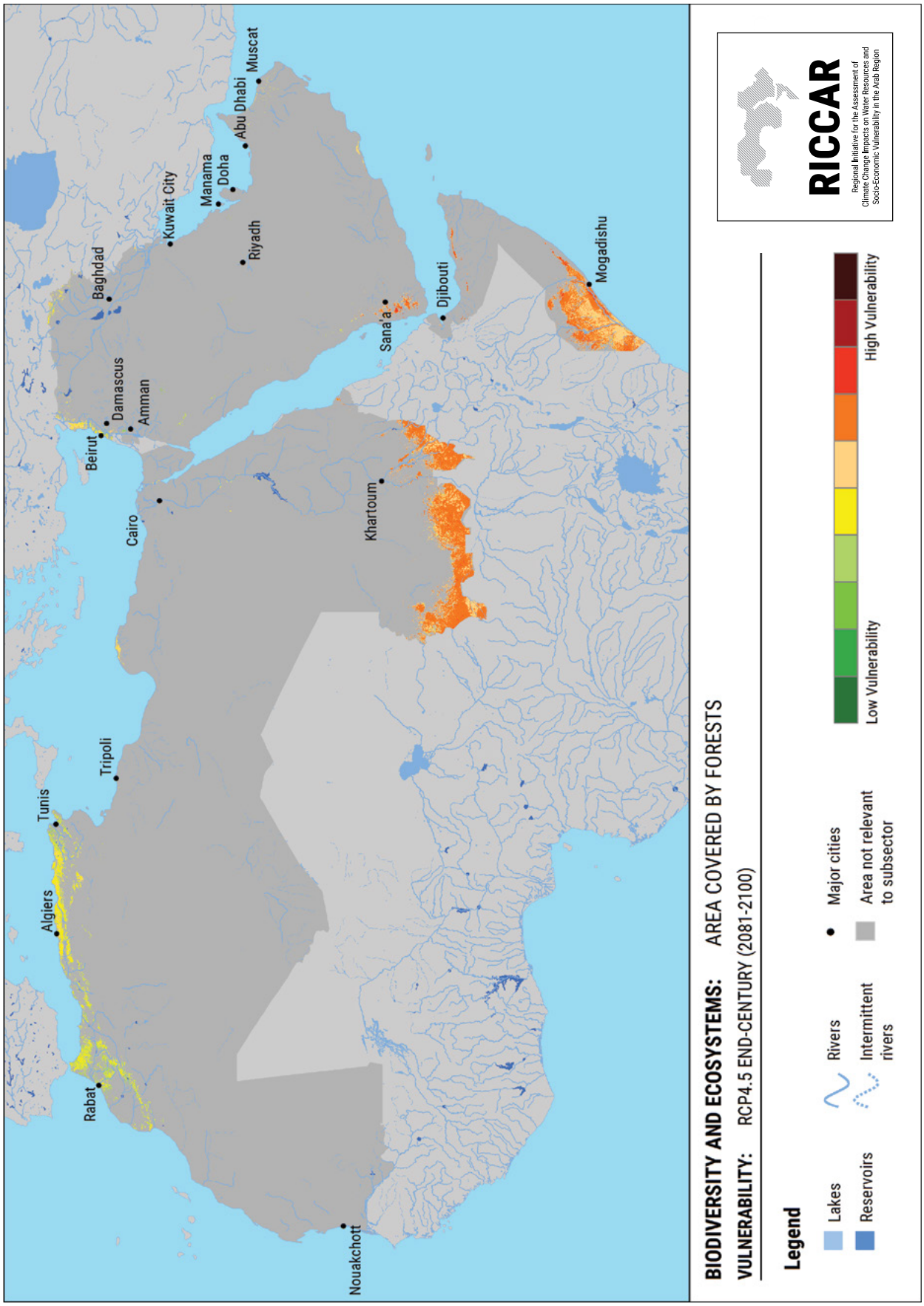
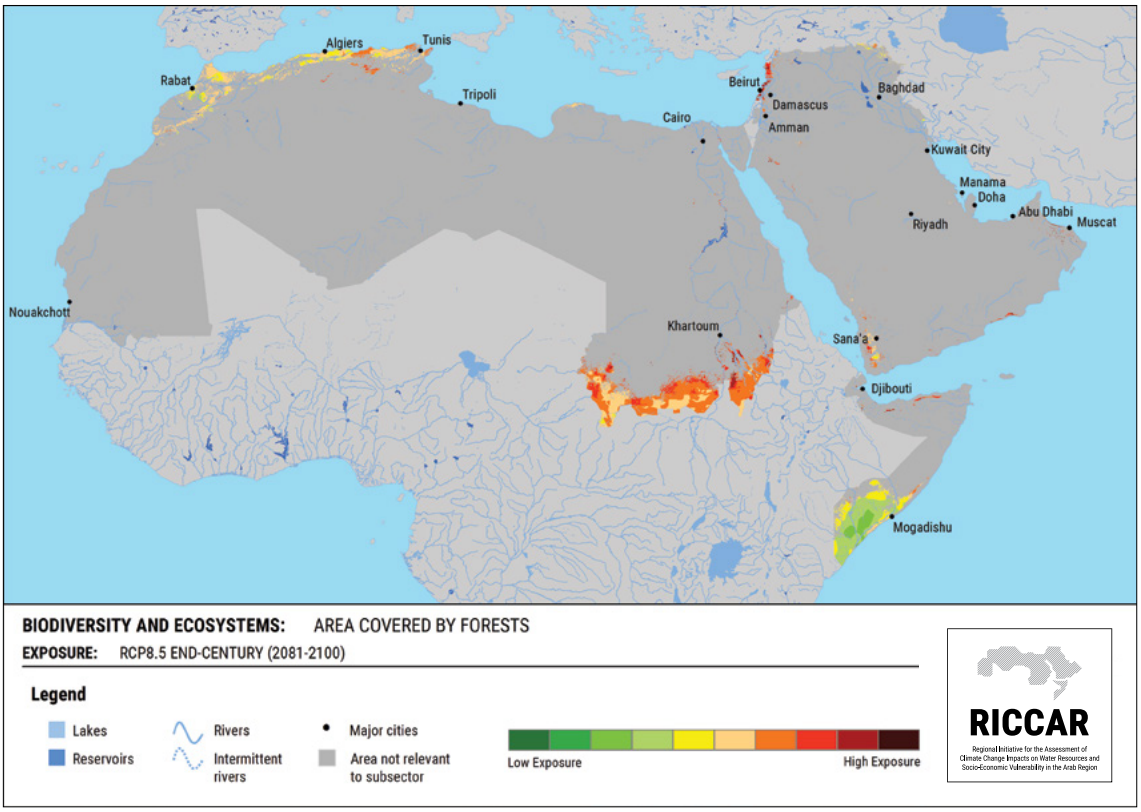



FIGURE 292

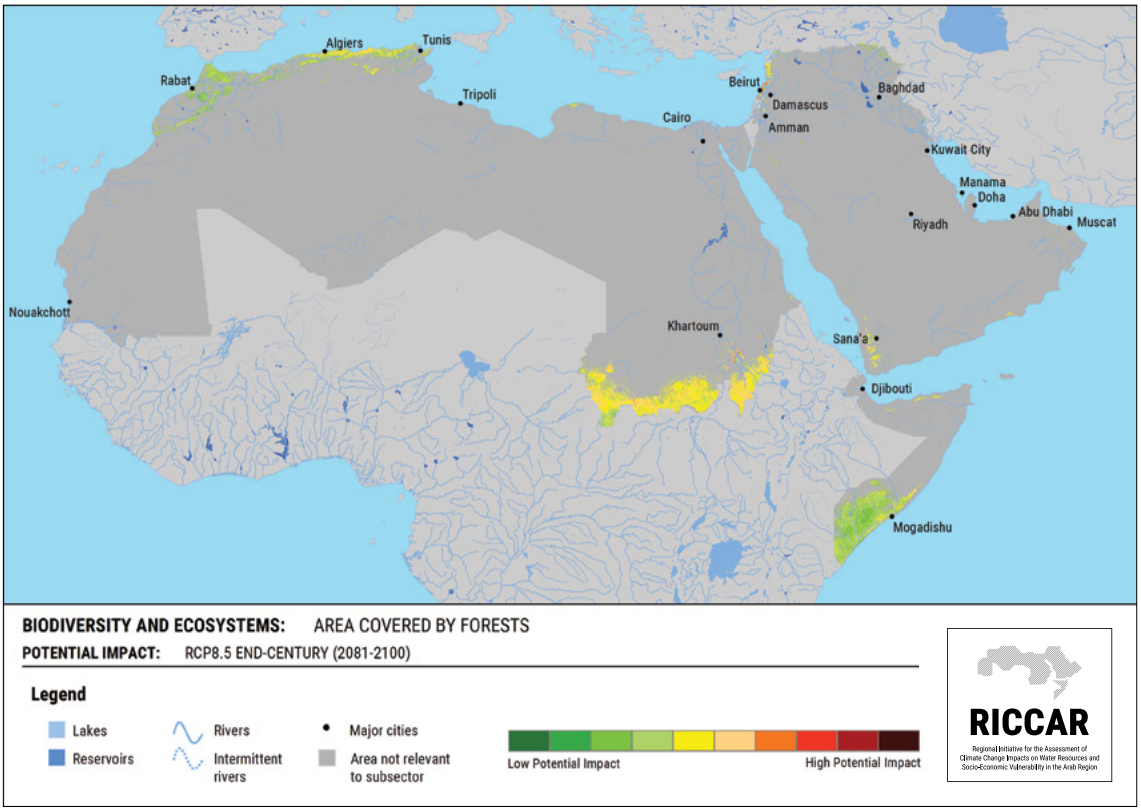
12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – 12.1.6.1. EXPOSURE

FIGURE 293




12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – 12.1.6.2. POTENTIAL IMPACT

FIGURE 294



12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – **12.1.6.3. VULNERABILITY**

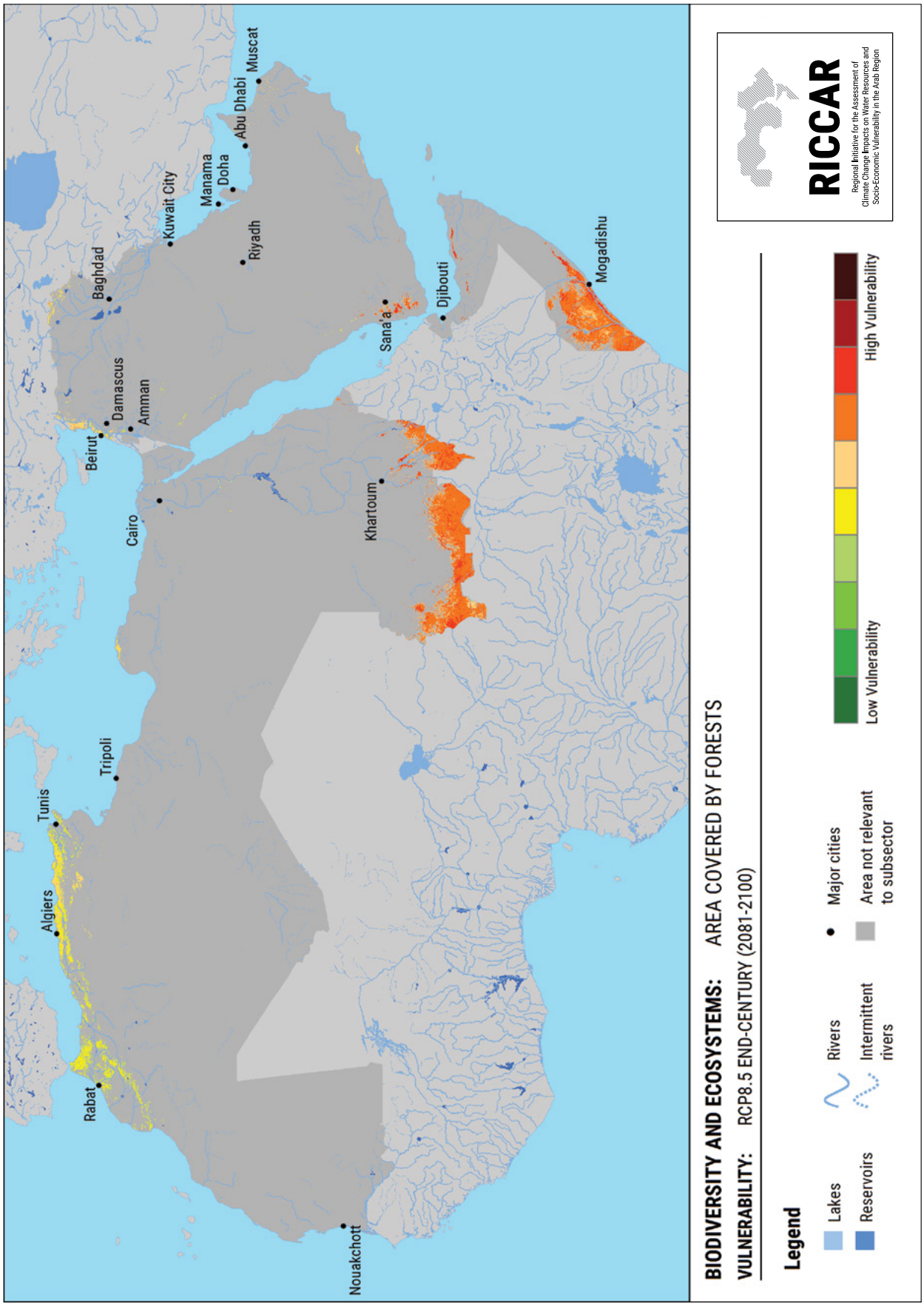



FIGURE 295

12.2. AREA COVERED BY WETLANDS – 12.2.1. IMPACT CHAIN

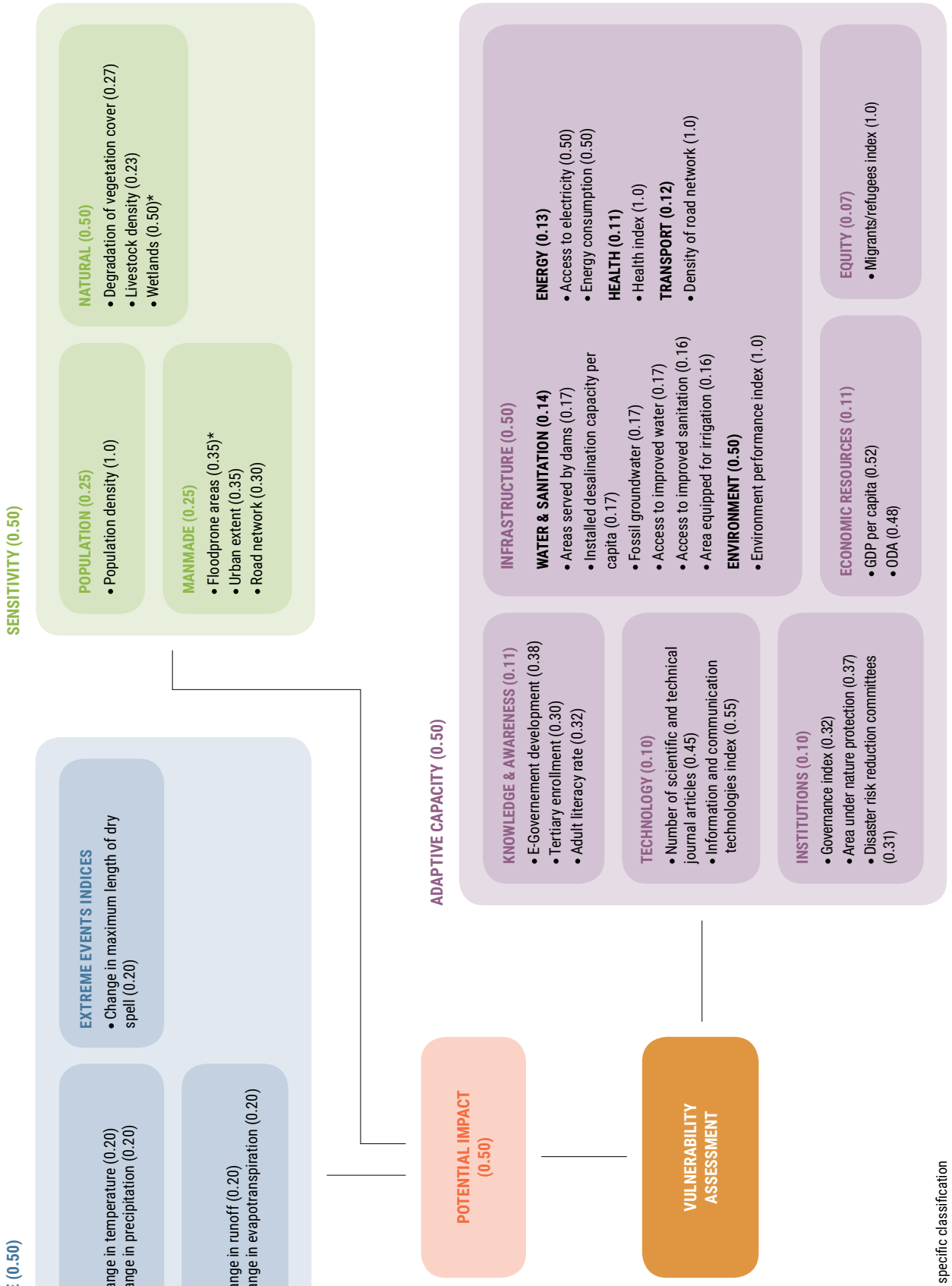
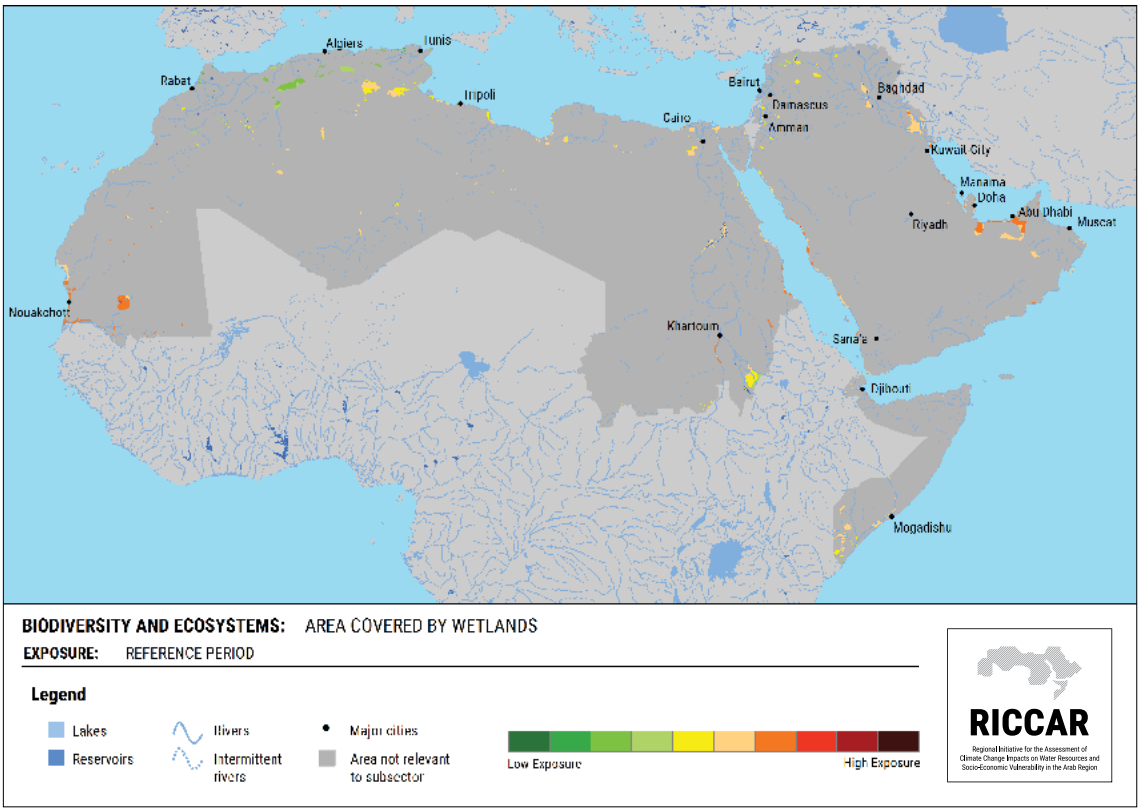



FIGURE 296

* Subsector specific classification

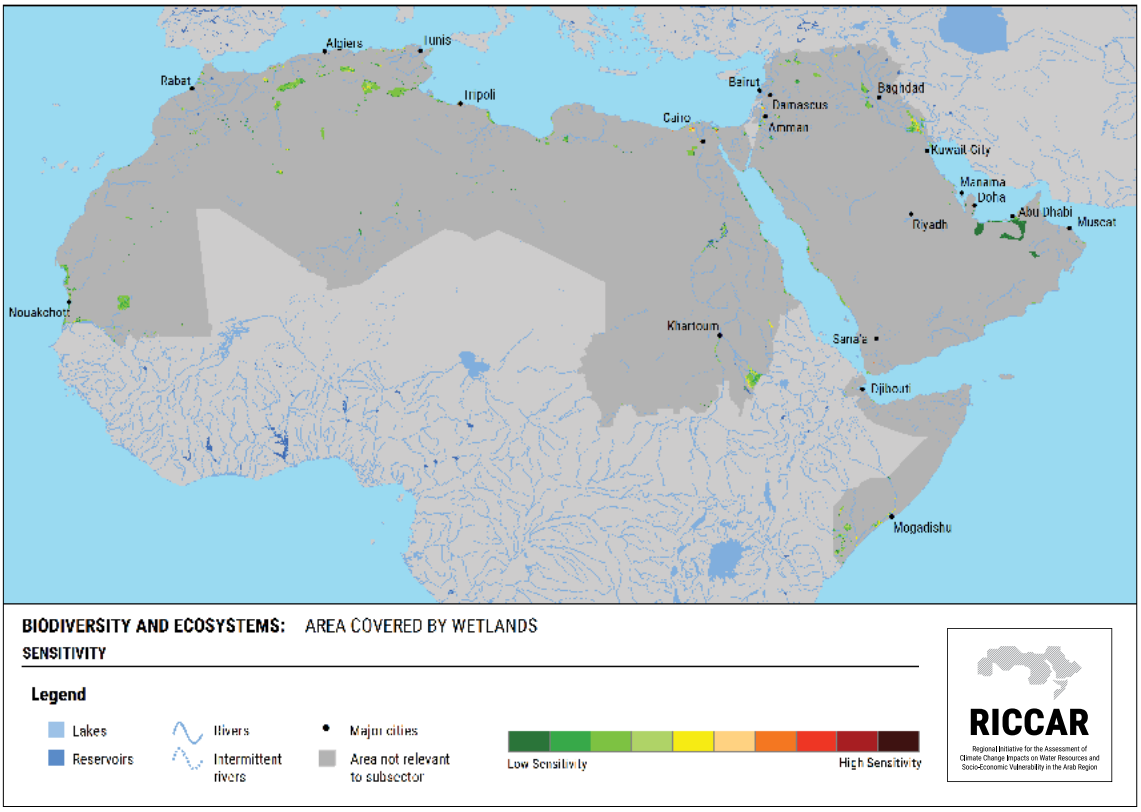
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – **12.2.2.1. EXPOSURE**

**FIGURE 297**



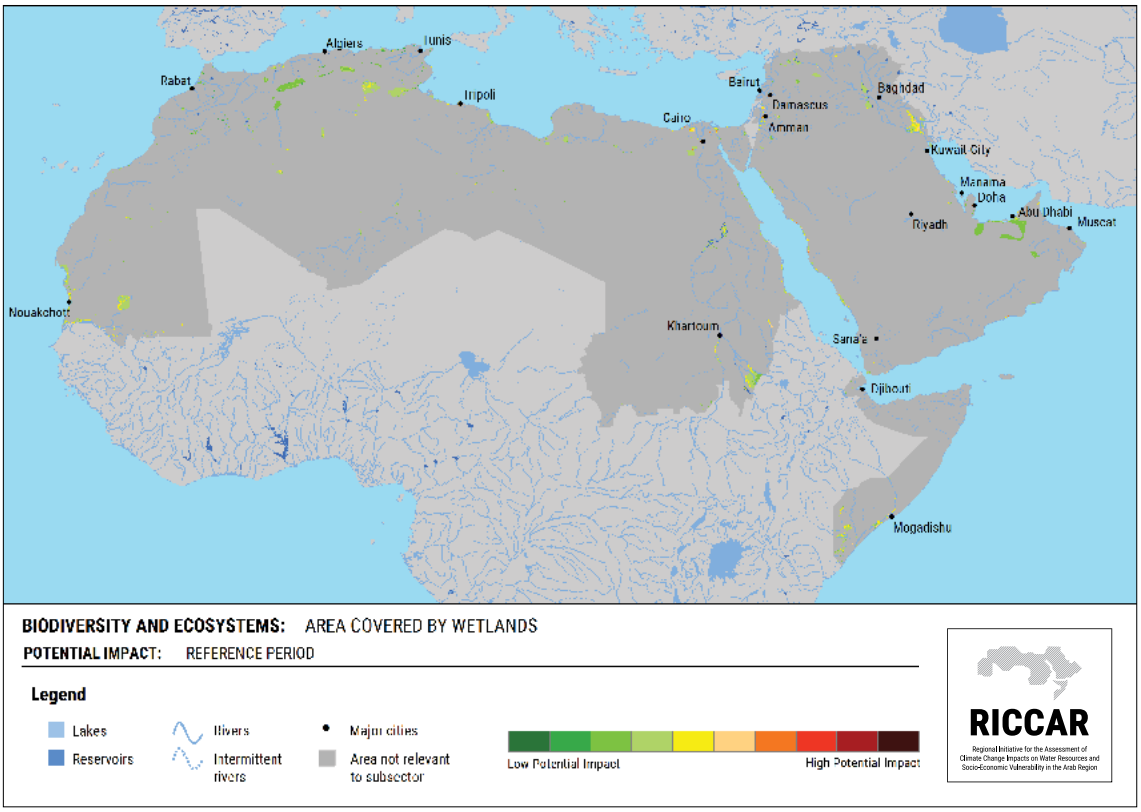

12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – **12.2.2.2. SENSITIVITY**

**FIGURE 298**



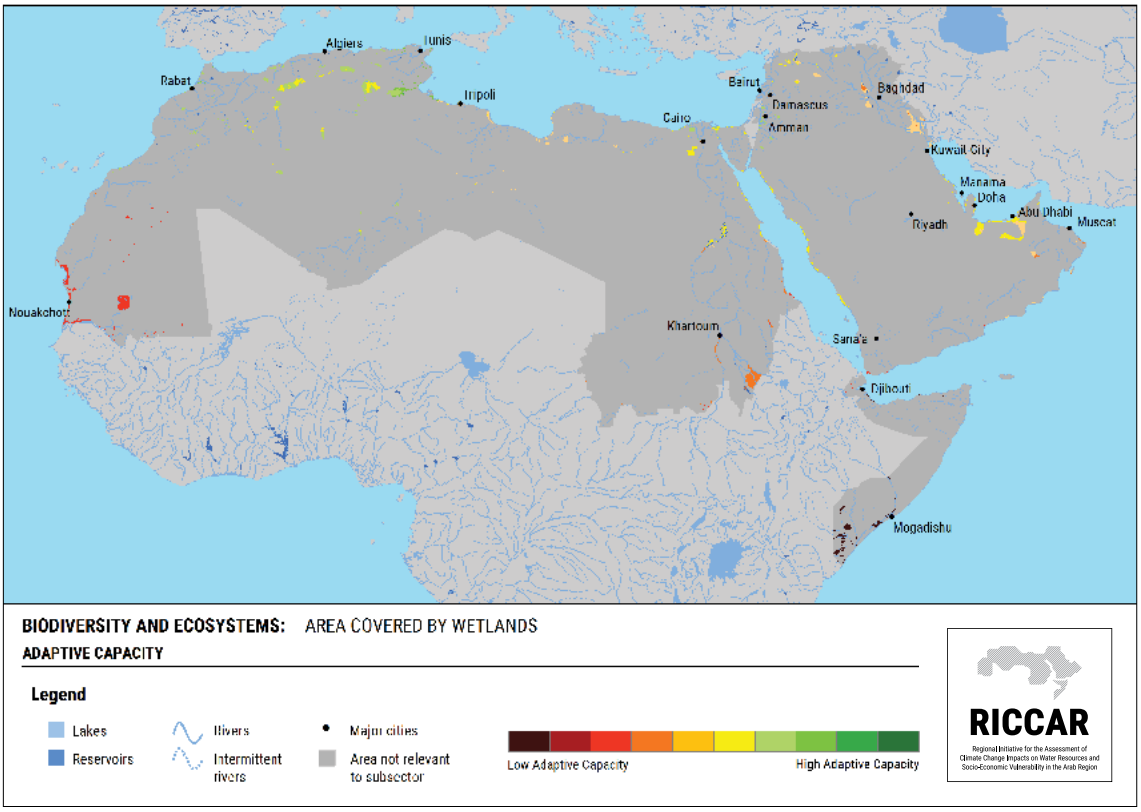
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.3. POTENTIAL IMPACT

FIGURE 299




12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.4. ADAPTIVE CAPACITY

FIGURE 300



12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – **12.2.2.5. VULNERABILITY**

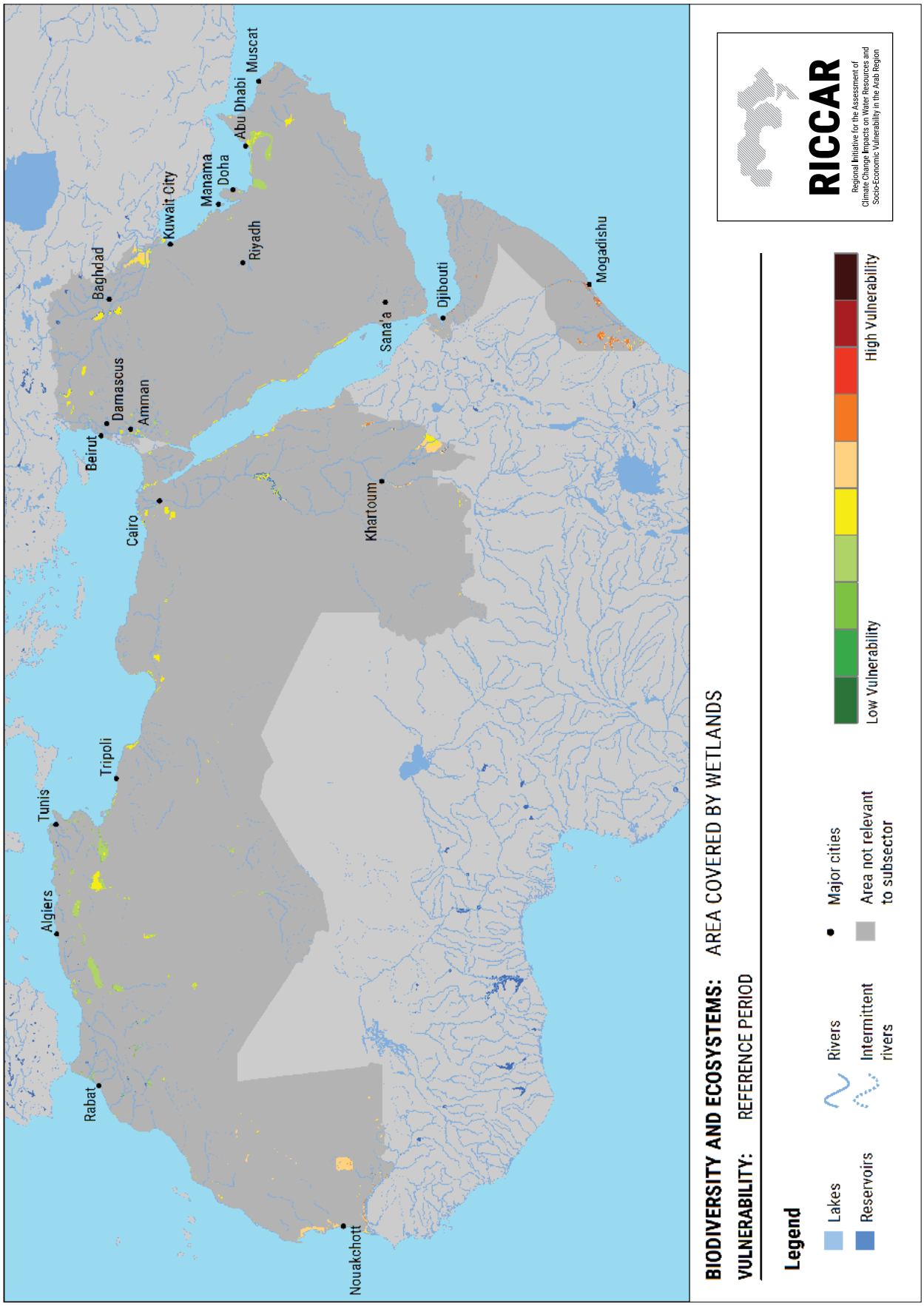
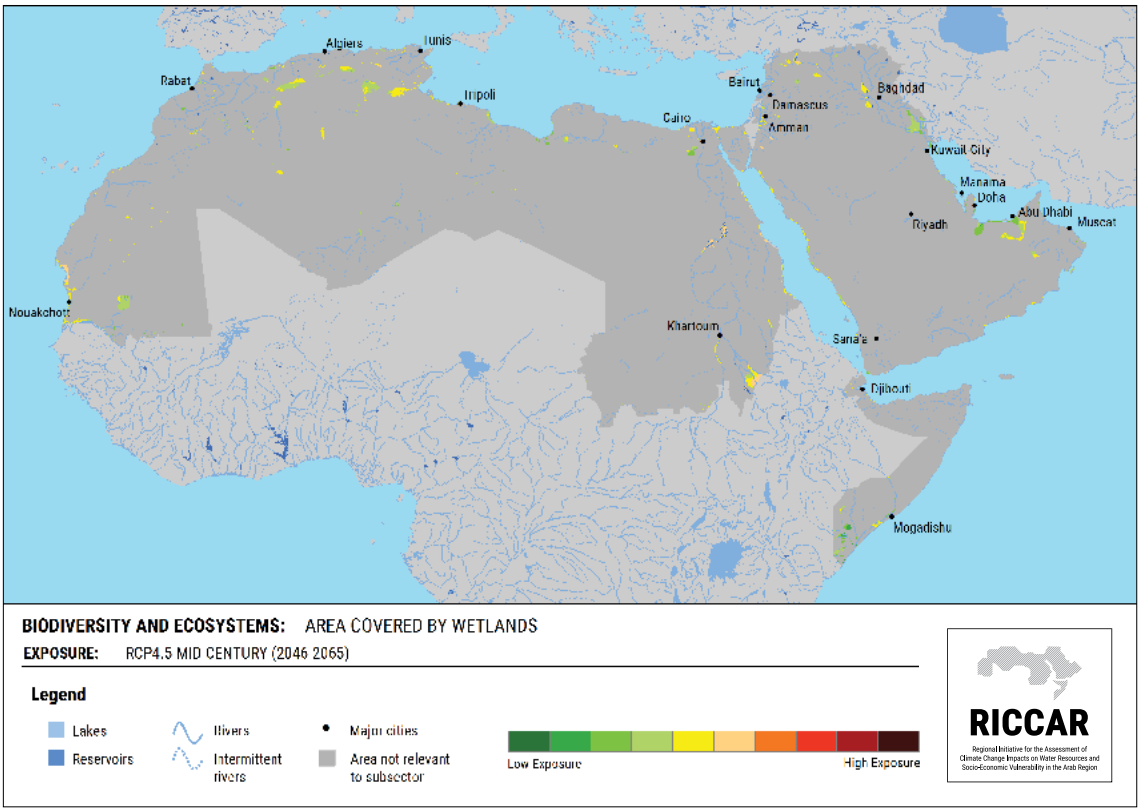



FIGURE 301

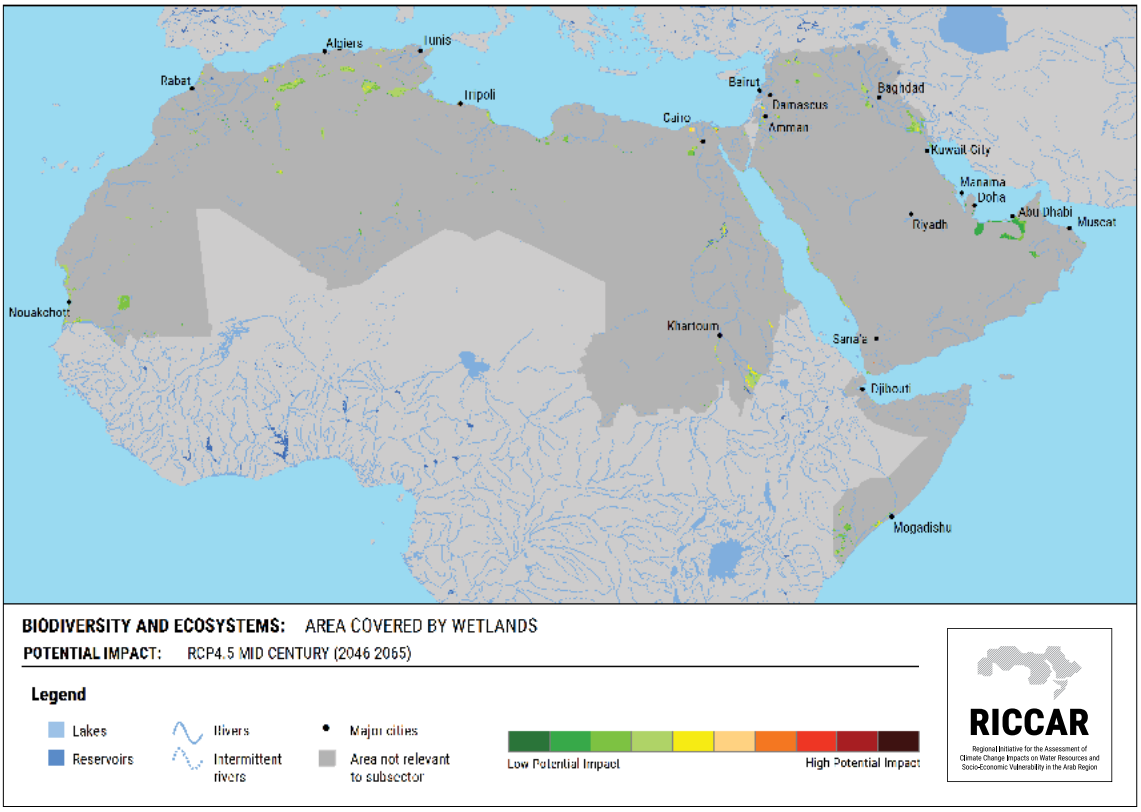
12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – 12.2.3.1. EXPOSURE

FIGURE 302




12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – 12.2.3.2. POTENTIAL IMPACT

FIGURE 303



12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – **12.2.3.3. VULNERABILITY**

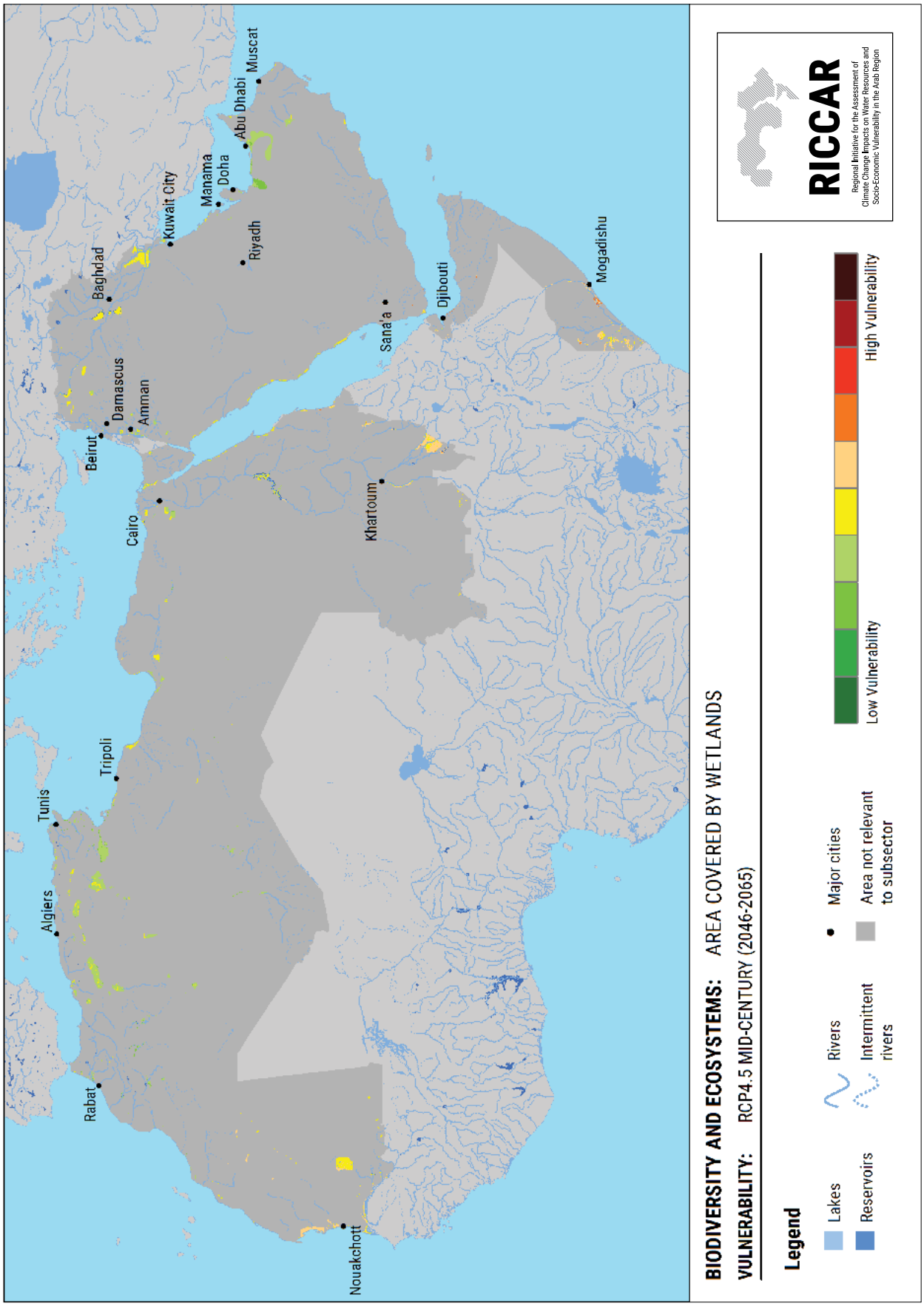
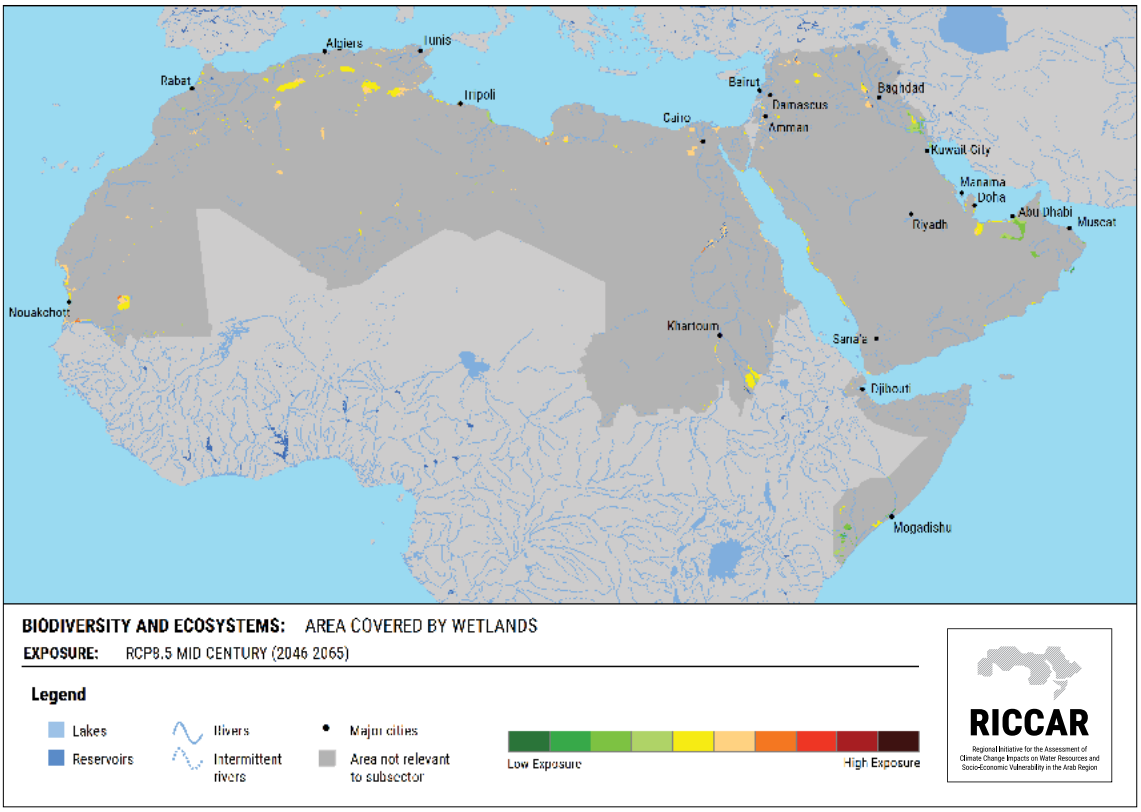



FIGURE 304

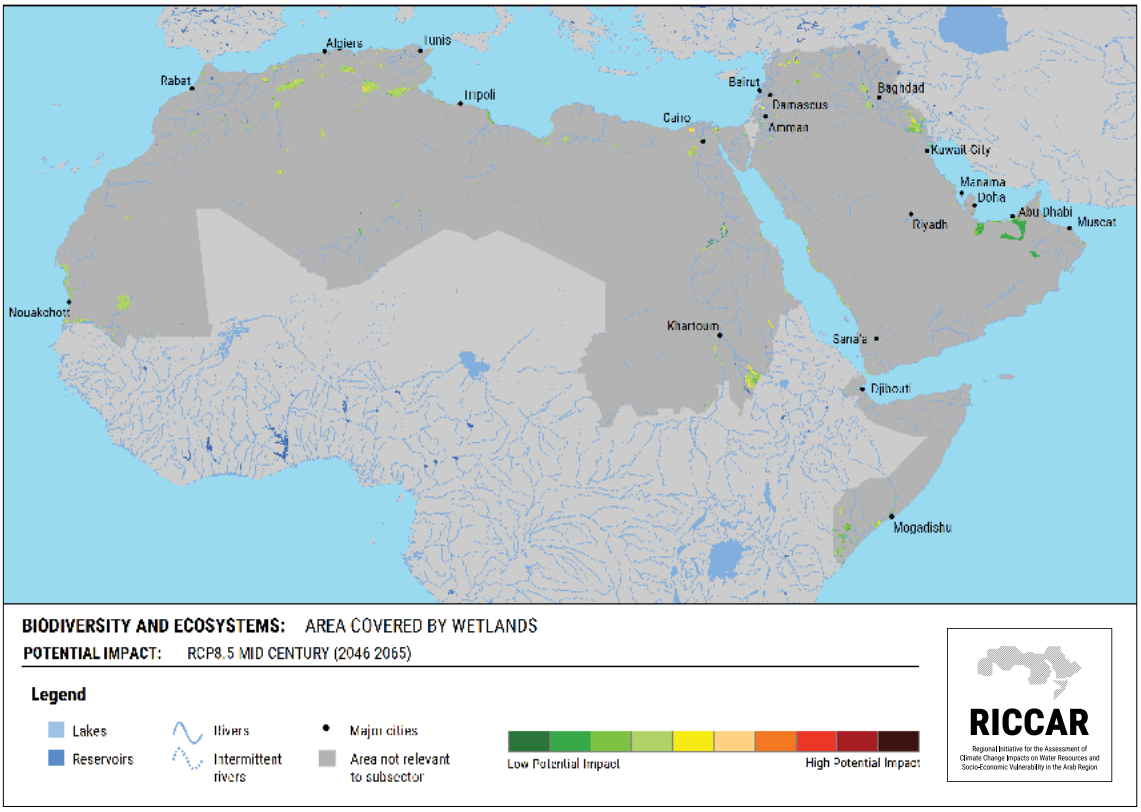
12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – 12.2.4.1. EXPOSURE

FIGURE 305




12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – 12.2.4.2. POTENTIAL IMPACT

FIGURE 306



12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – **12.2.4.3. VULNERABILITY**

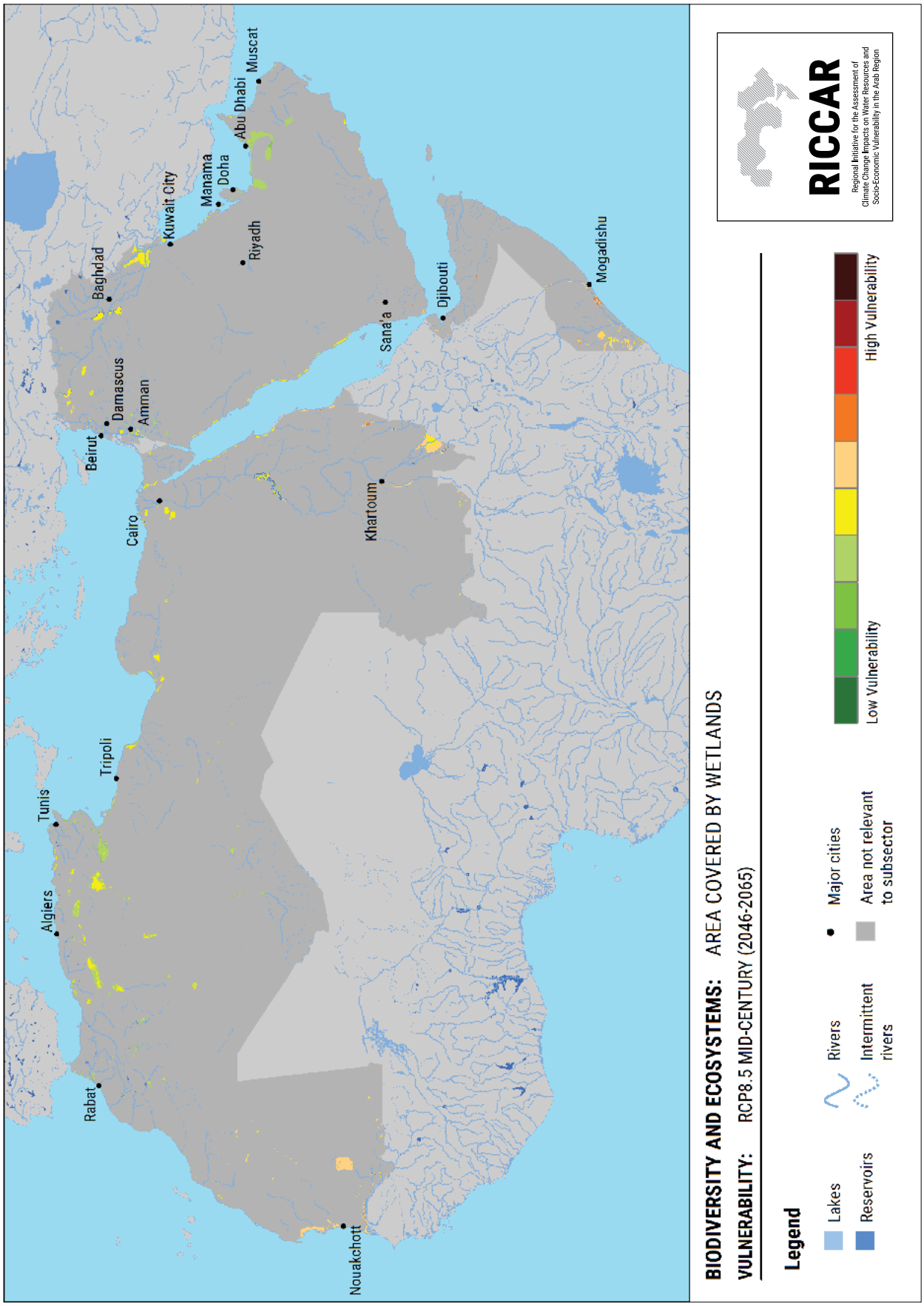
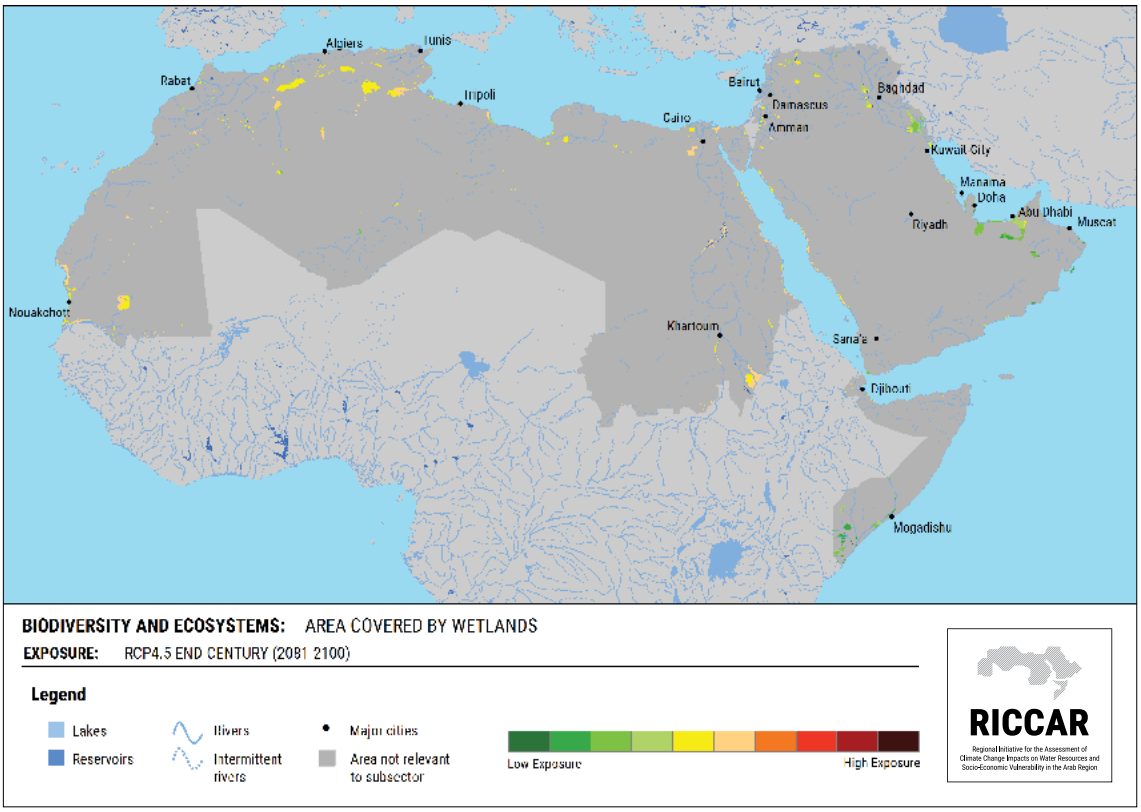



FIGURE 307

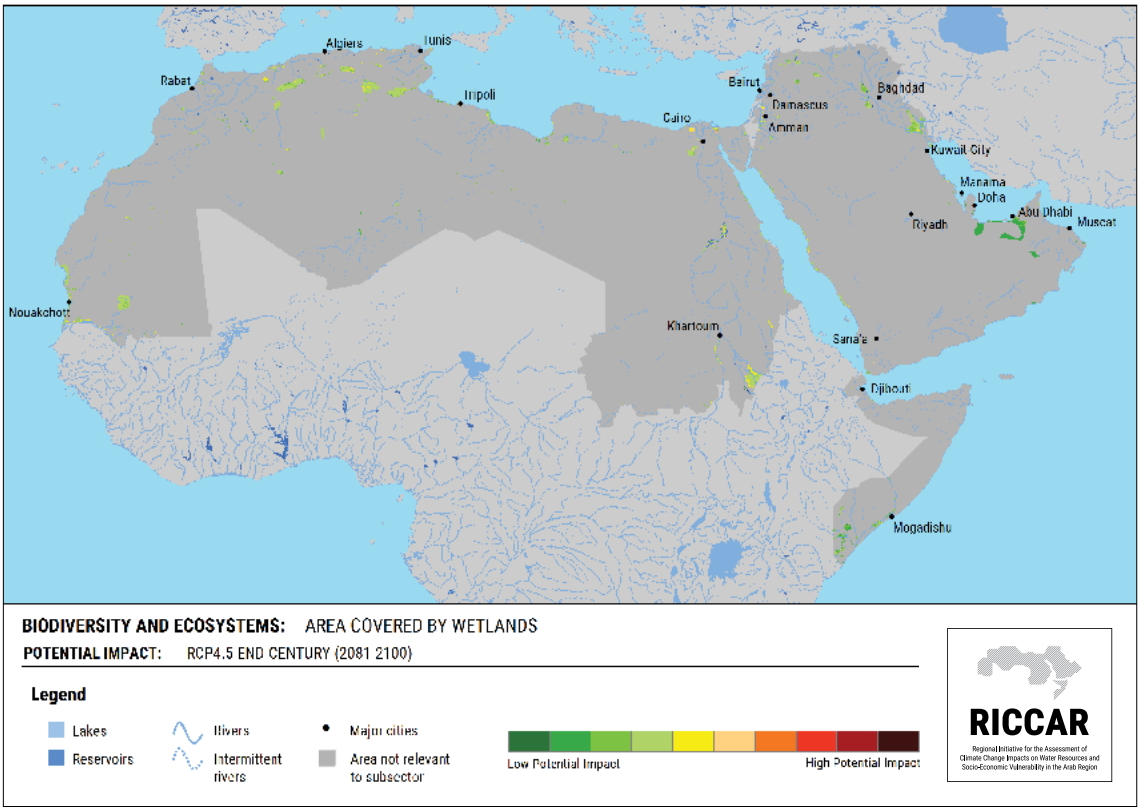
12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – 12.2.5.1. EXPOSURE

FIGURE 308




12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – 12.2.5.2. POTENTIAL IMPACT

FIGURE 309



12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – **12.2.5.3. VULNERABILITY**

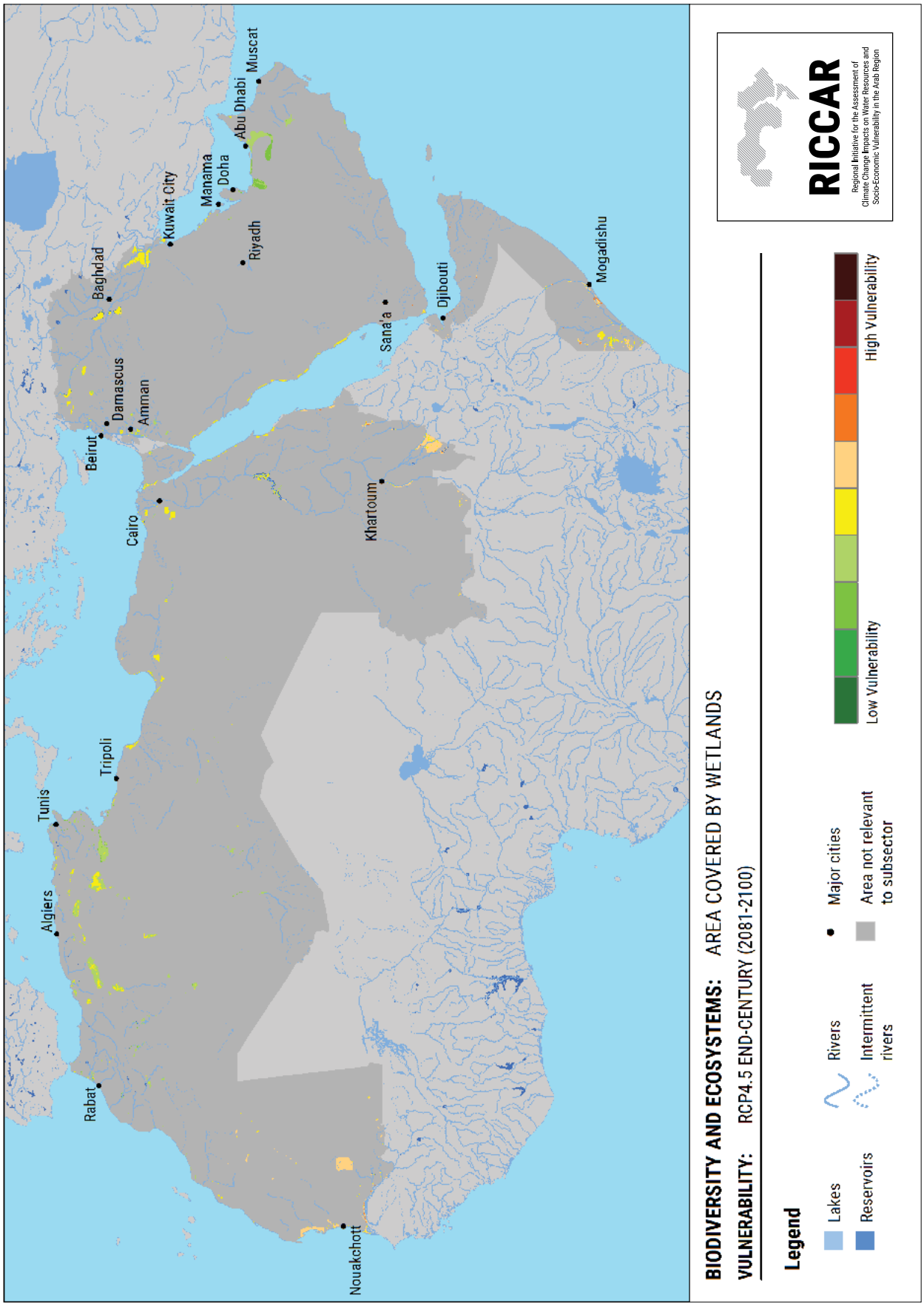
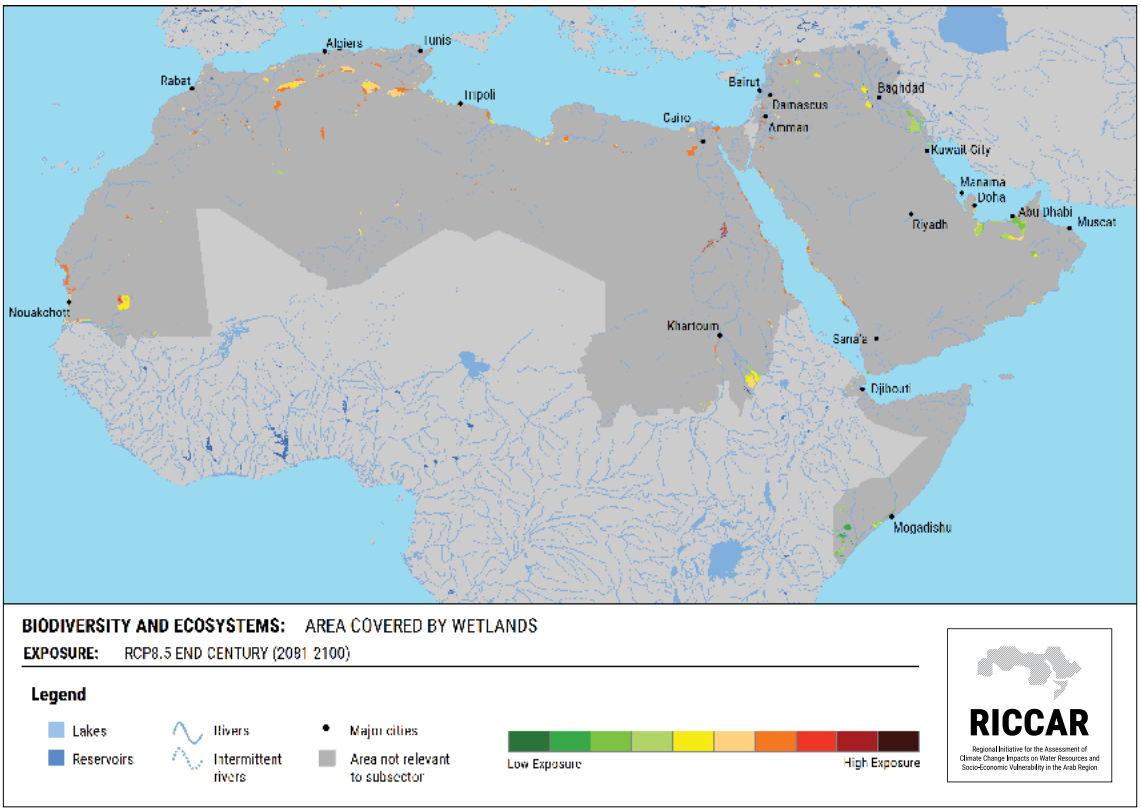



FIGURE 310

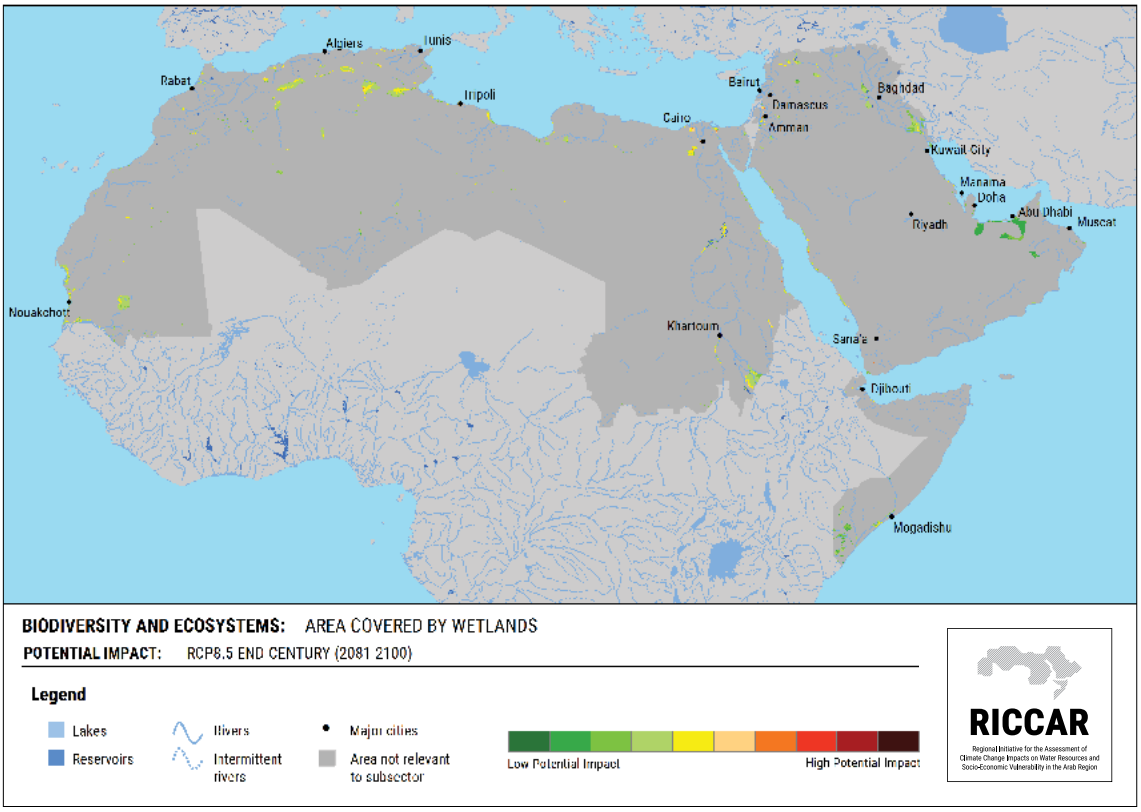
12.2. AREA COVERED BY WETLANDS – 12.2.6. END-CENTURY RCP 8.5 – 12.2.6.1. EXPOSURE

FIGURE 311




12.2. AREA COVERED BY WETLANDS – 12.2.6. END-CENTURY RCP 8.5 – 12.2.6.2. POTENTIAL IMPACT

FIGURE 312



12.2. AREA COVERED BY WETLANDS – 12.2.6. END-CENTURY RCP 8.5 – **12.2.6.3. VULNERABILITY**

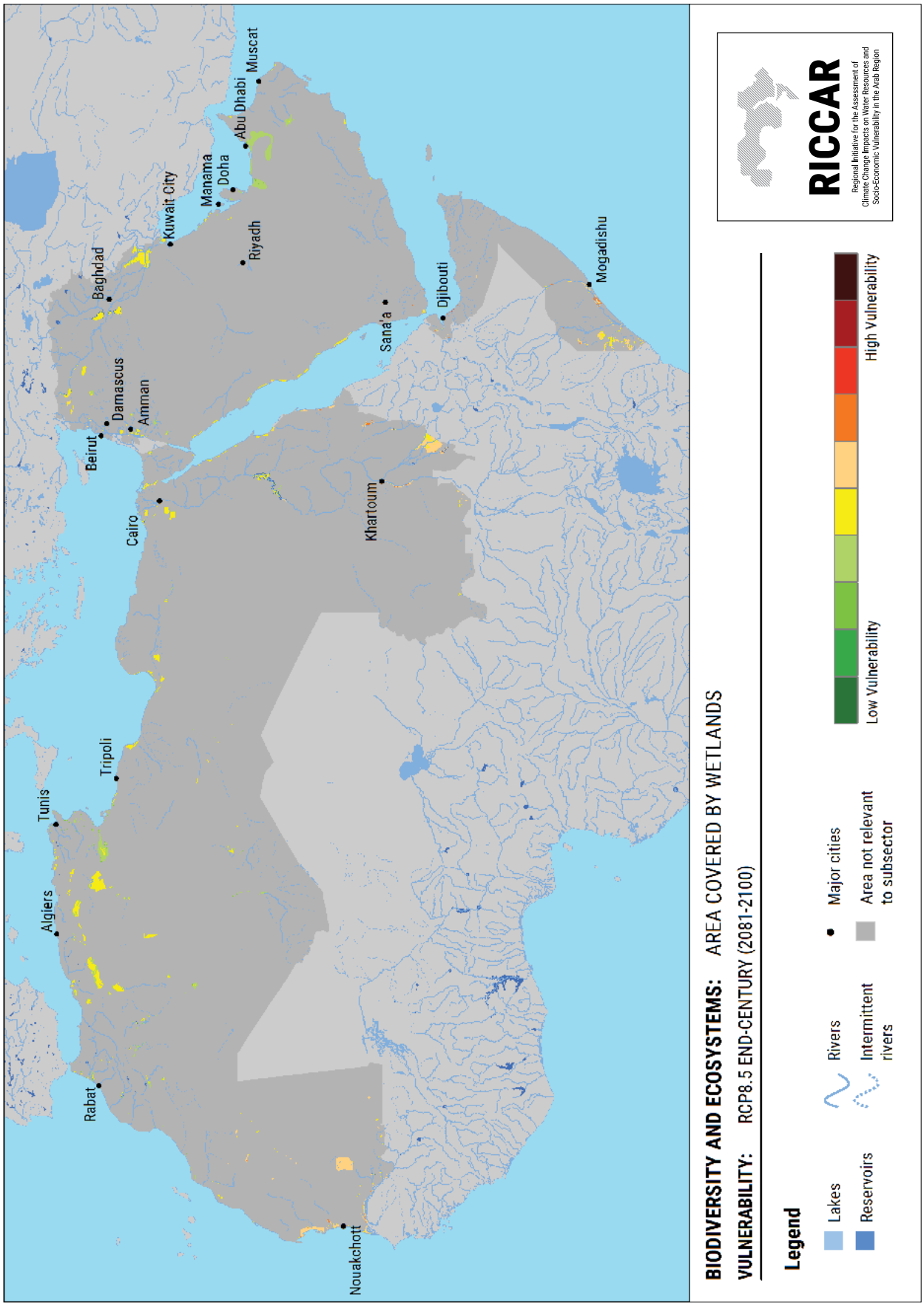



FIGURE 313

12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.1. REFERENCE PERIOD

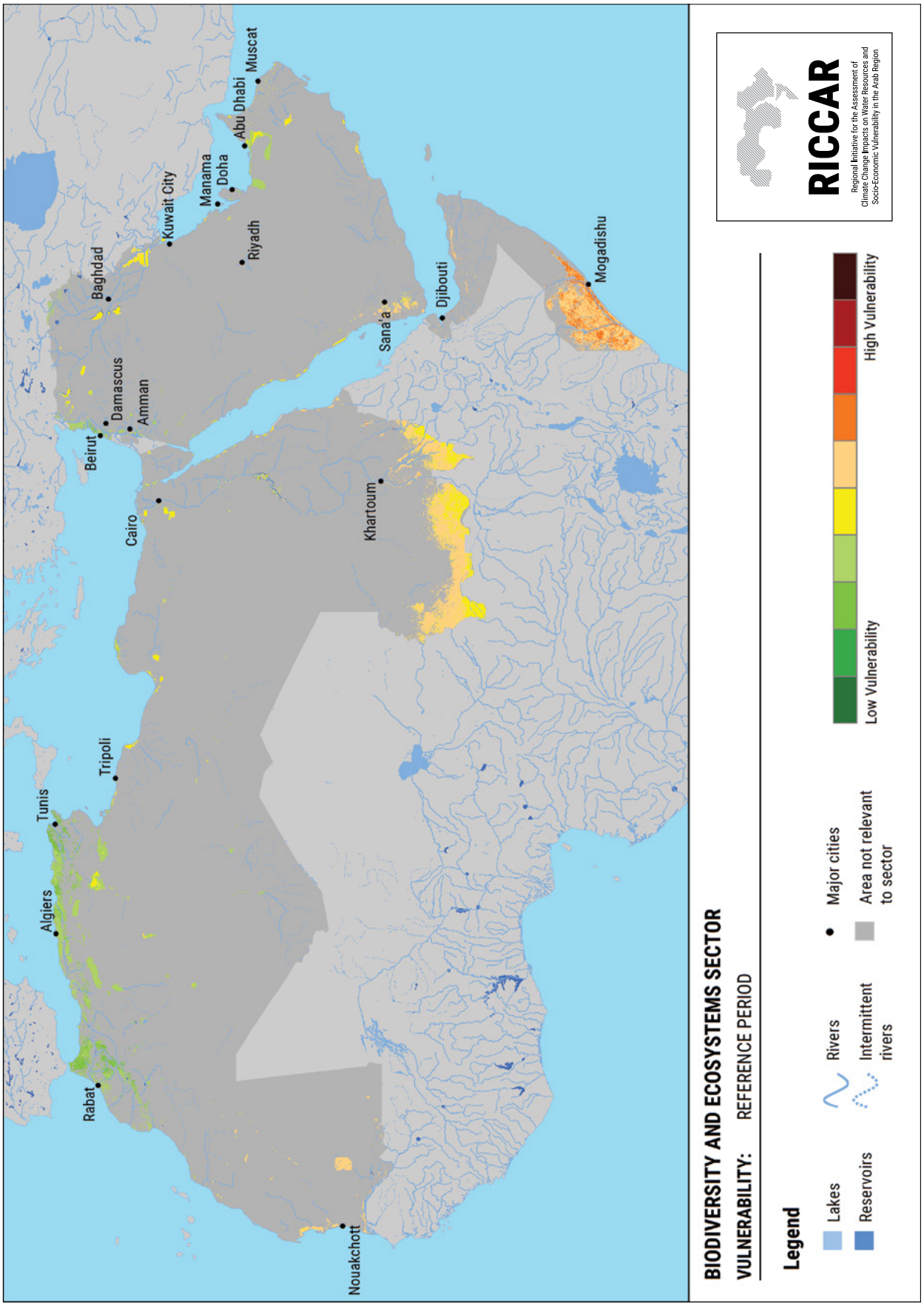



FIGURE 314

12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – **12.3.2. MID-CENTURY RCP 4.5**

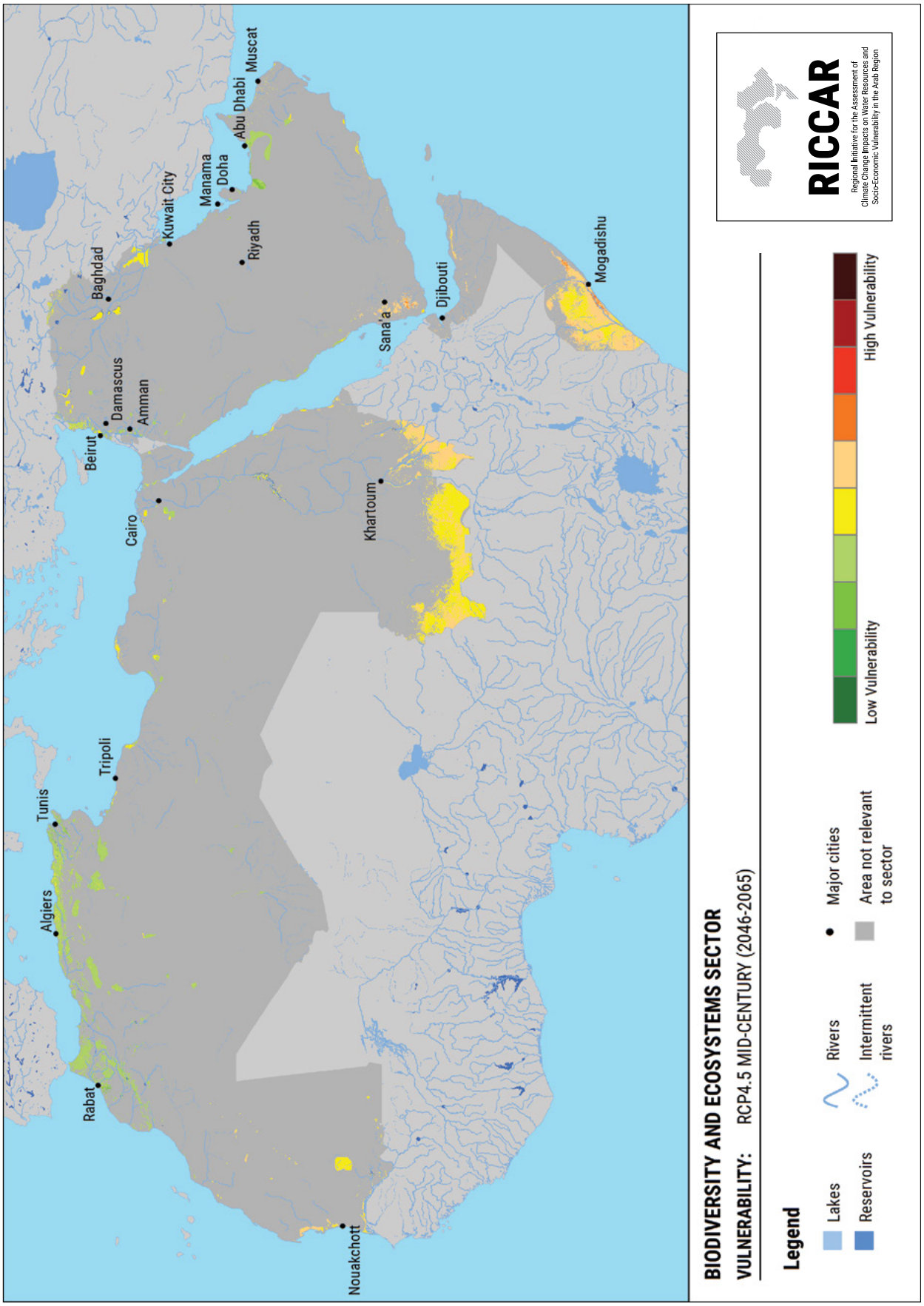



FIGURE 315

12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.3. MID-CENTURY RCP 8.5

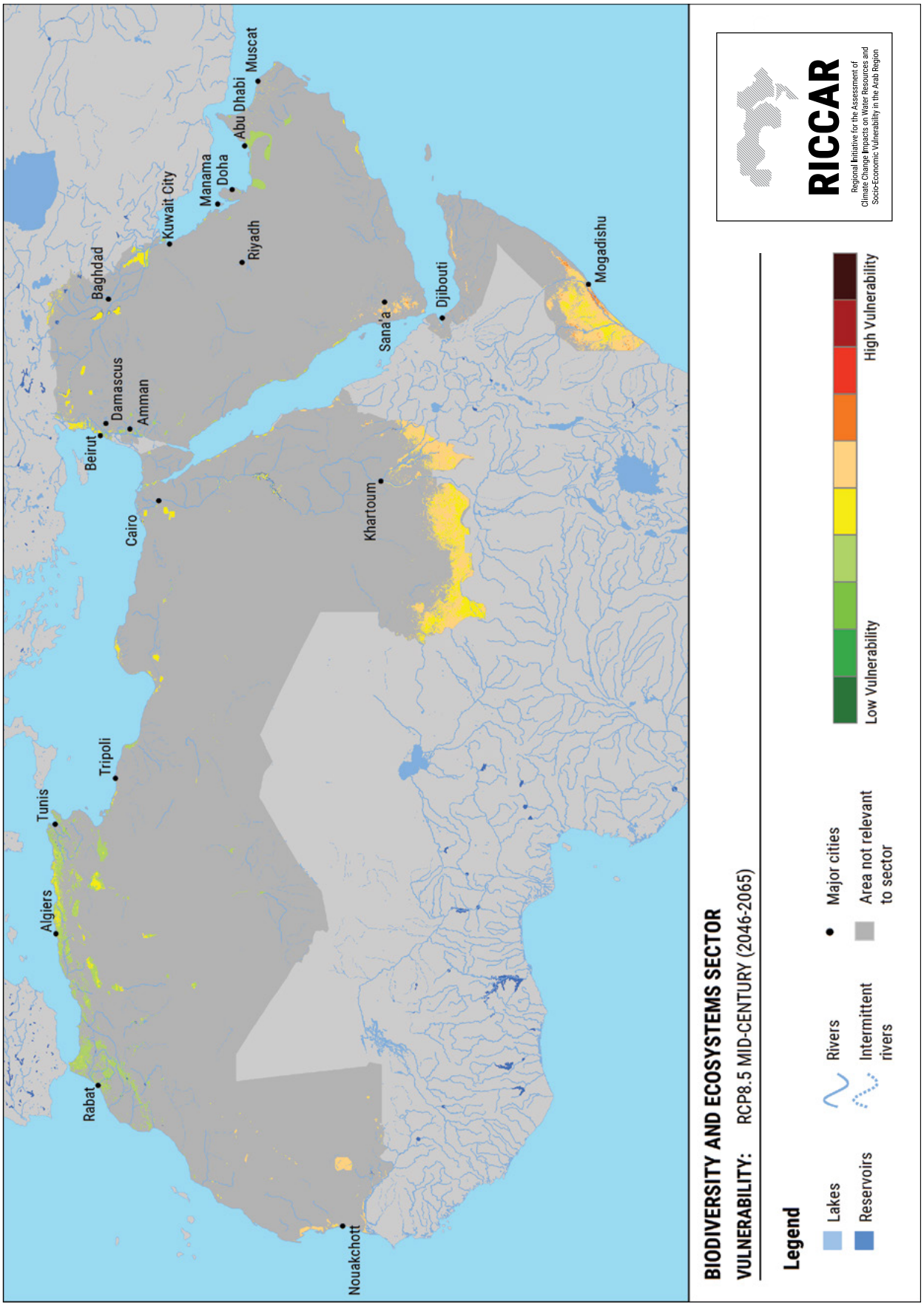



FIGURE 316

12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – **12.3.4. END-CENTURY RCP 4.5**

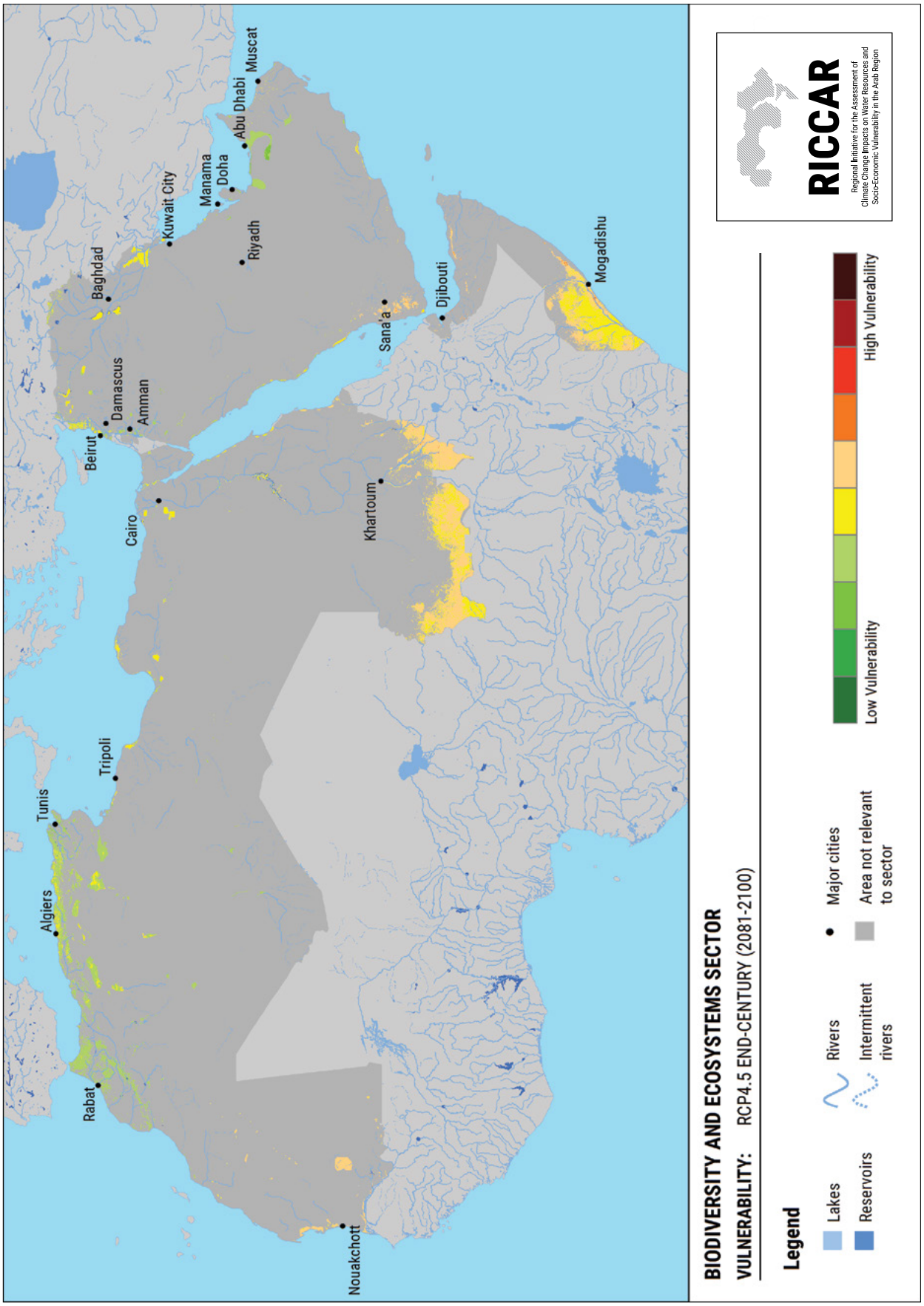



FIGURE 317

12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.5. END-CENTURY RCP 8.5

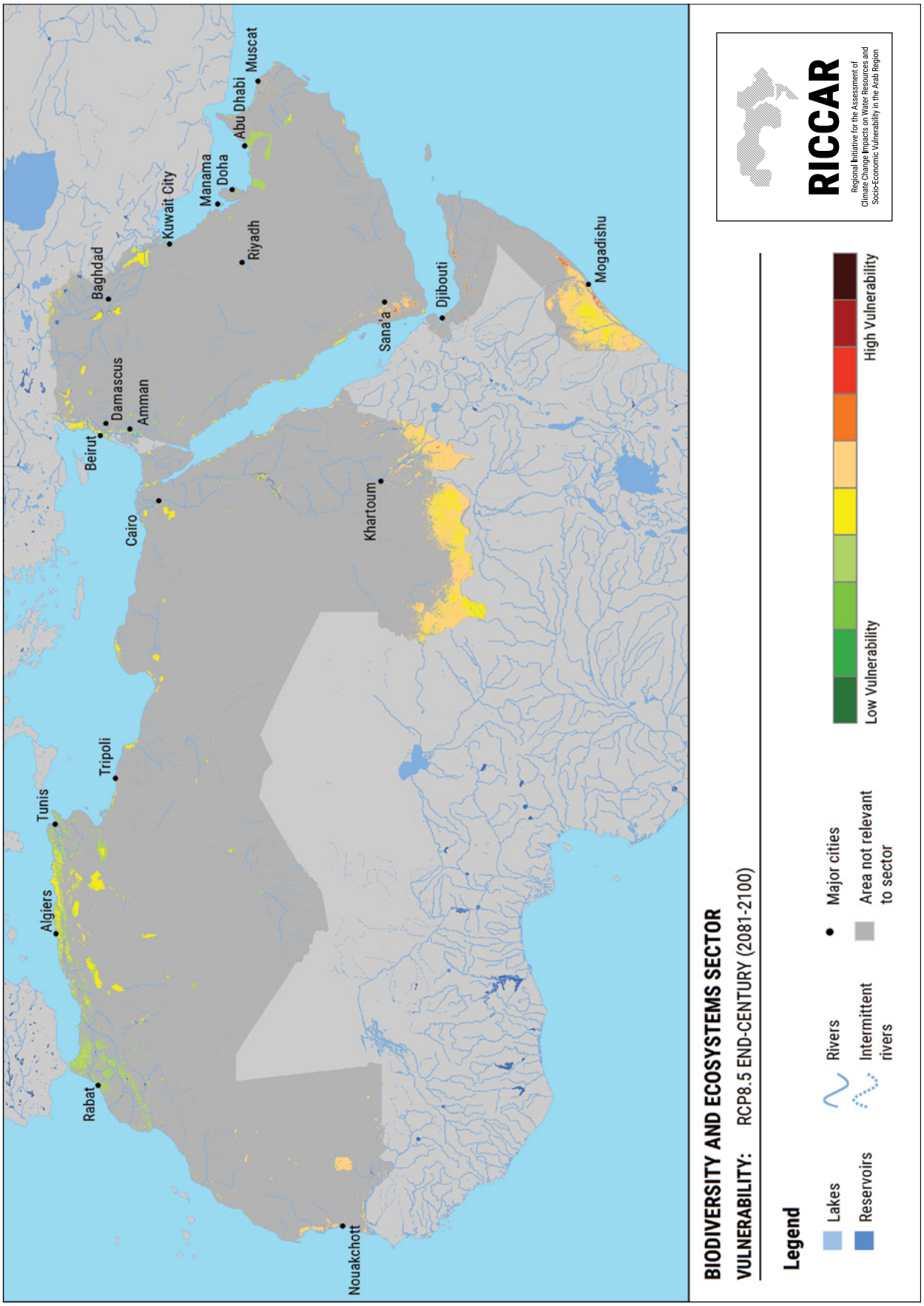



FIGURE 318

# CHAPTER 13

## AGRICULTURE SECTOR

13.1. WATER AVAILABLE FOR CROPS – 13.1.1. IMPACT CHAIN

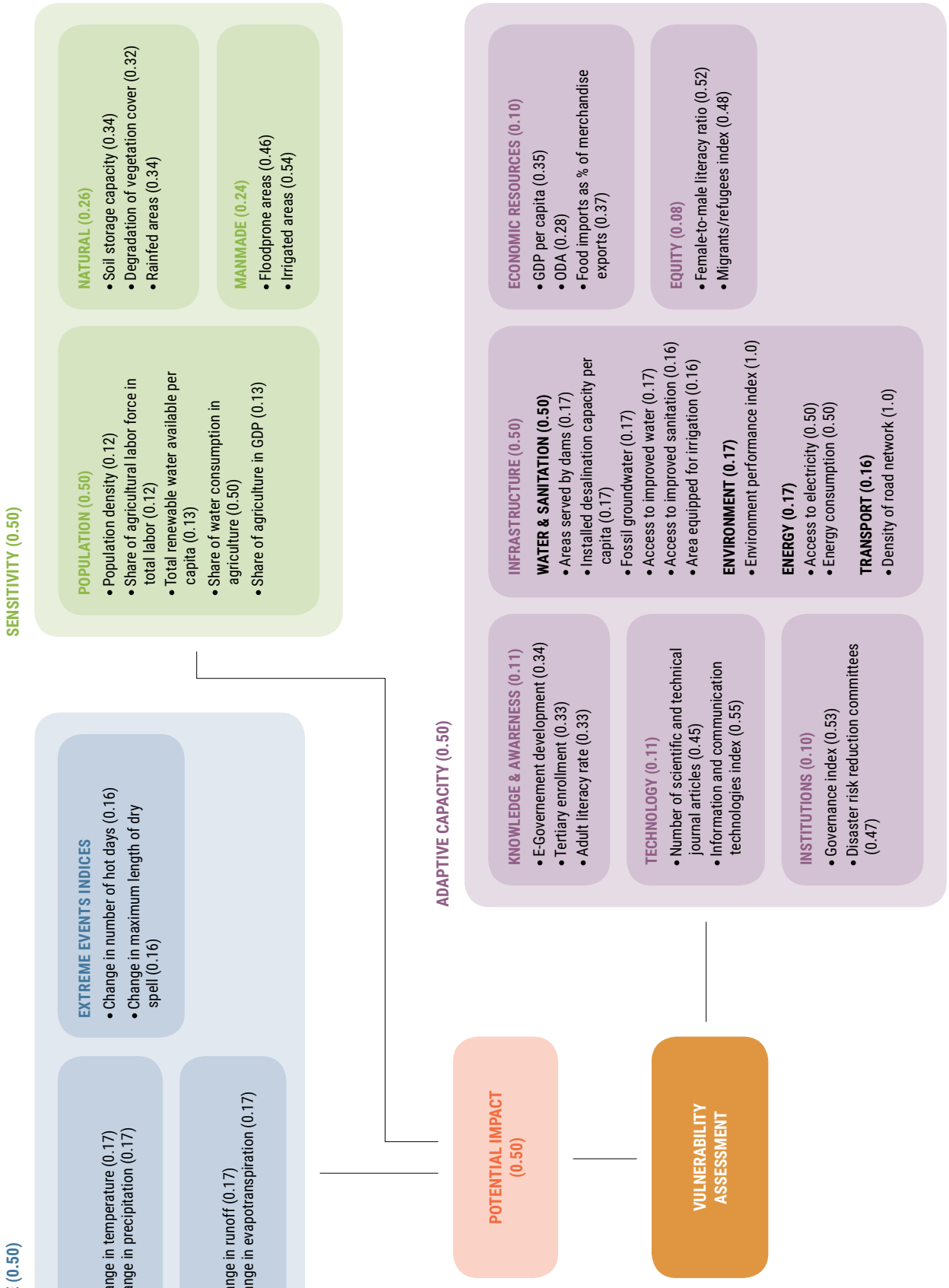
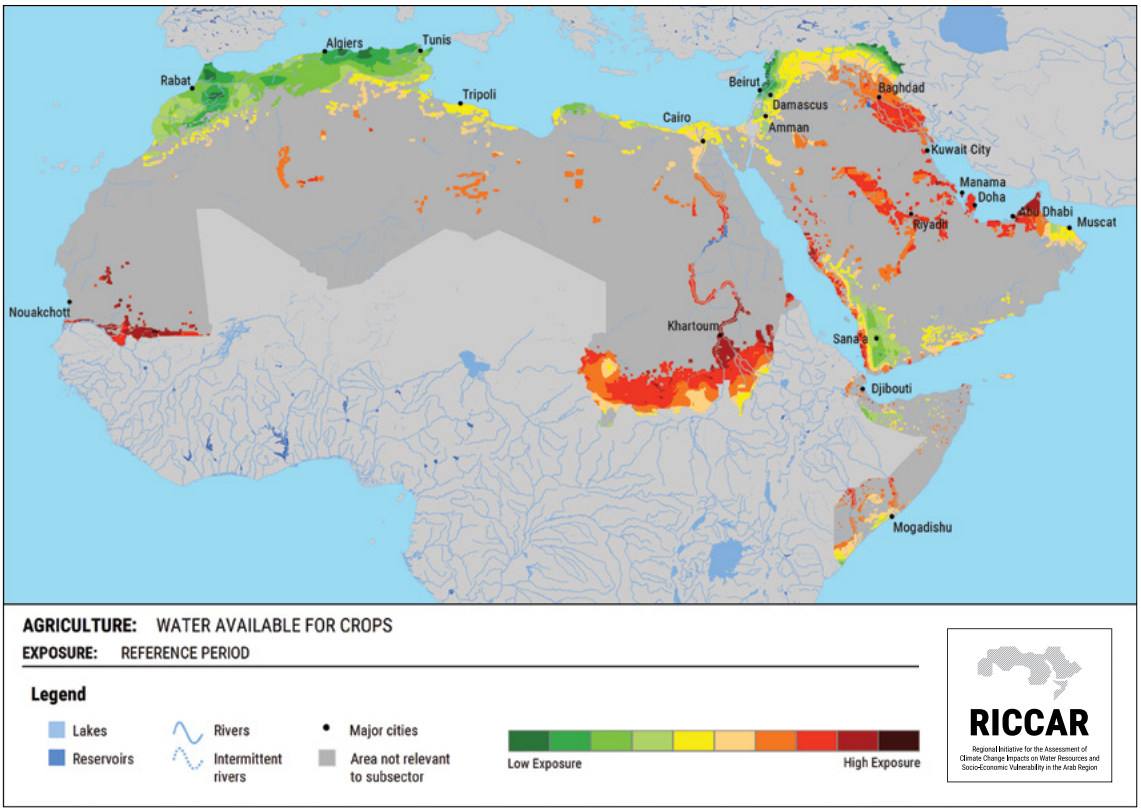



FIGURE 319

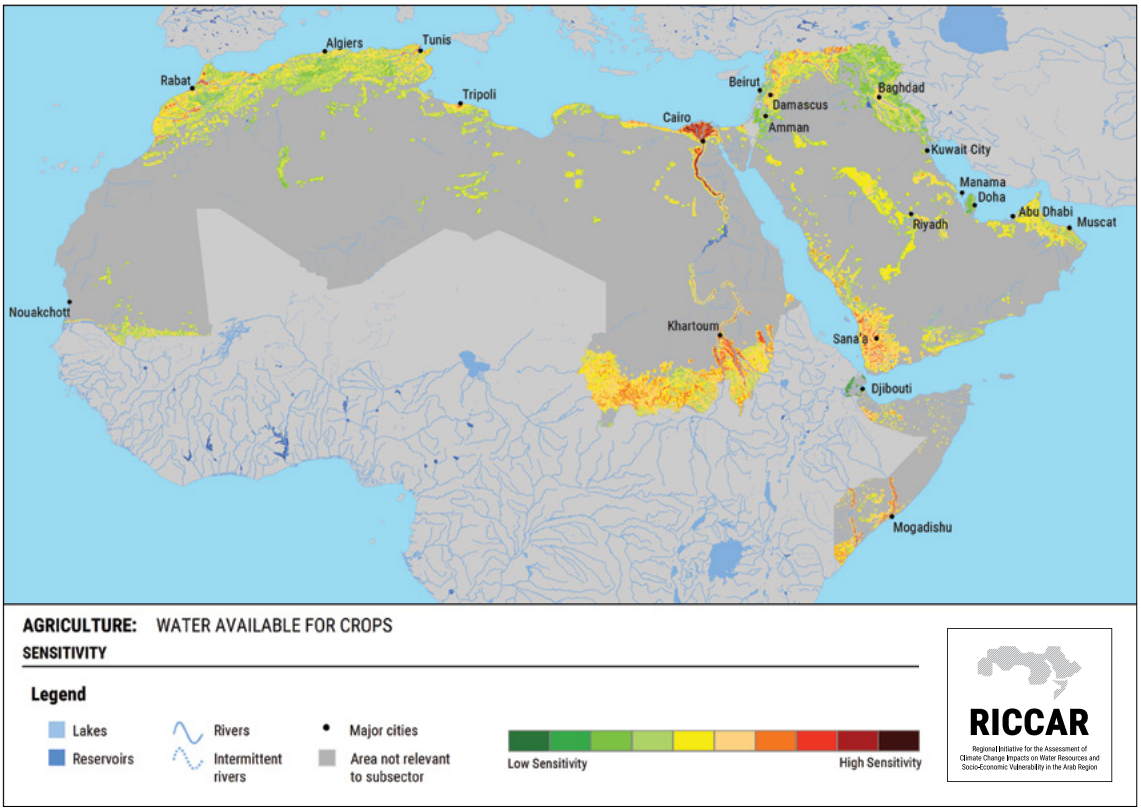
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – **13.1.2.1. EXPOSURE**

**FIGURE 320**



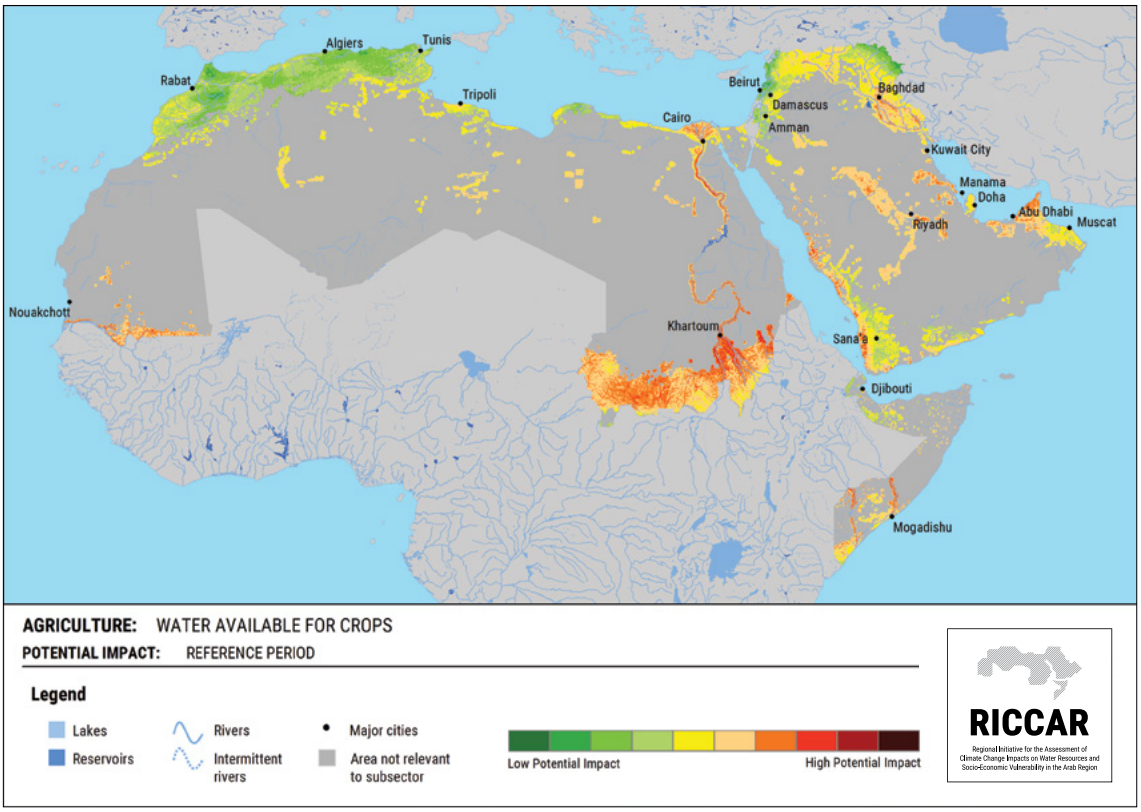

13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – **13.1.2.2. SENSITIVITY**

**FIGURE 321**



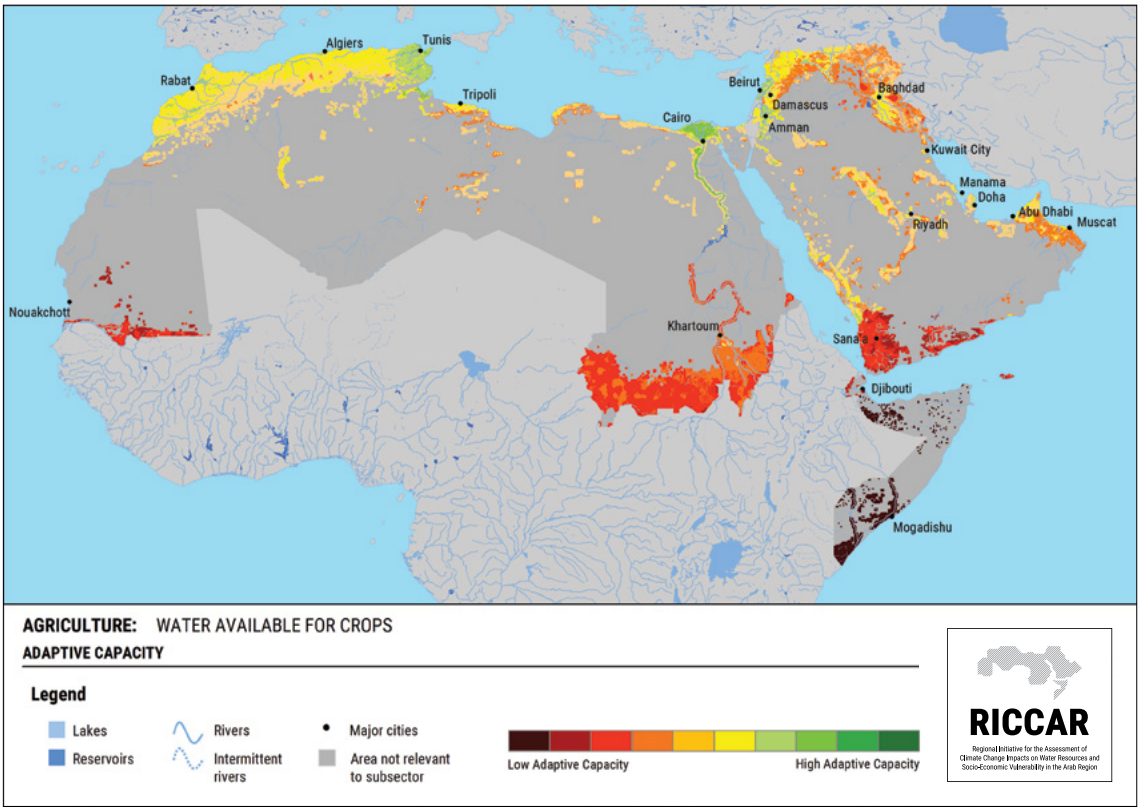
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.3. POTENTIAL IMPACT

FIGURE 322




13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.4. ADAPTIVE CAPACITY

FIGURE 323



13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – **13.1.2.5. VULNERABILITY**

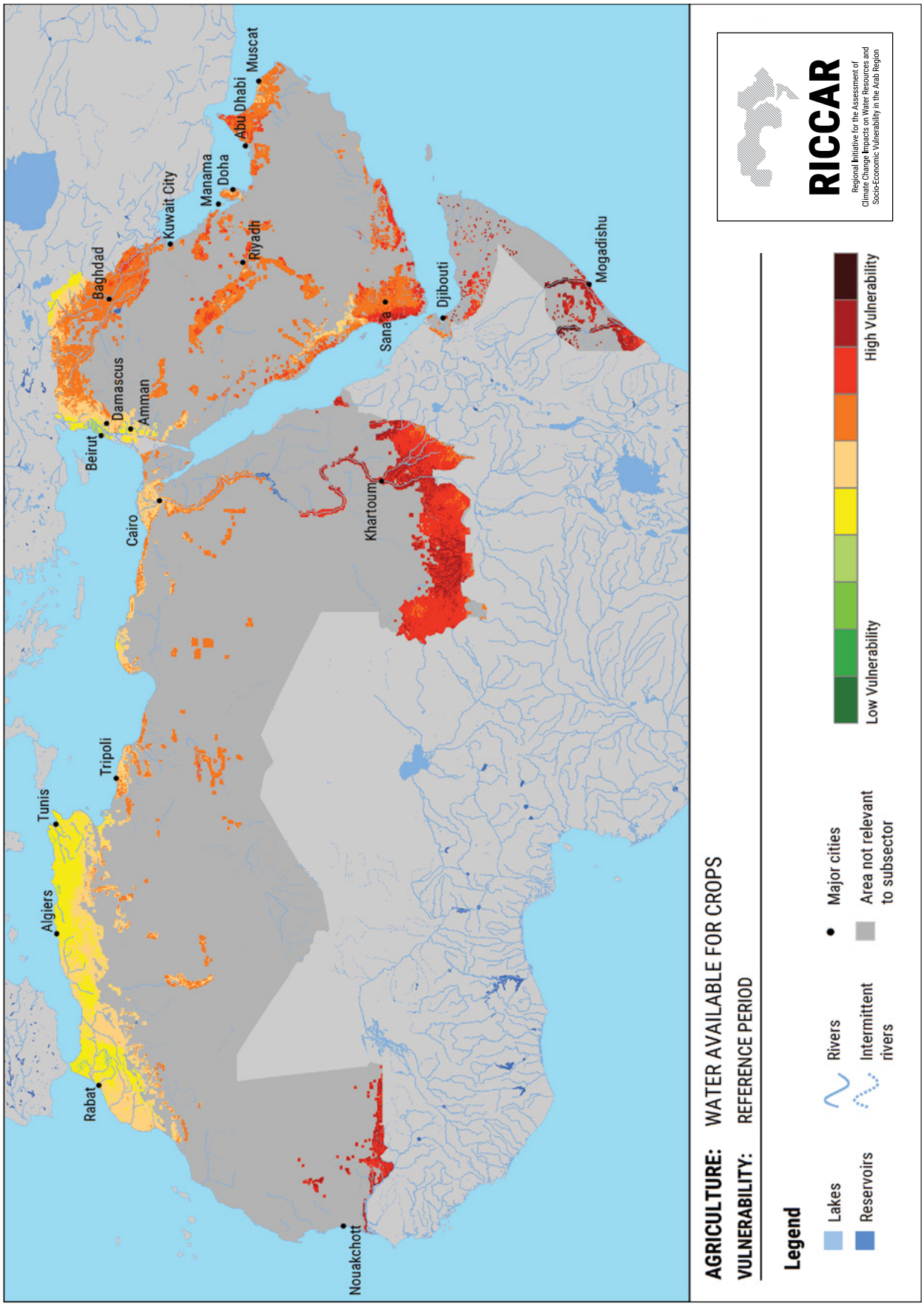
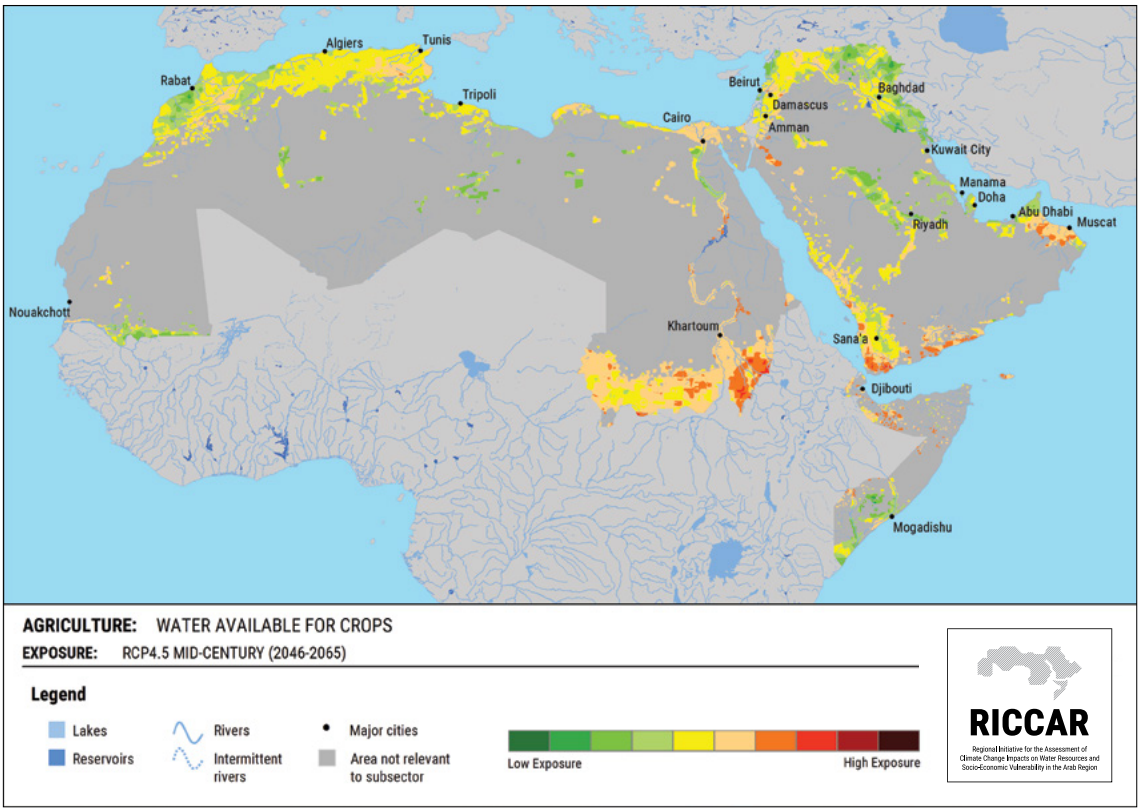



FIGURE 324

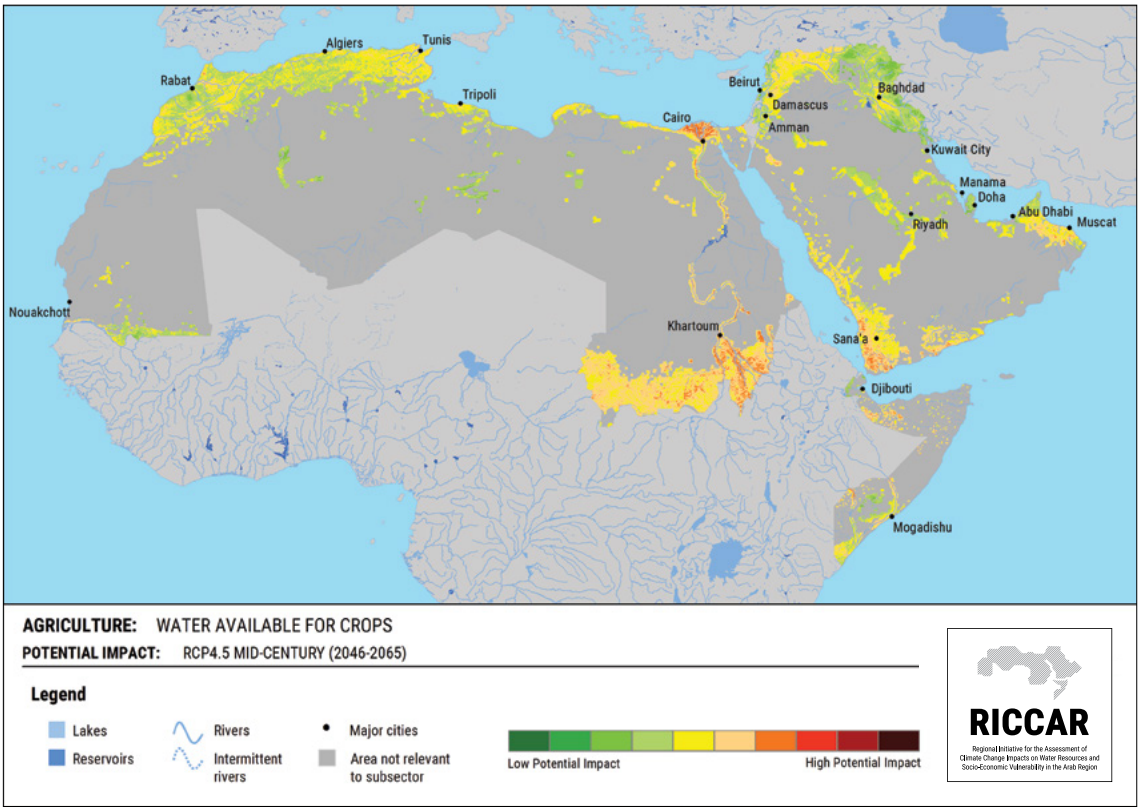
13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – 13.1.3.1. EXPOSURE

FIGURE 325




13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – 13.1.3.2. POTENTIAL IMPACT

FIGURE 326



13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – **13.1.3.3. VULNERABILITY**

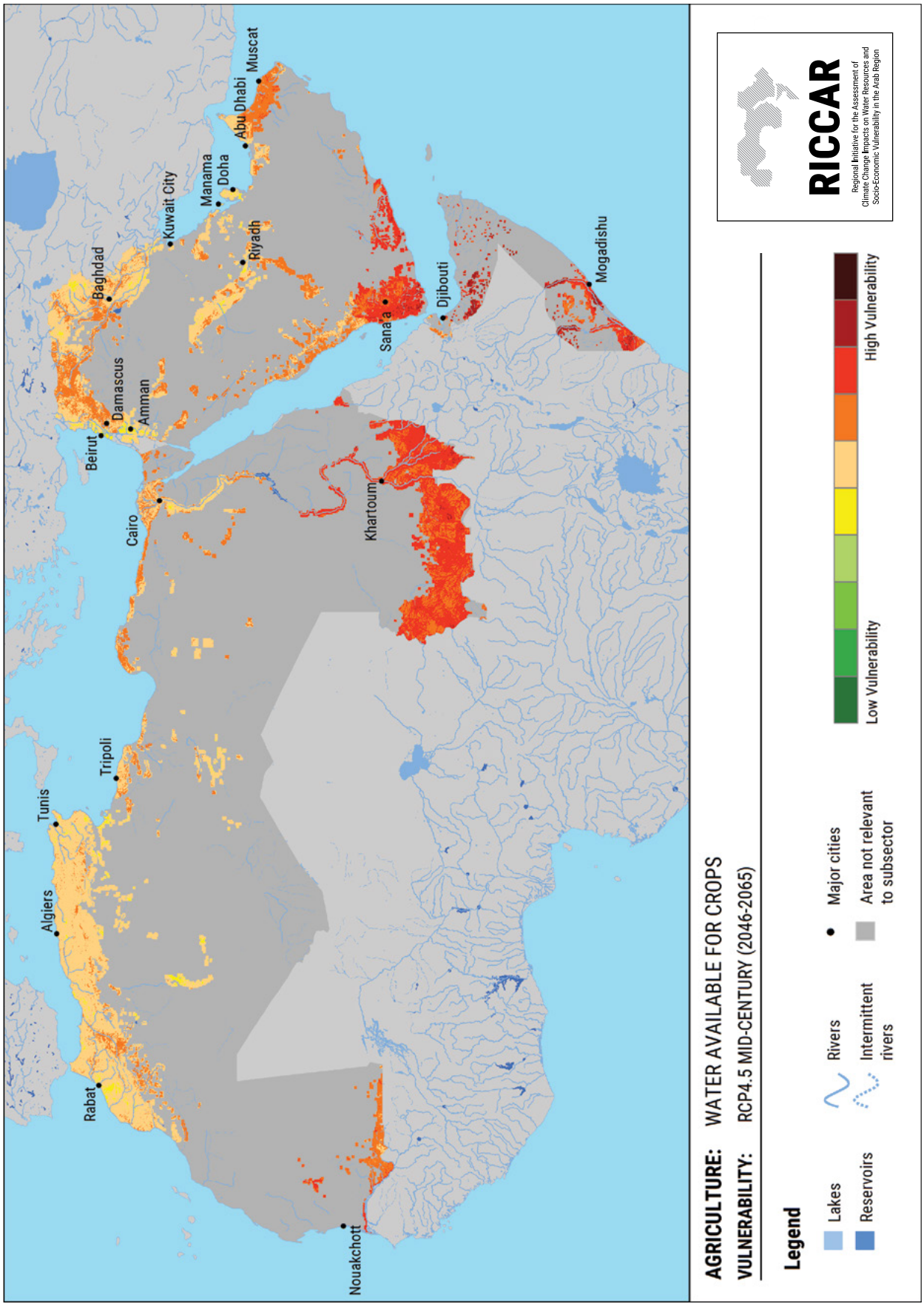
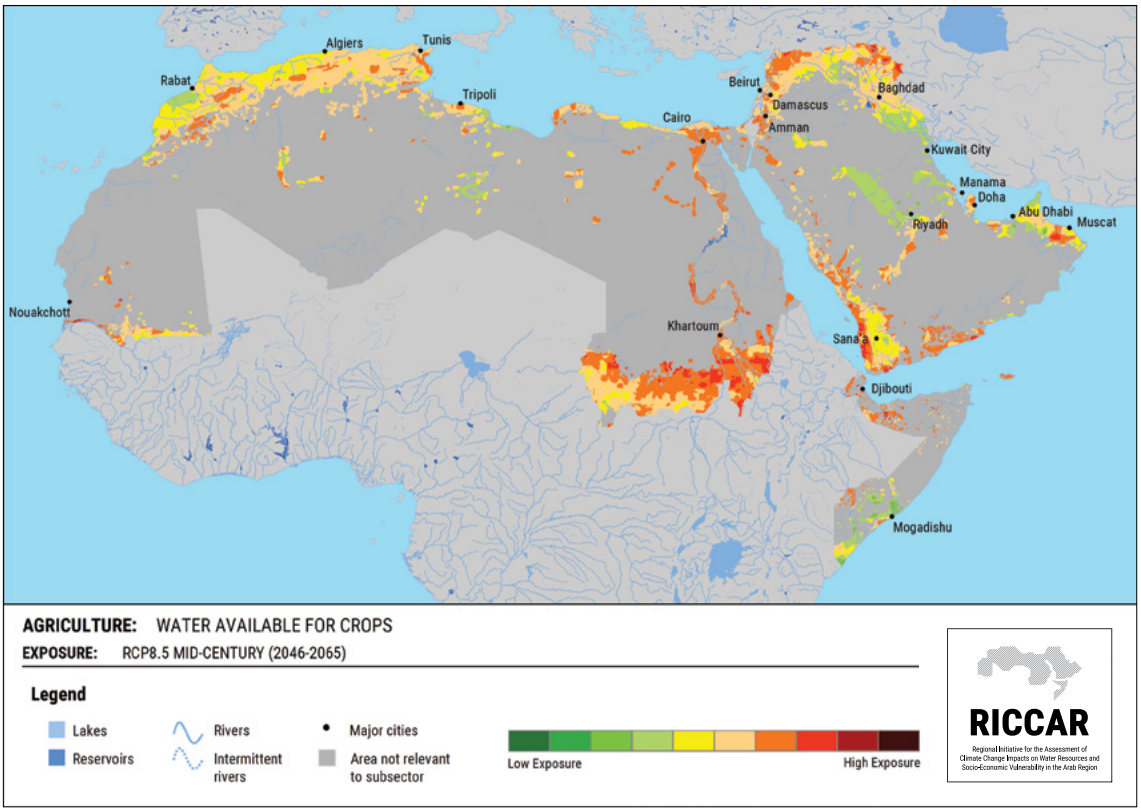



FIGURE 327

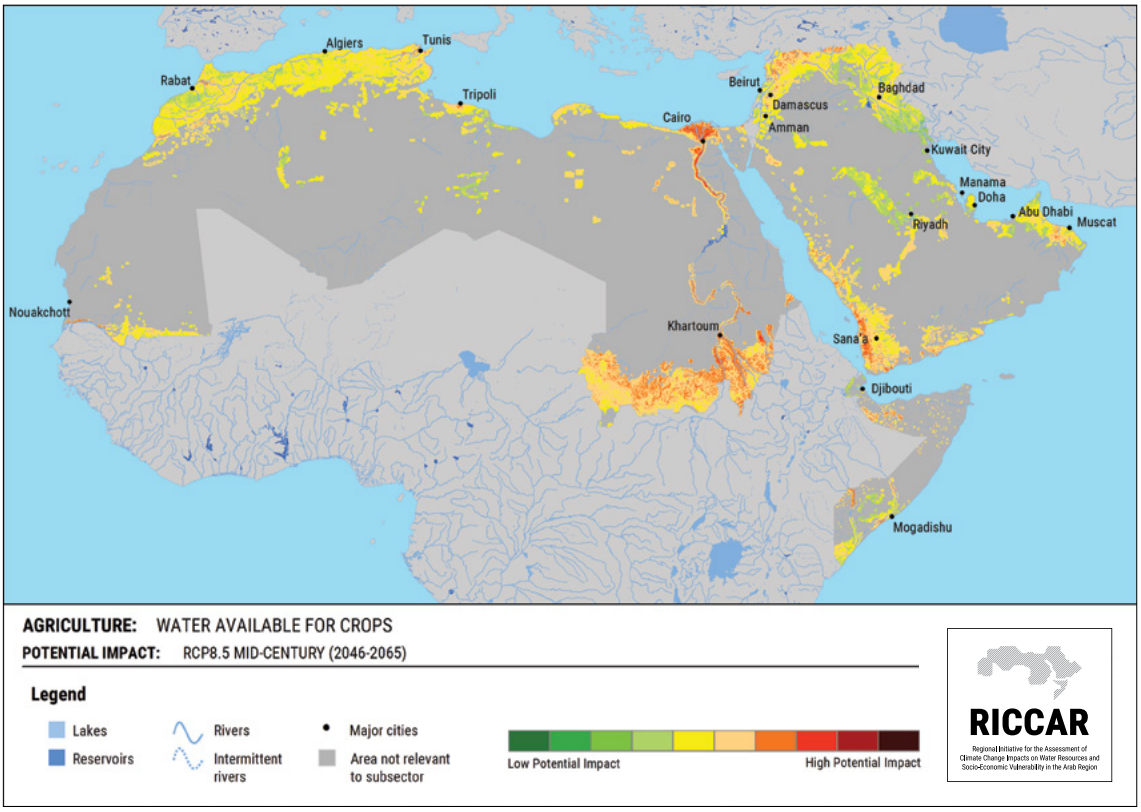
13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – 13.1.4.1. EXPOSURE

FIGURE 328




13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – 13.1.4.2. POTENTIAL IMPACT

FIGURE 329



13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – **13.1.4.3. VULNERABILITY**

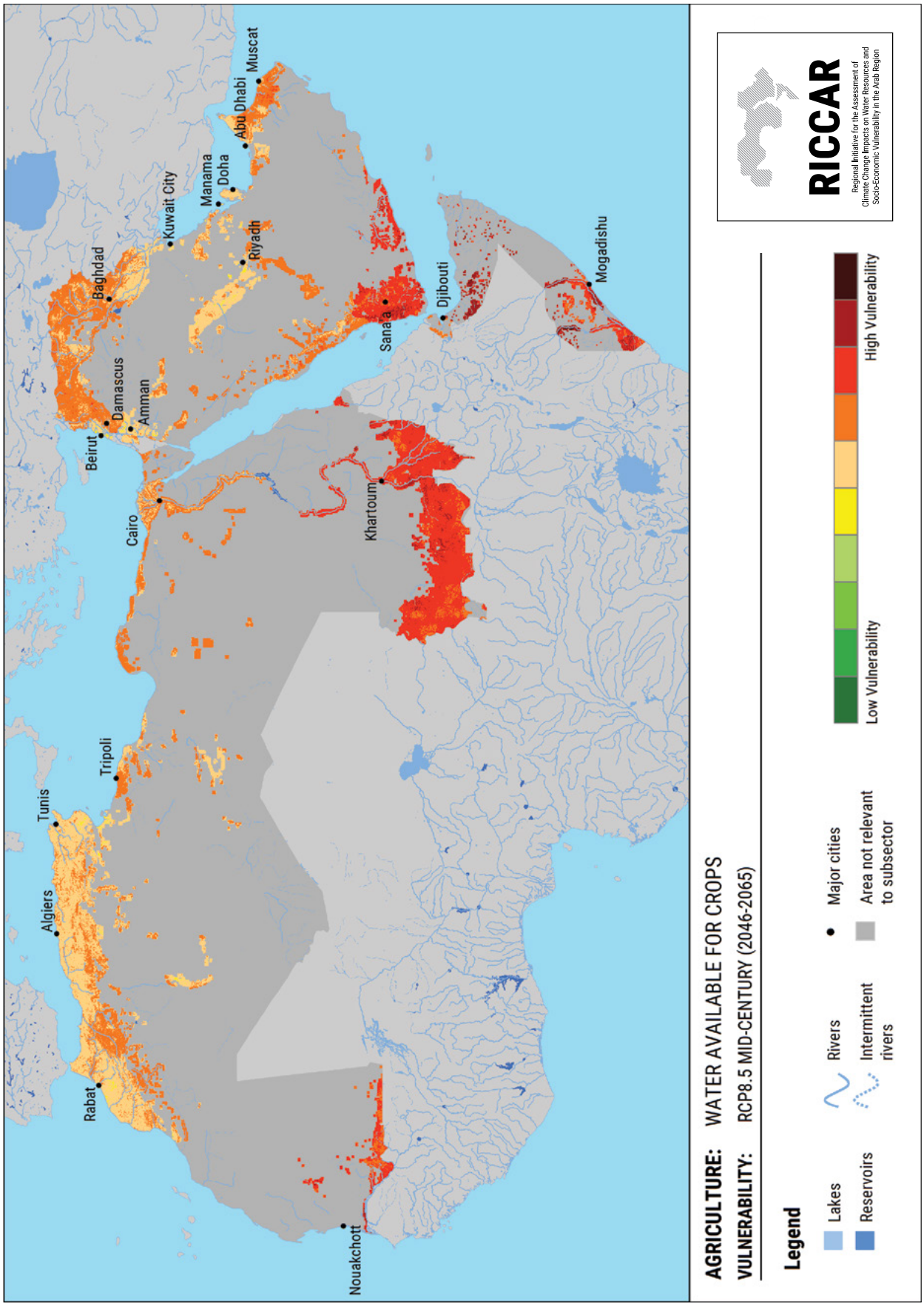
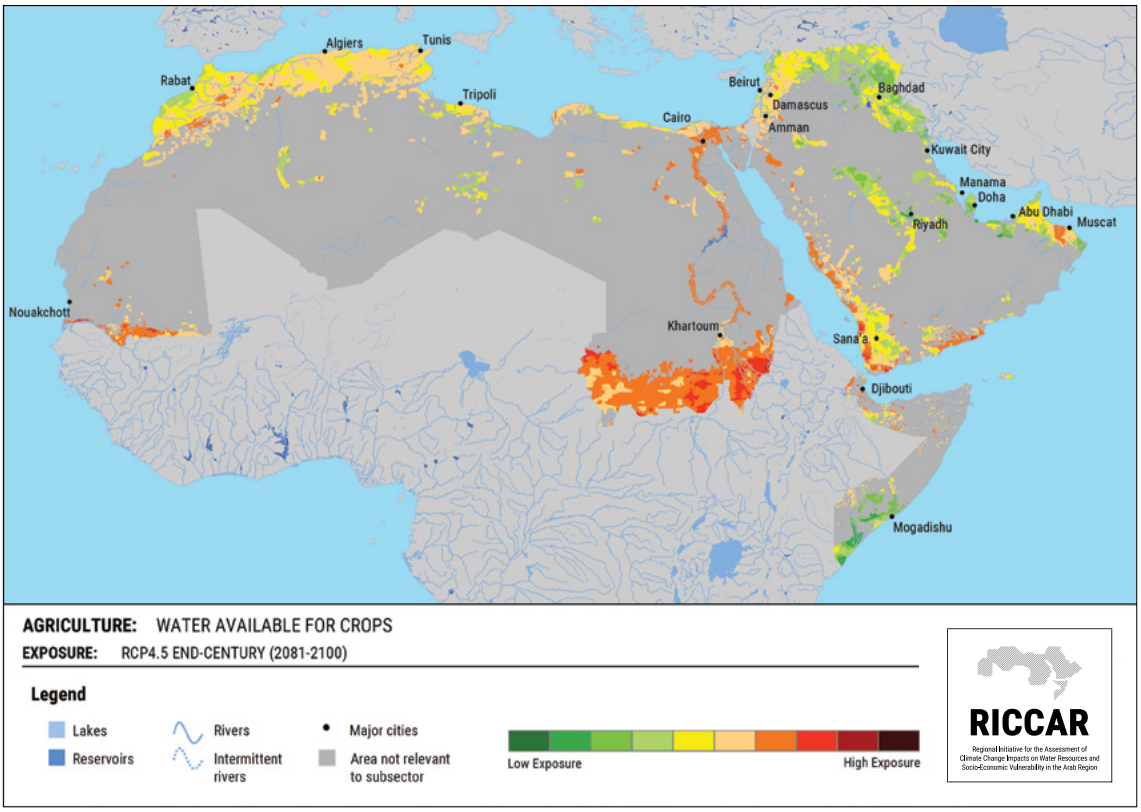



FIGURE 330

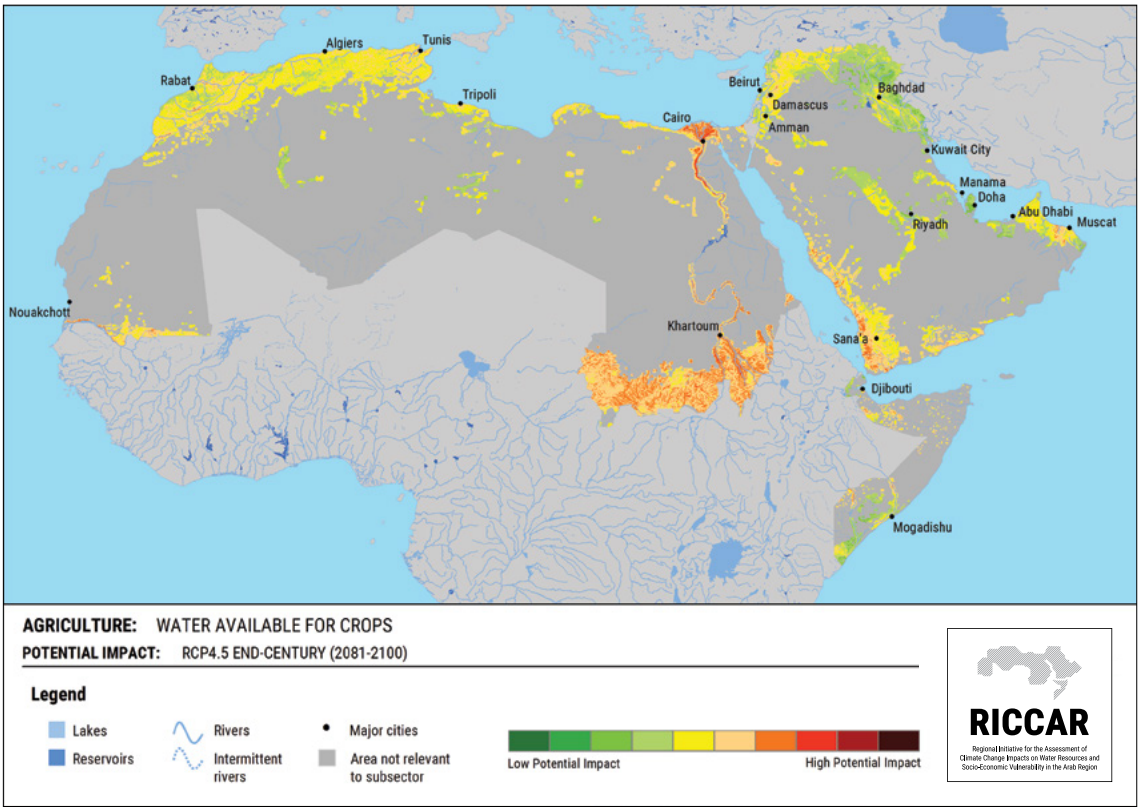
13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – 13.1.5.1. EXPOSURE

FIGURE 331




13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – 13.1.5.2. POTENTIAL IMPACT

FIGURE 332



13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – **13.1.5.3. VULNERABILITY**

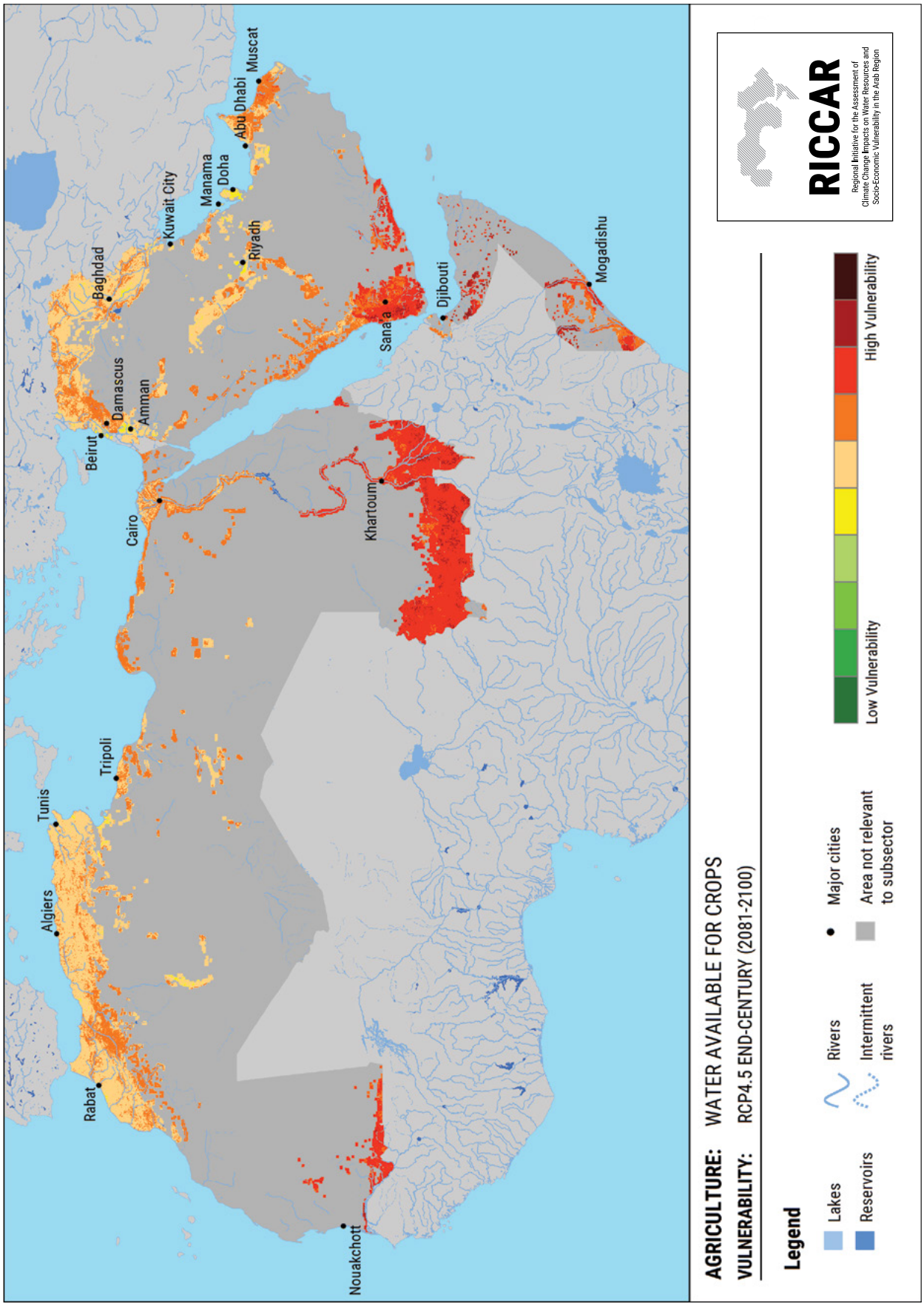
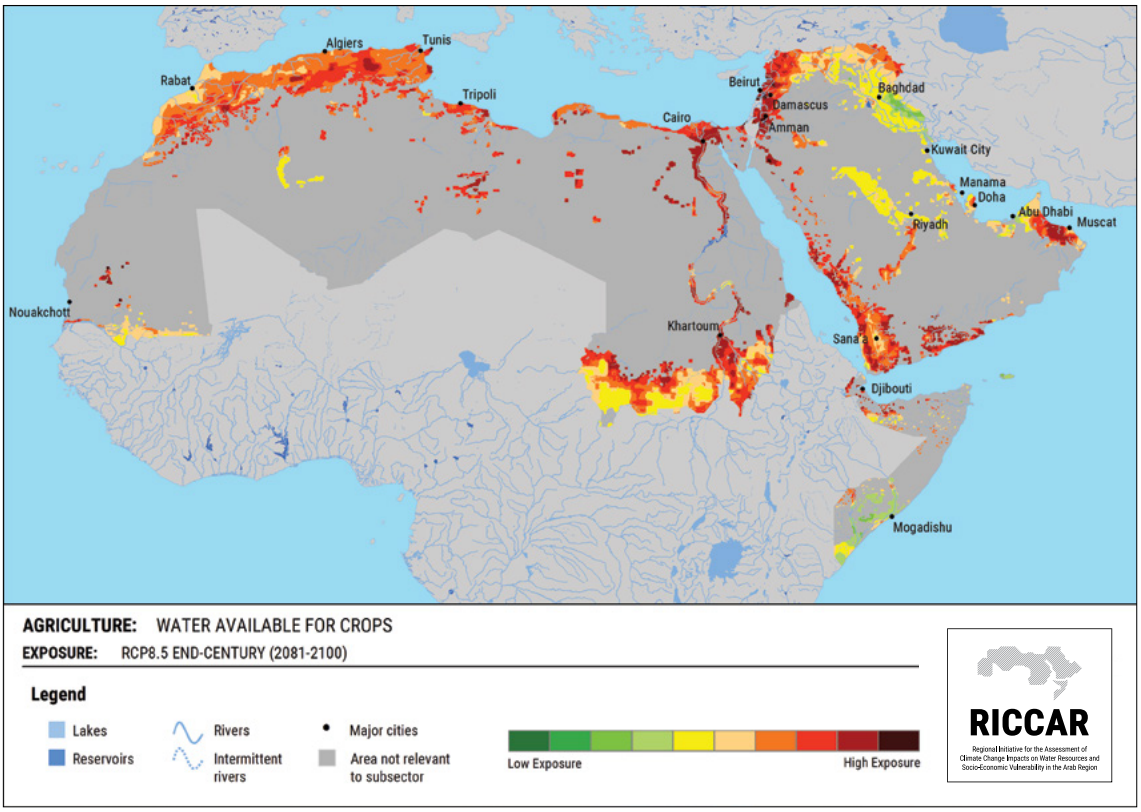



FIGURE 333

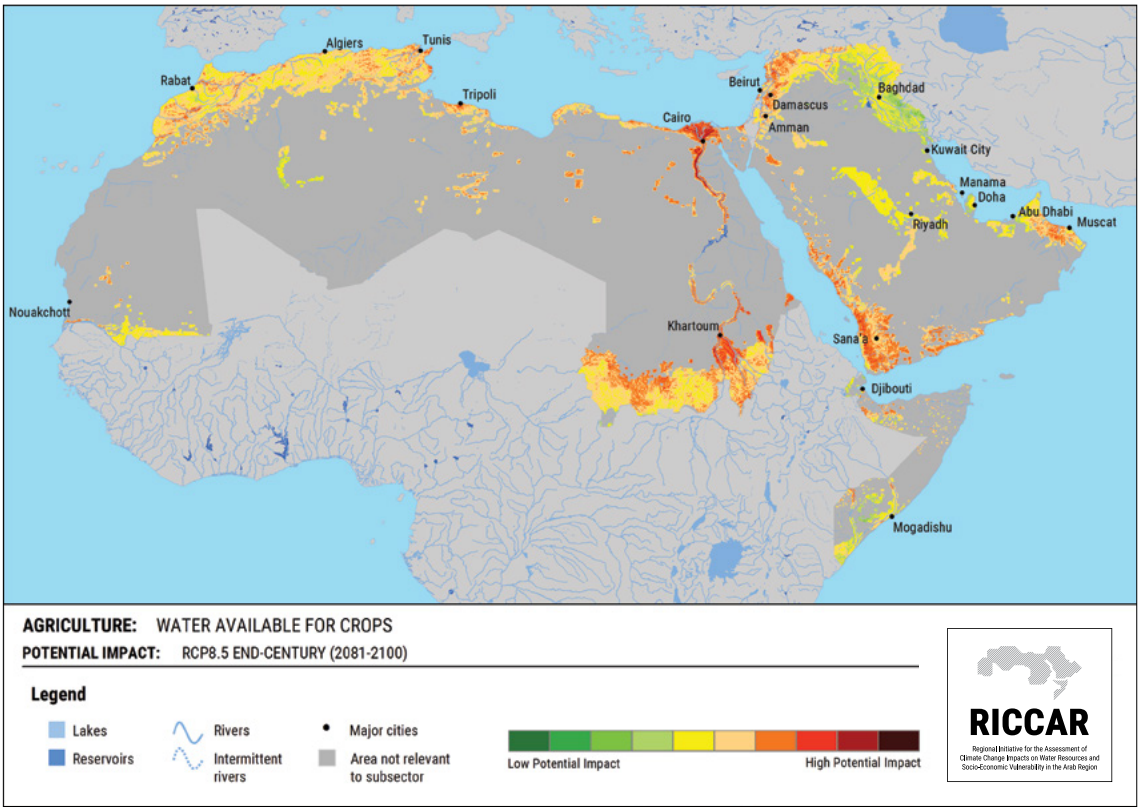
13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – 13.1.6.1. EXPOSURE

FIGURE 334




13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – 13.1.6.2. POTENTIAL IMPACT

FIGURE 335



13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – **13.1.6.3. VULNERABILTY**

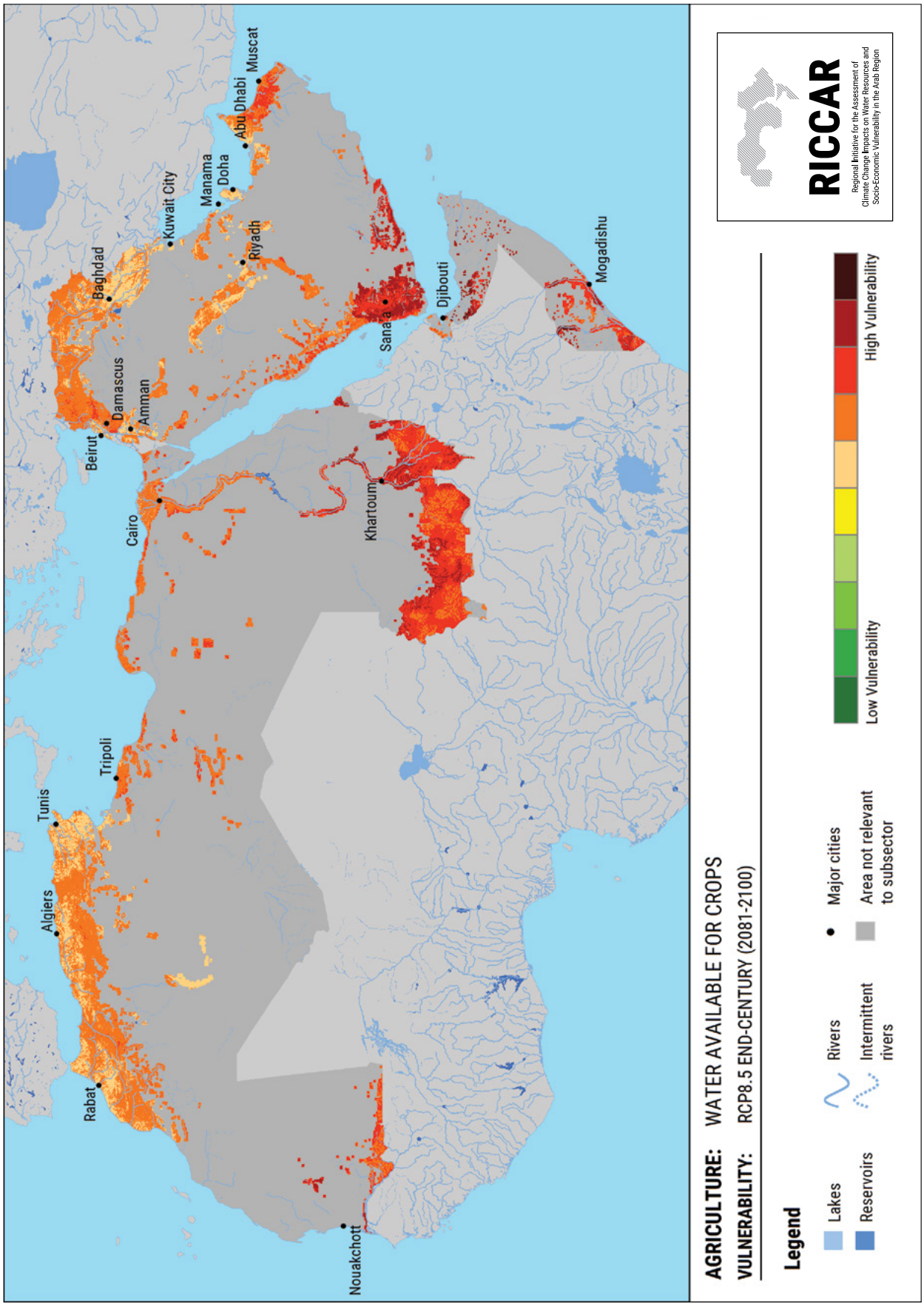
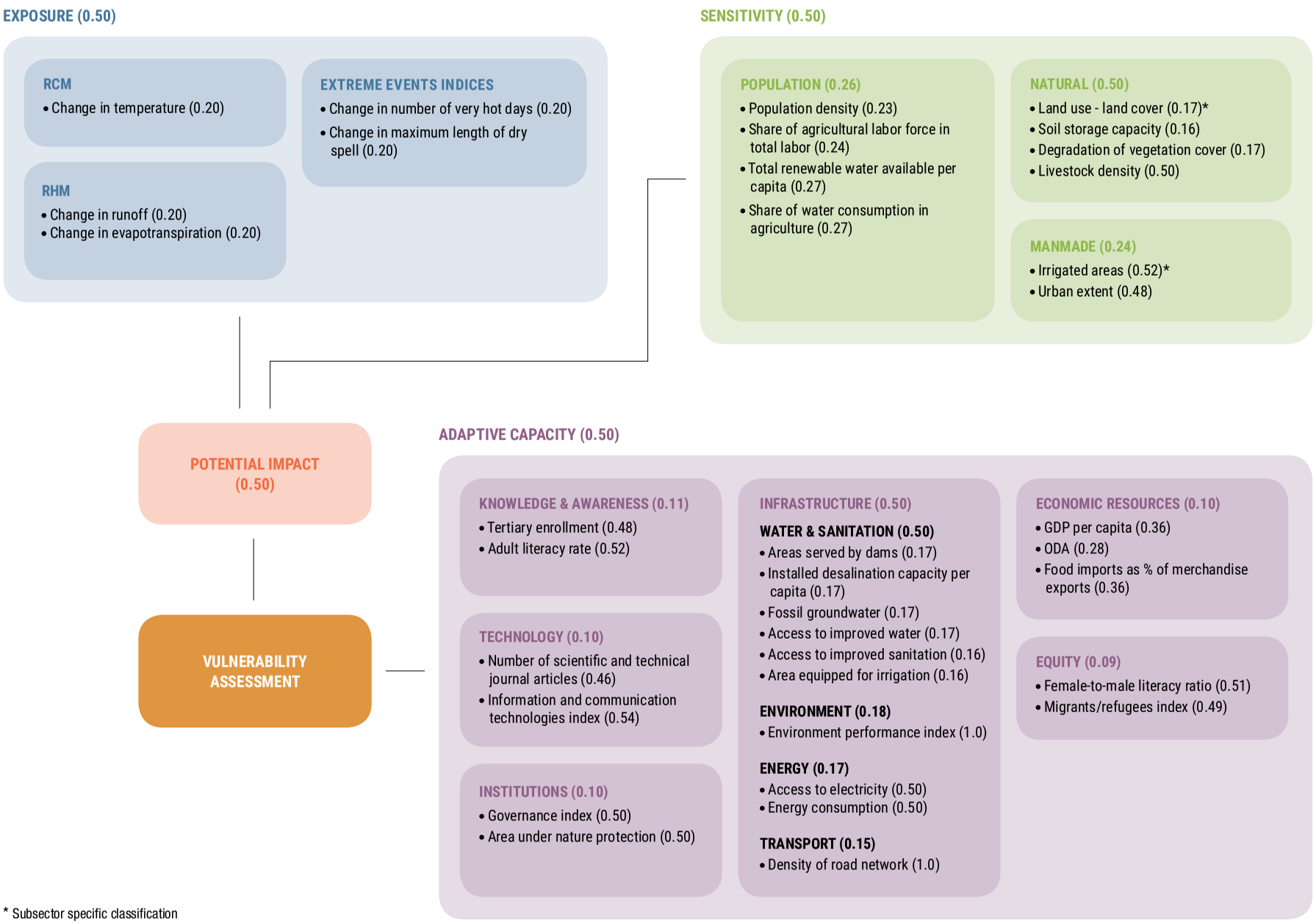



FIGURE 336

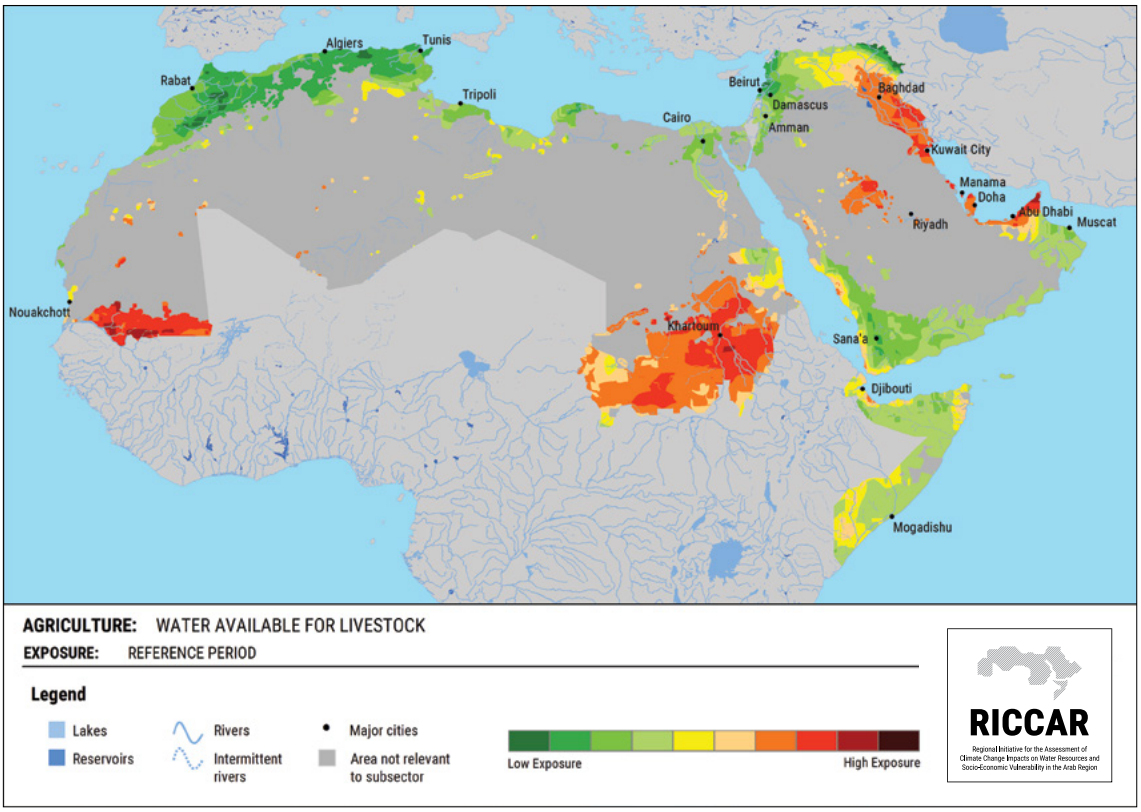
FIGURE 337




* Subsector specific classification

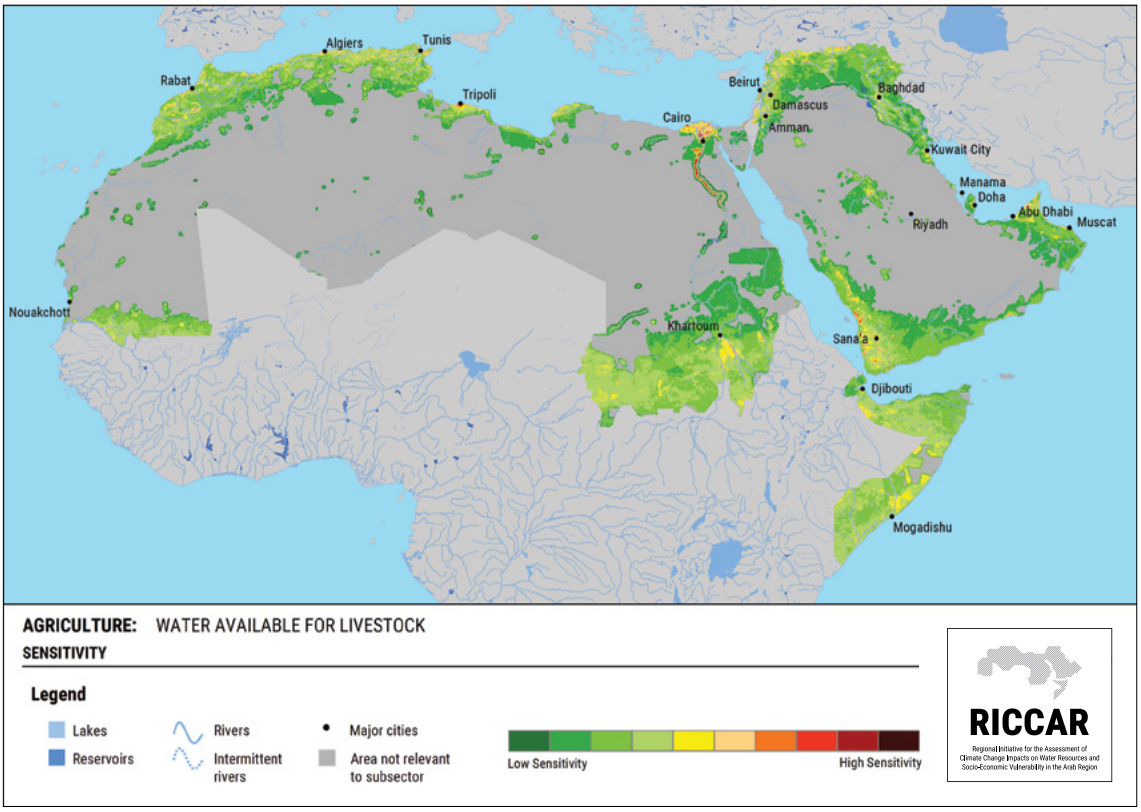
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – **13.2.2.1. EXPOSURE**

**FIGURE 338**



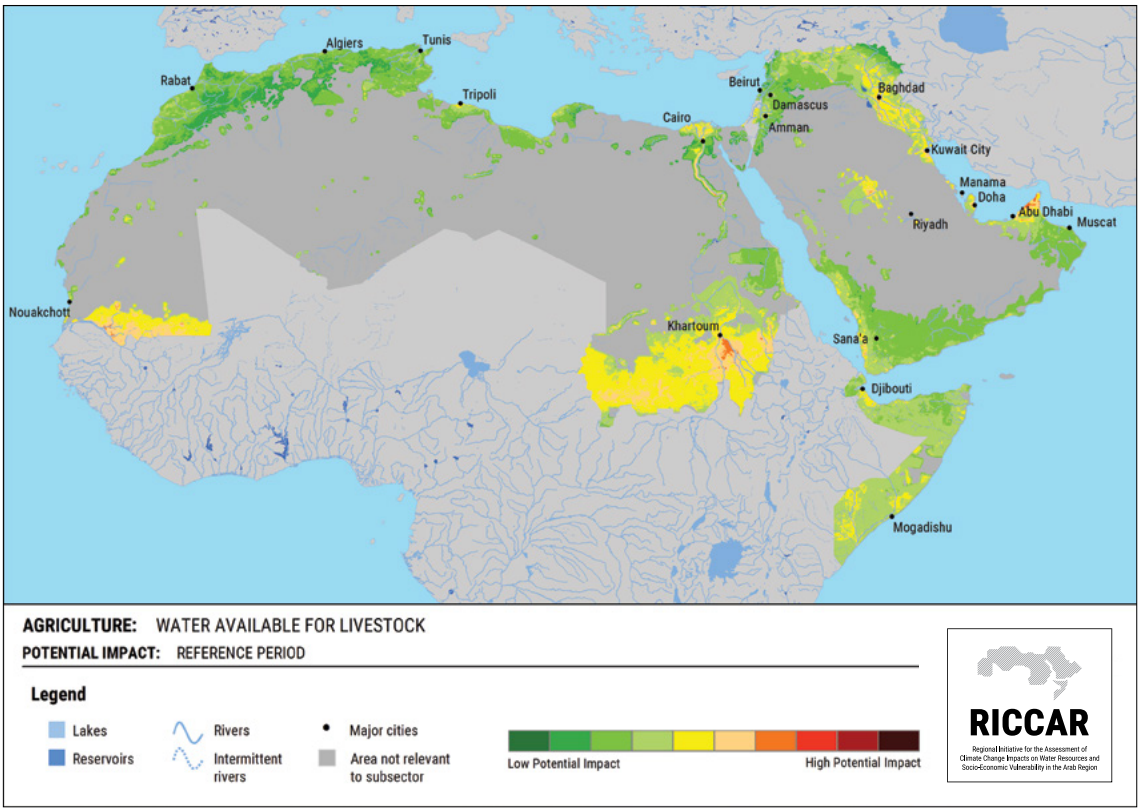

13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – **13.2.2.2. SENSITIVITY**

**FIGURE 339**



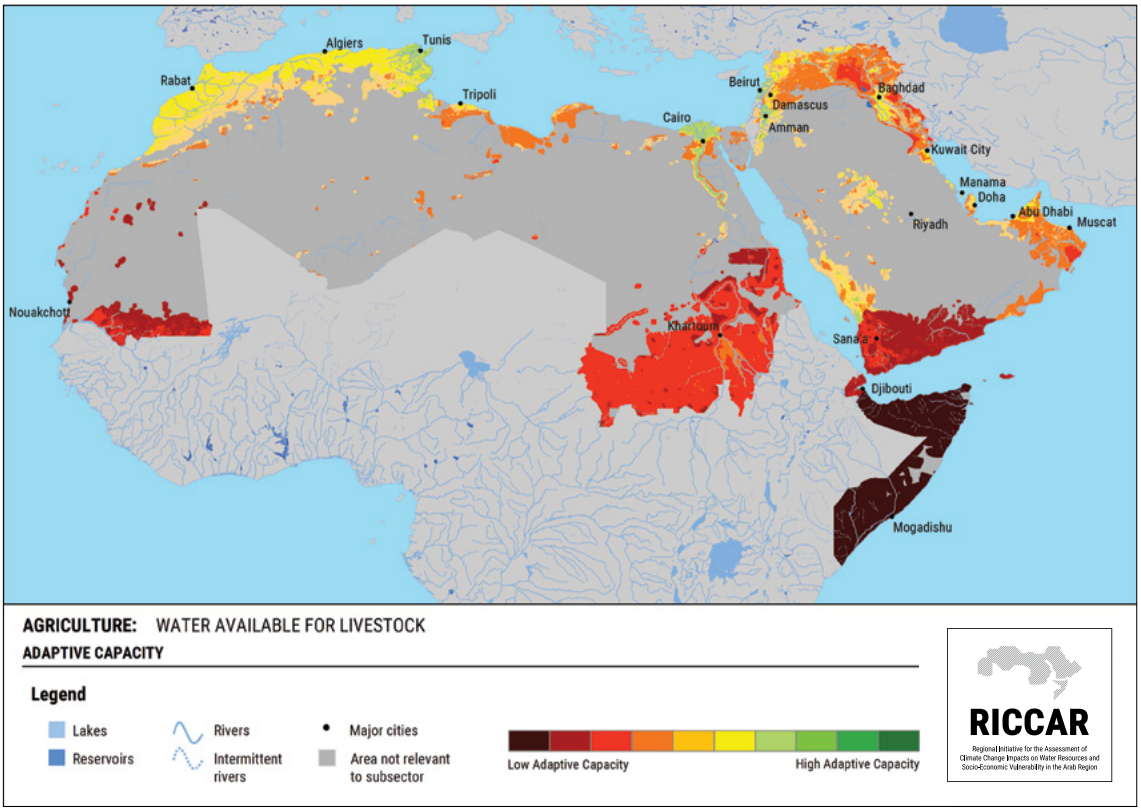
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.3. POTENTIAL IMPACT

FIGURE 340




13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.4. ADAPTIVE CAPACITY

FIGURE 341



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – **13.2.2.5. VULNERABILTY**

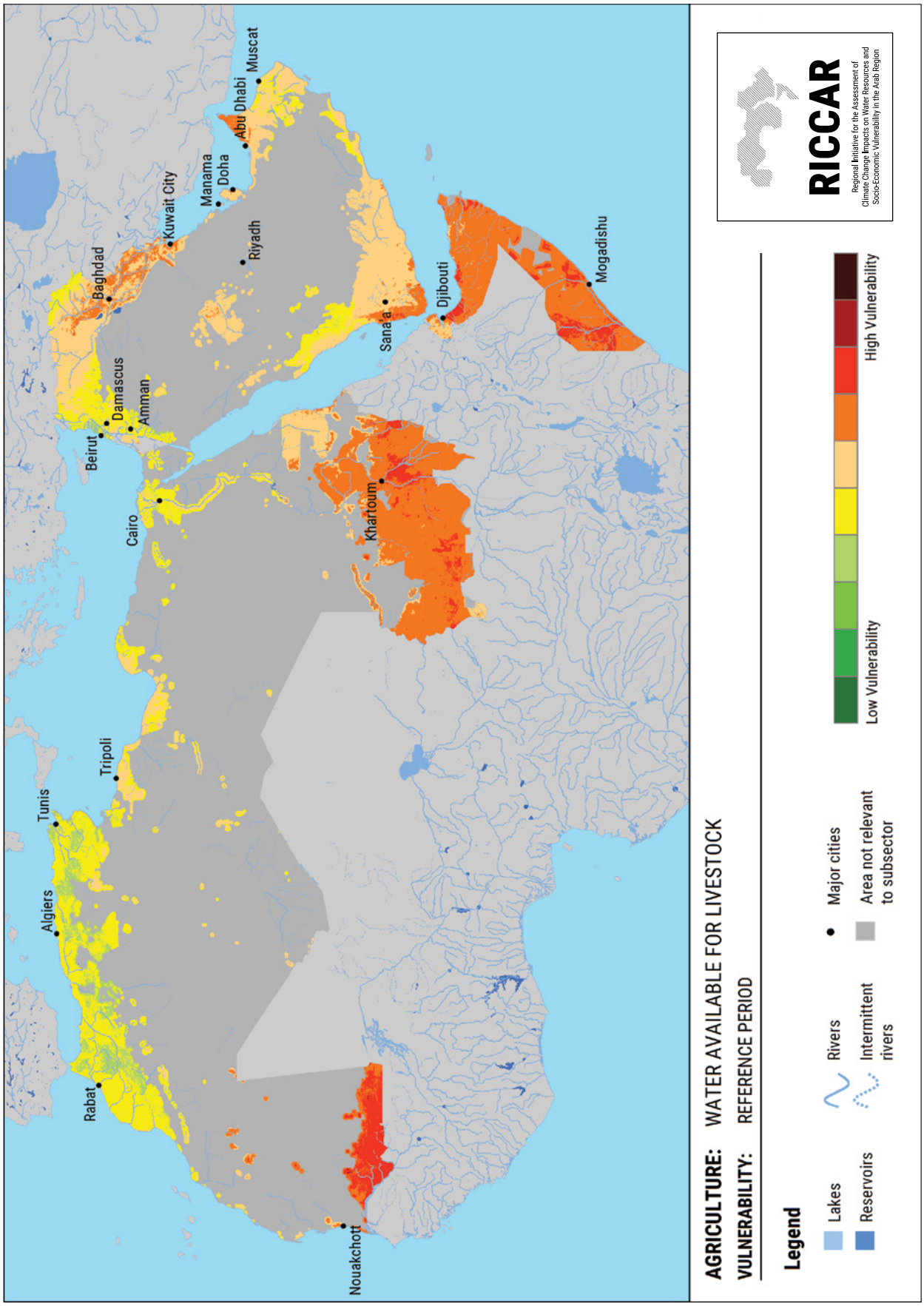
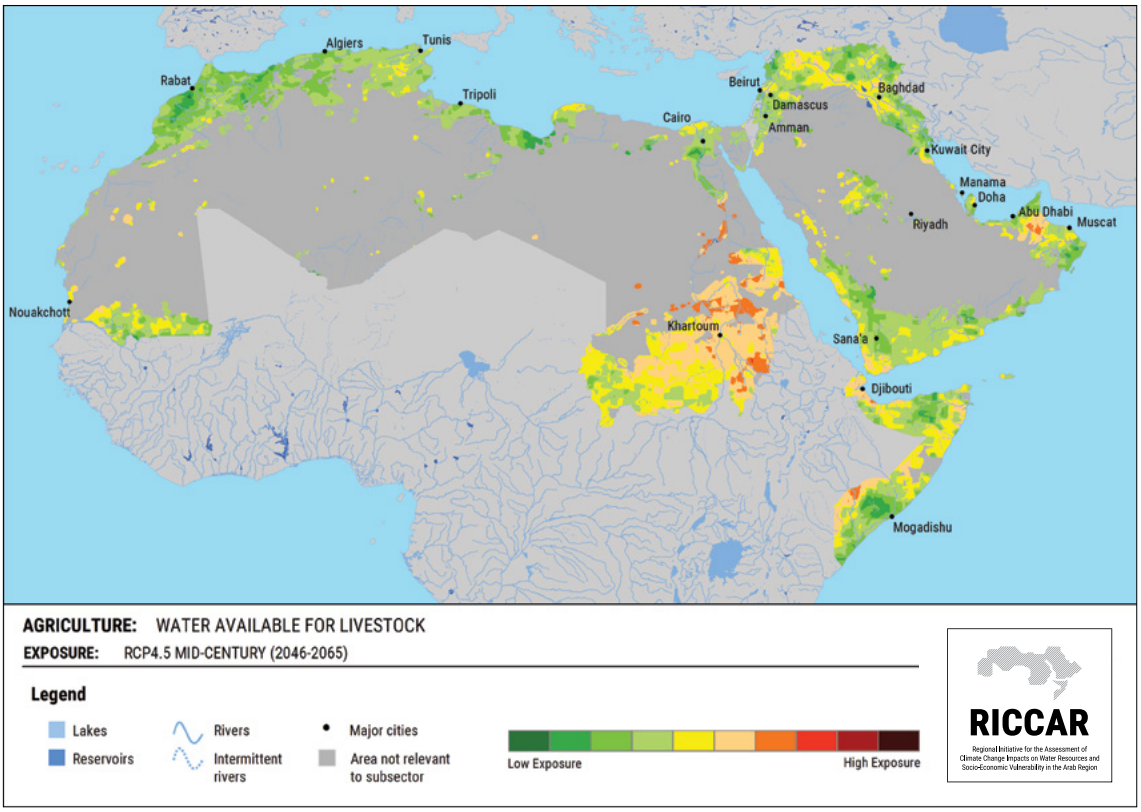



FIGURE 342

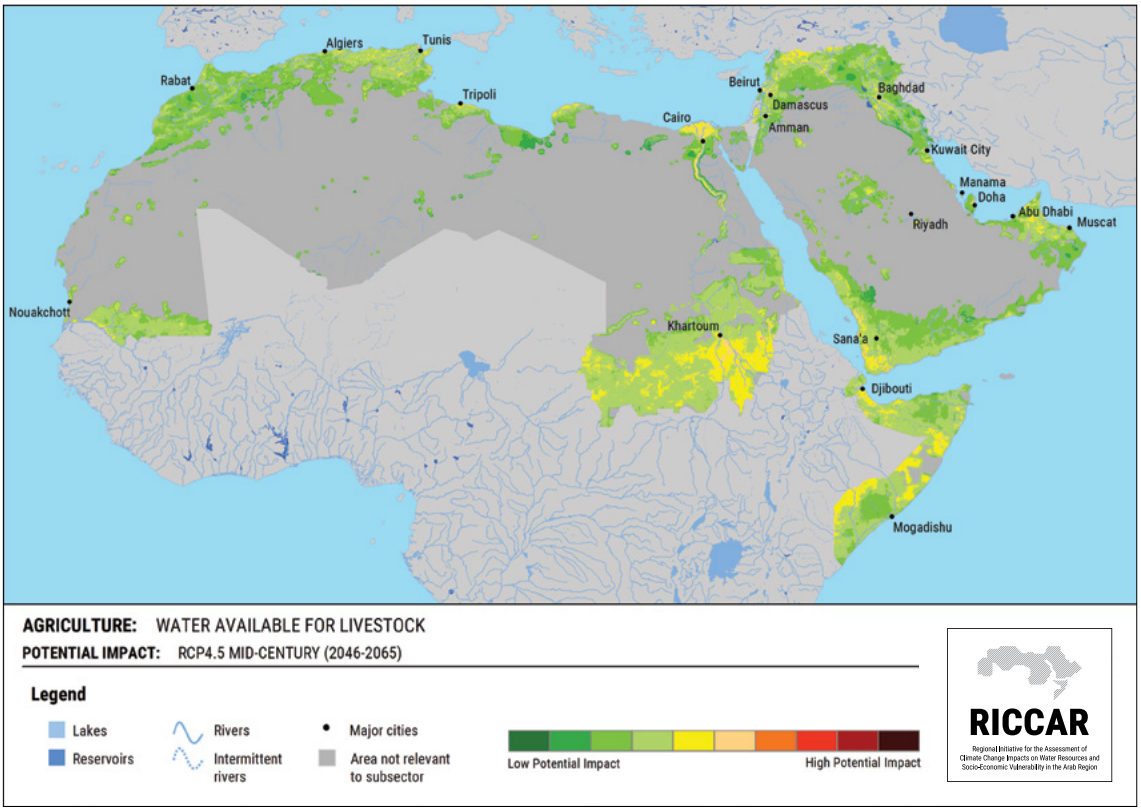
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – 13.2.3.1. EXPOSURE

FIGURE 343




13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – 13.2.3.2. POTENTIAL IMPACT

FIGURE 344



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – **13.2.3.3. VULNERABILITY**

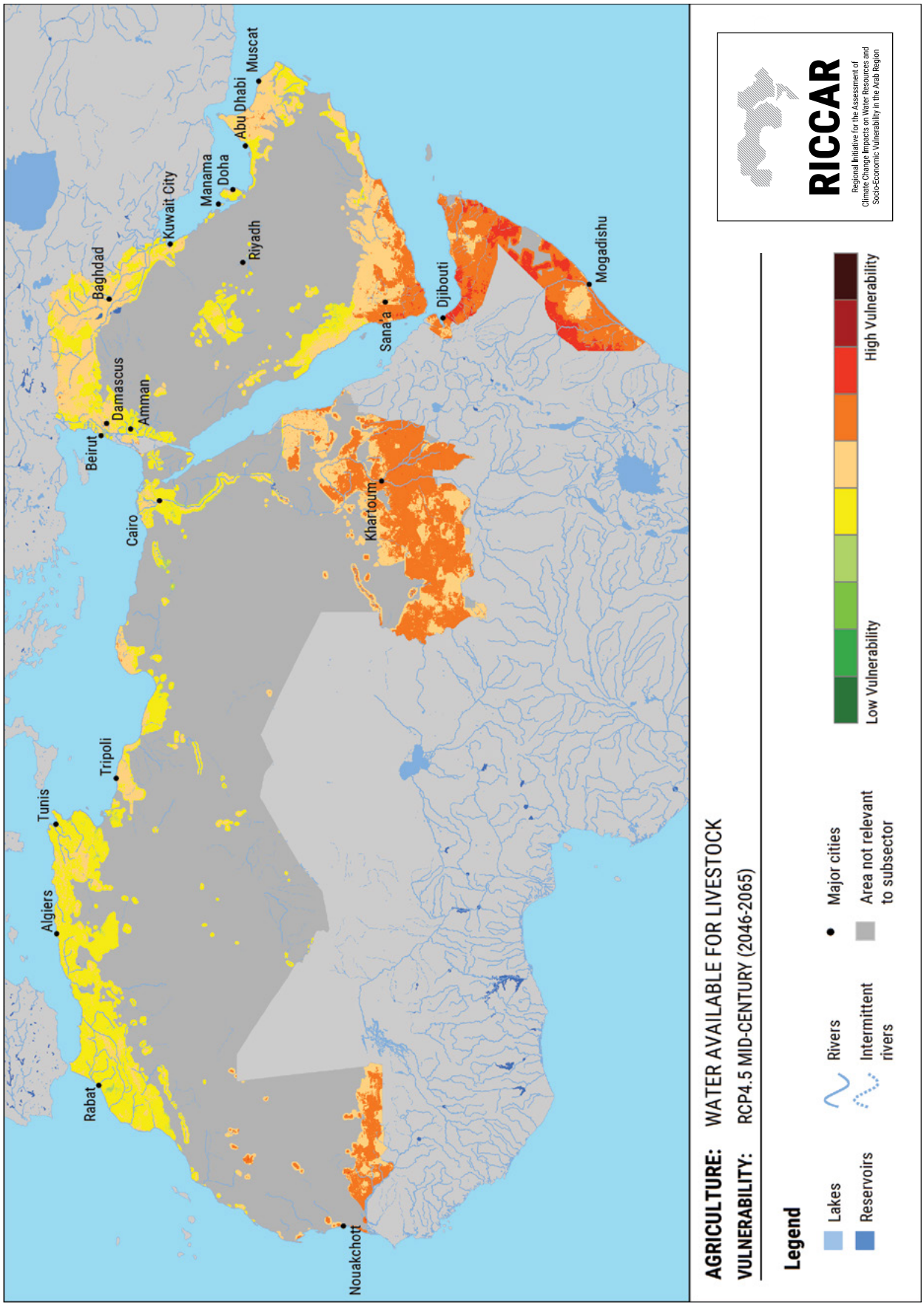
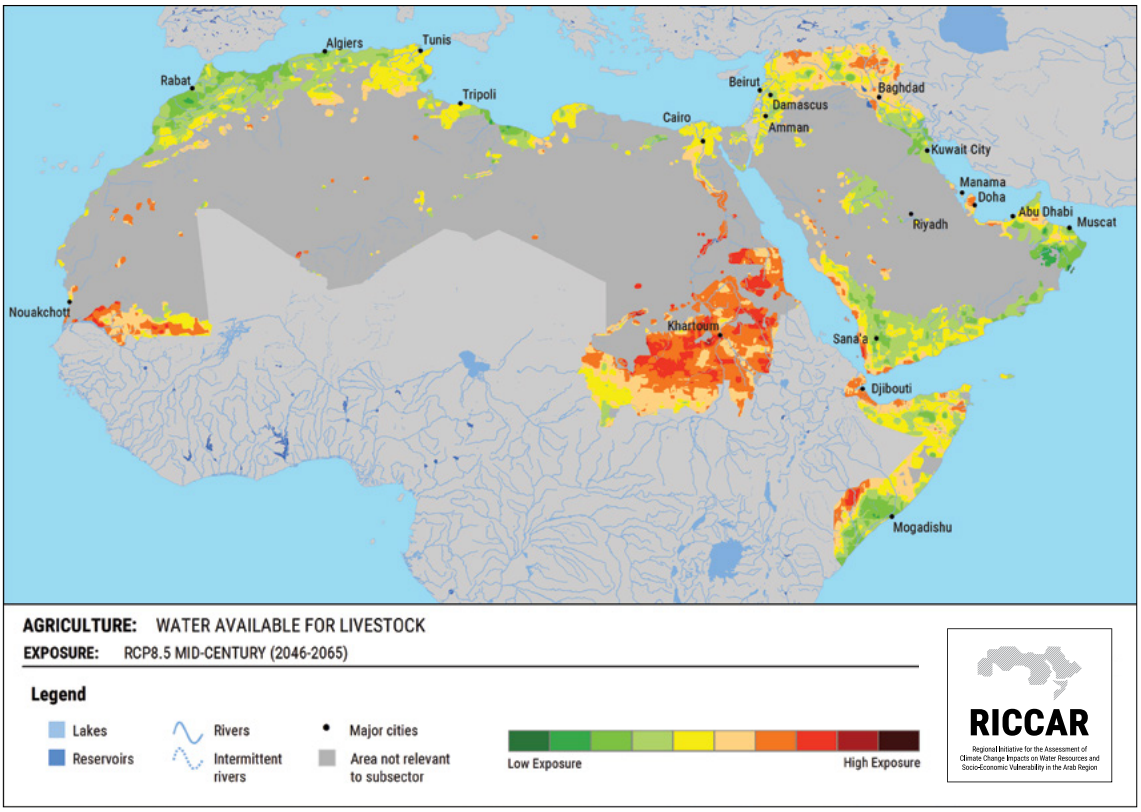



FIGURE 345

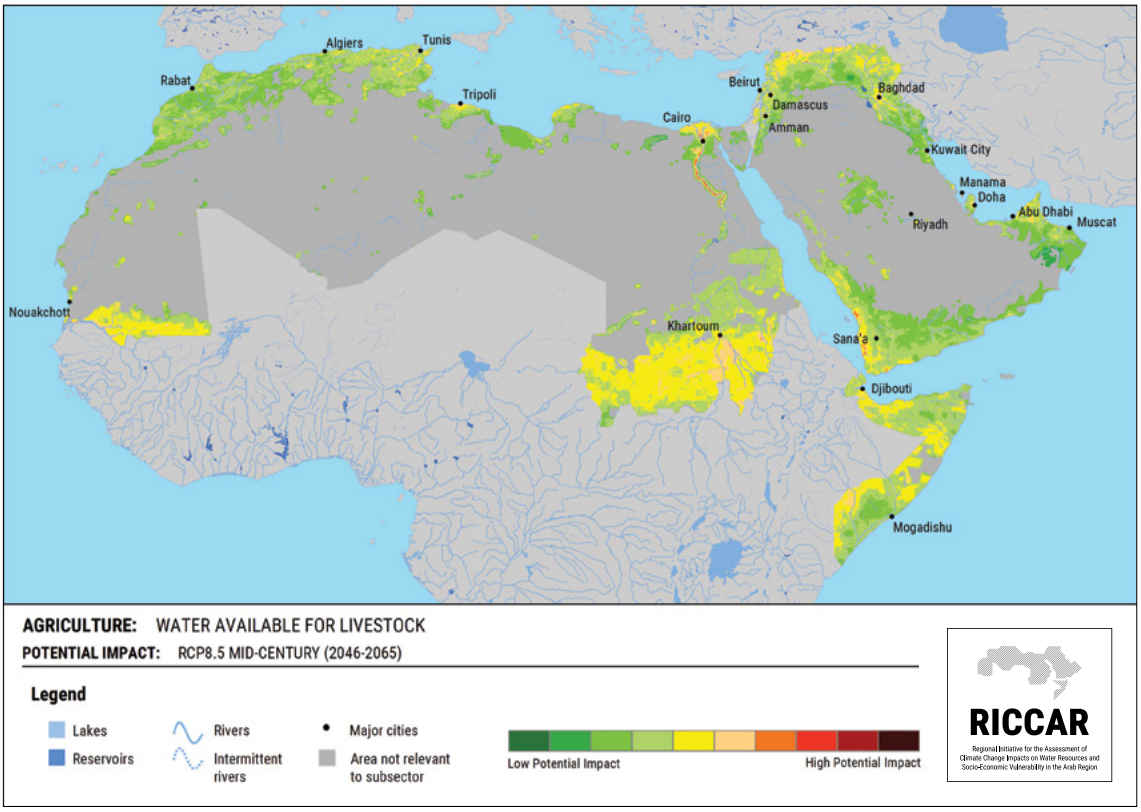
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – 13.2.4.1. EXPOSURE

FIGURE 346




13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – 13.2.4.2. POTENTIAL IMPACT

FIGURE 347



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – **13.2.4.3. VULNERABILTY**

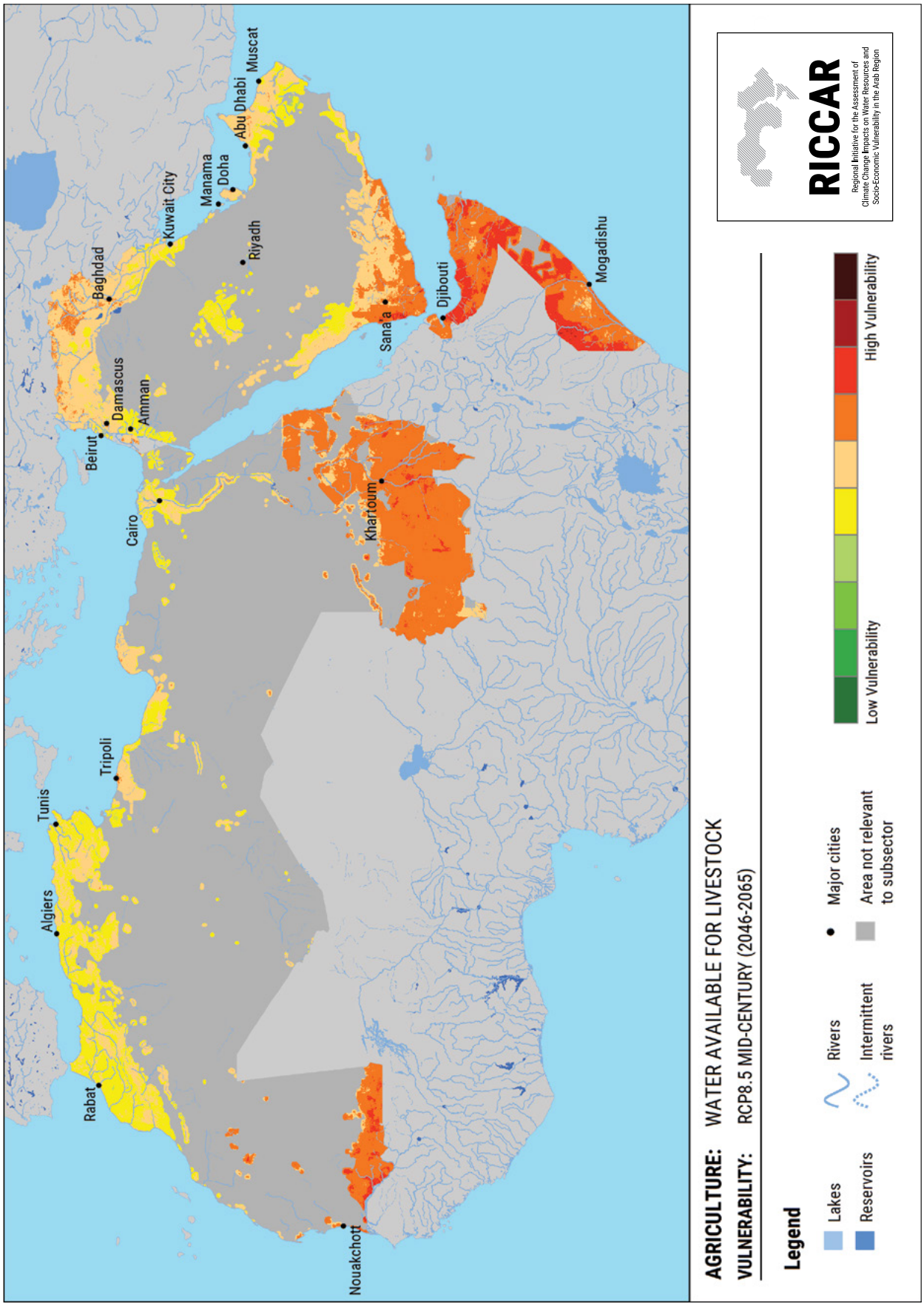
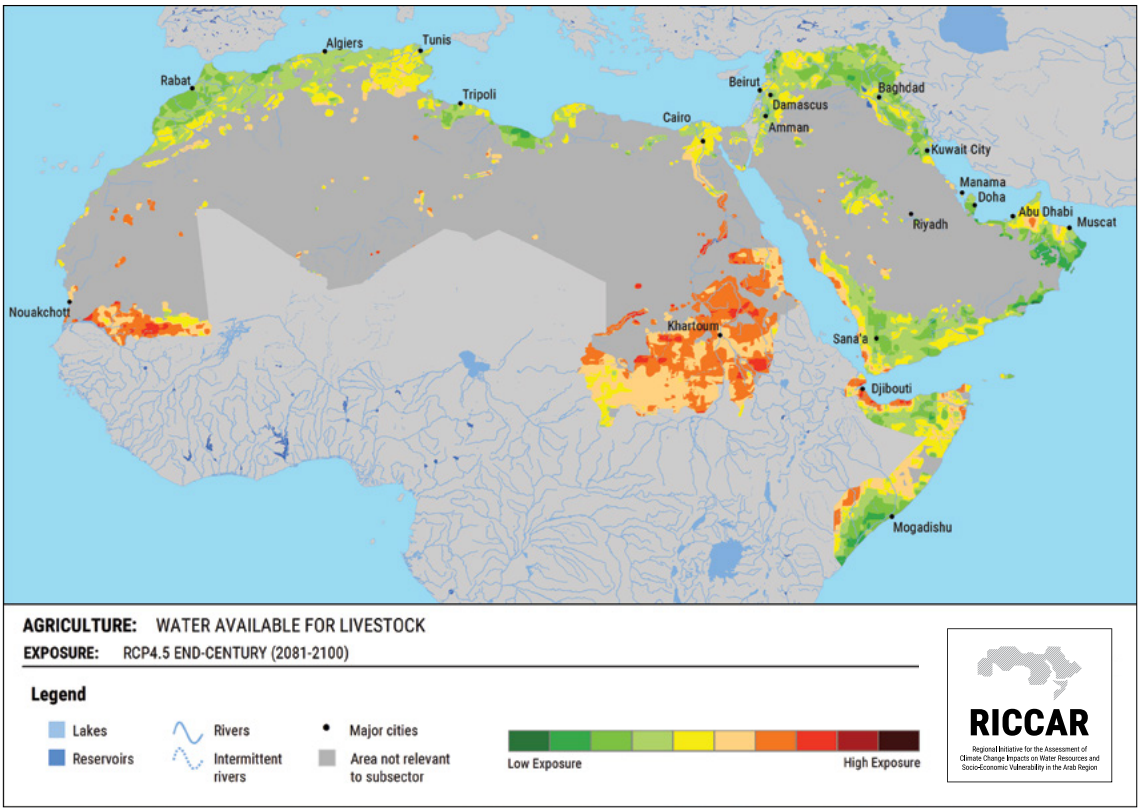



FIGURE 348

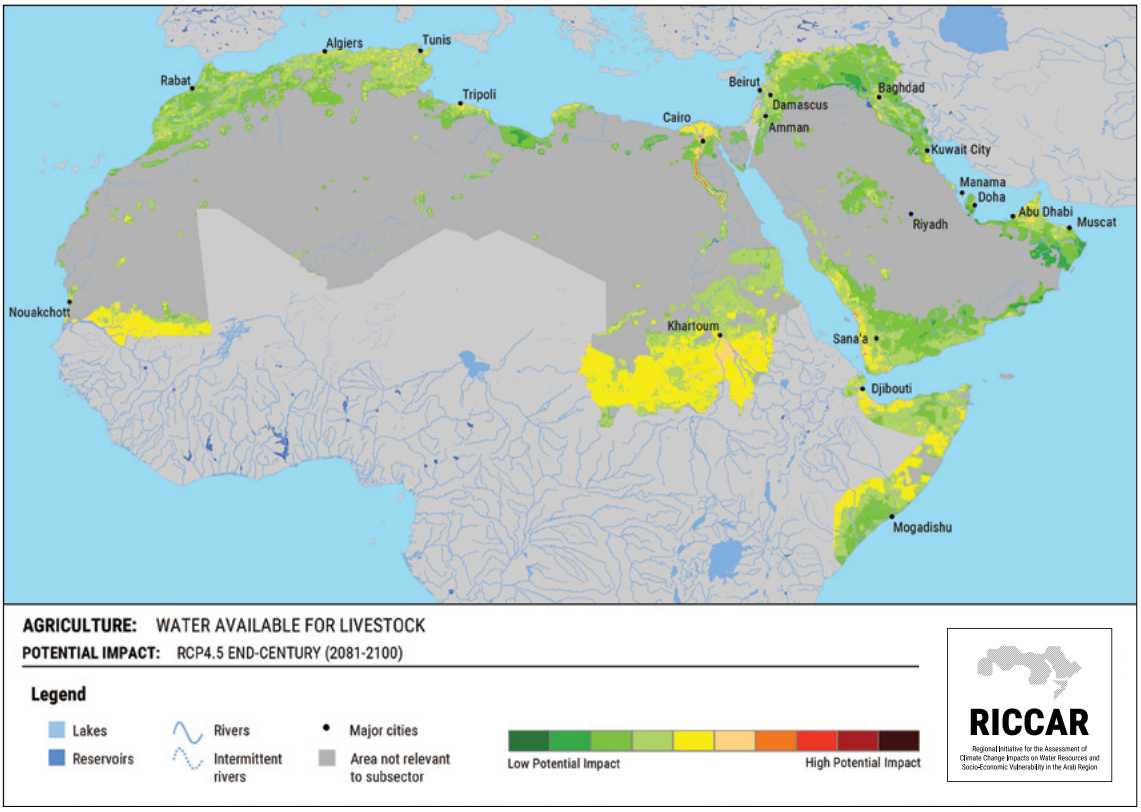
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – 13.2.5.1. EXPOSURE

FIGURE 349




13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – 13.2.5.2. POTENTIAL IMPACT

FIGURE 350



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – **13.2.5.3. VULNERABILITY**

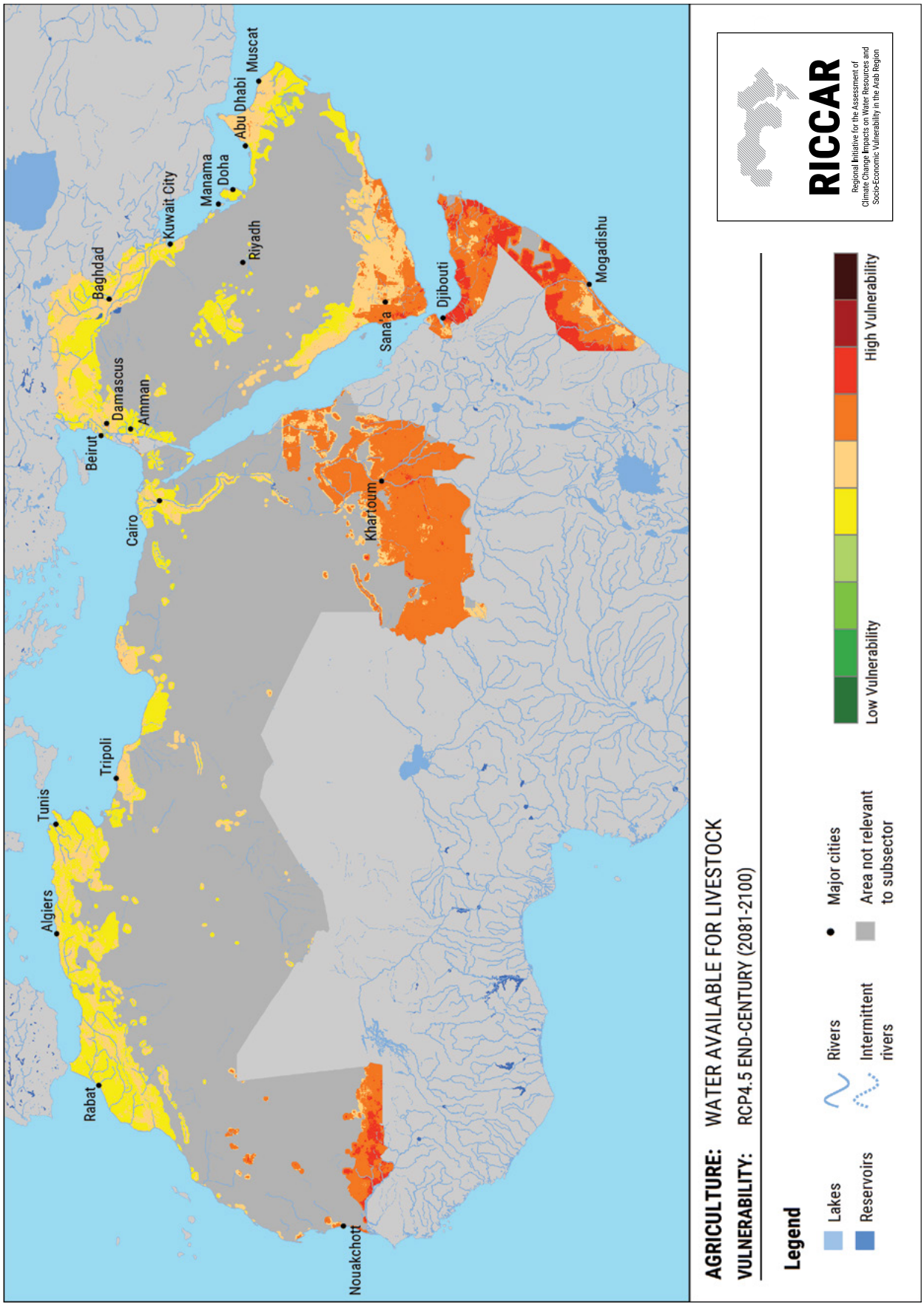
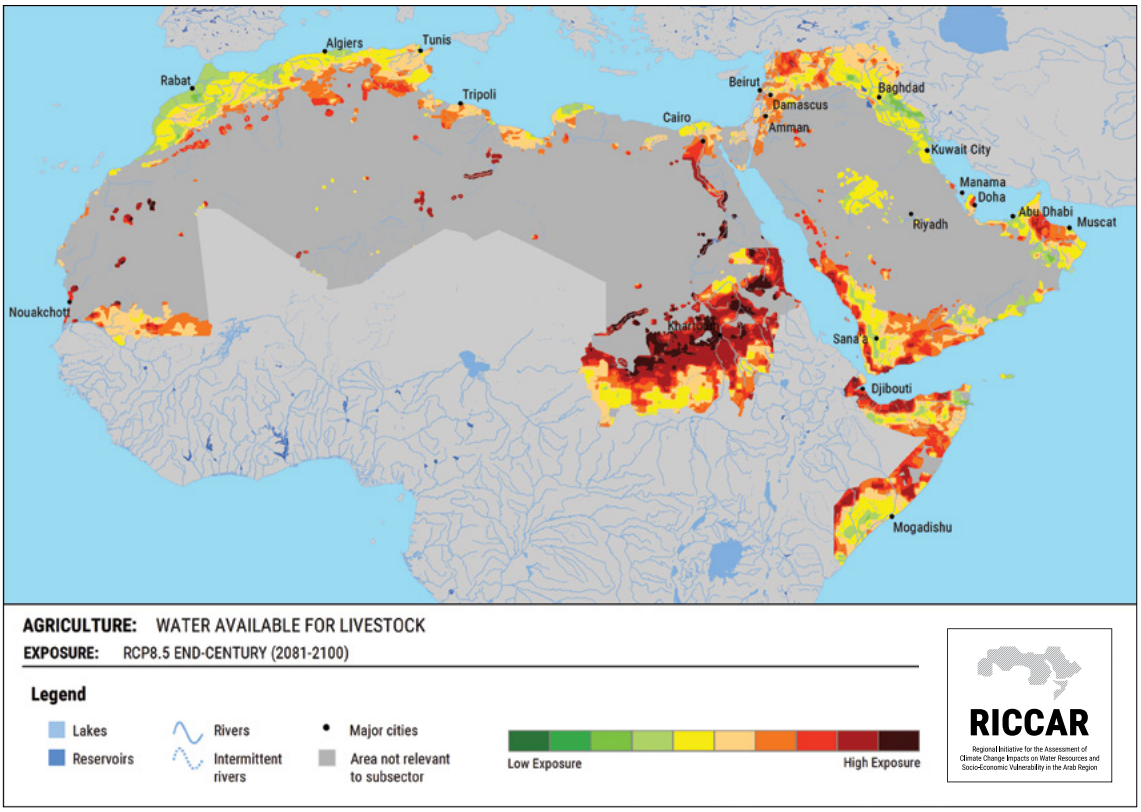



FIGURE 351

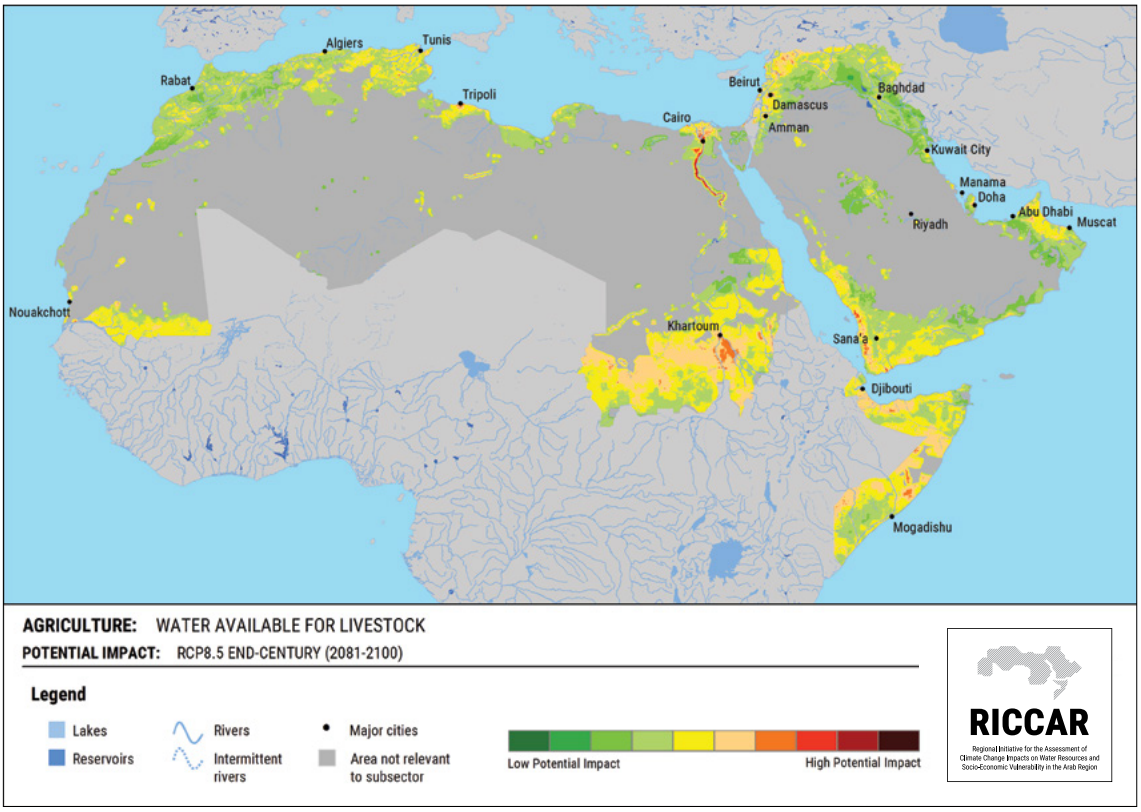
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.6. END-CENTURY RCP 8.5 – 13.2.6.1. EXPOSURE

FIGURE 352




13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.6. END-CENTURY RCP 8.5 – 13.2.6.2. POTENTIAL IMPACT

FIGURE 353



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.6. END-CENTURY RCP 8.5 – **13.2.6.3. VULNERABILITY**

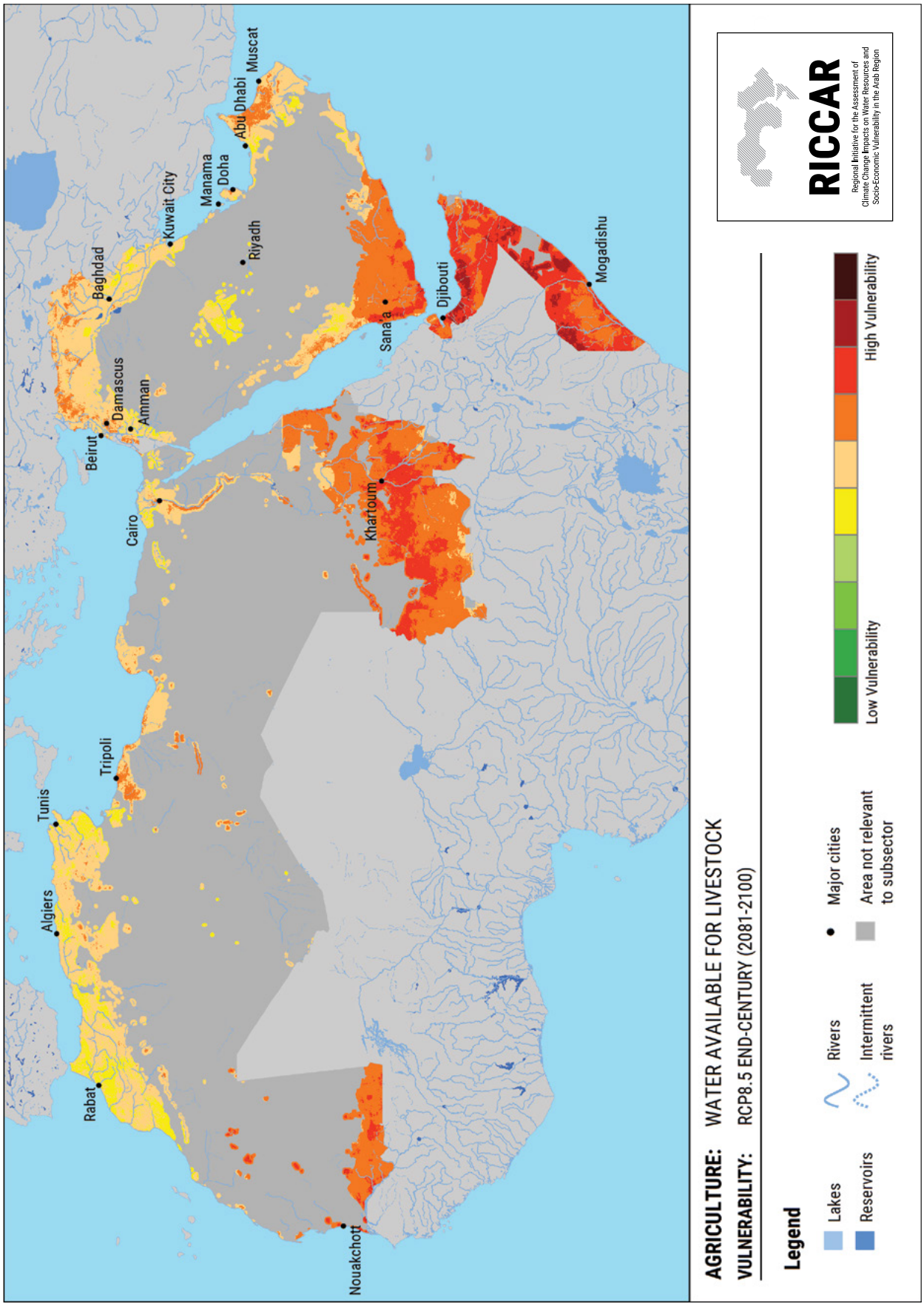



FIGURE 354

13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.1. REFERENCE PERIOD

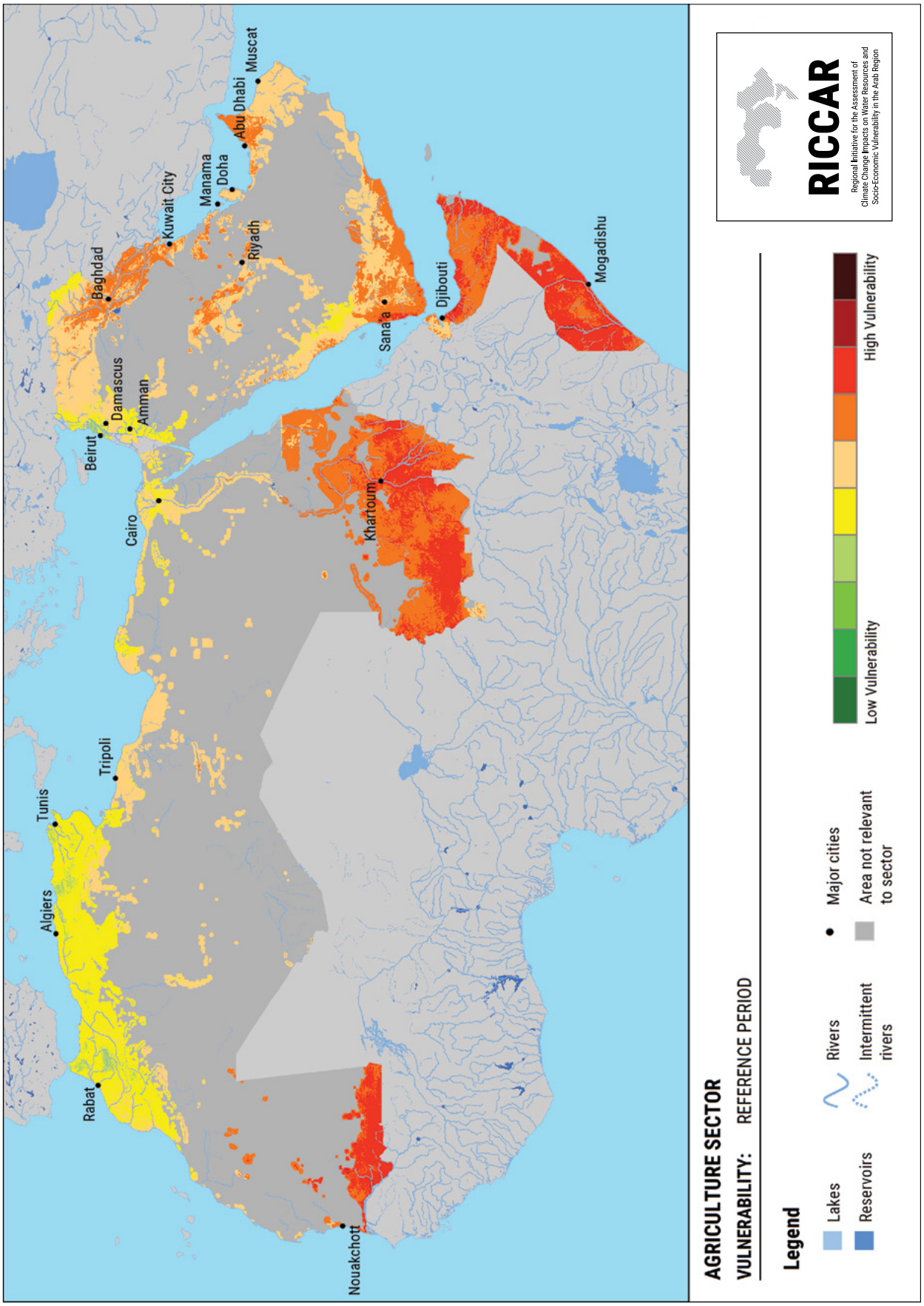



FIGURE 355

13.3. AGRICULTURE SECTOR: VULNERABILITY – **13.3.2. MID-CENTURY RCP 4.5**

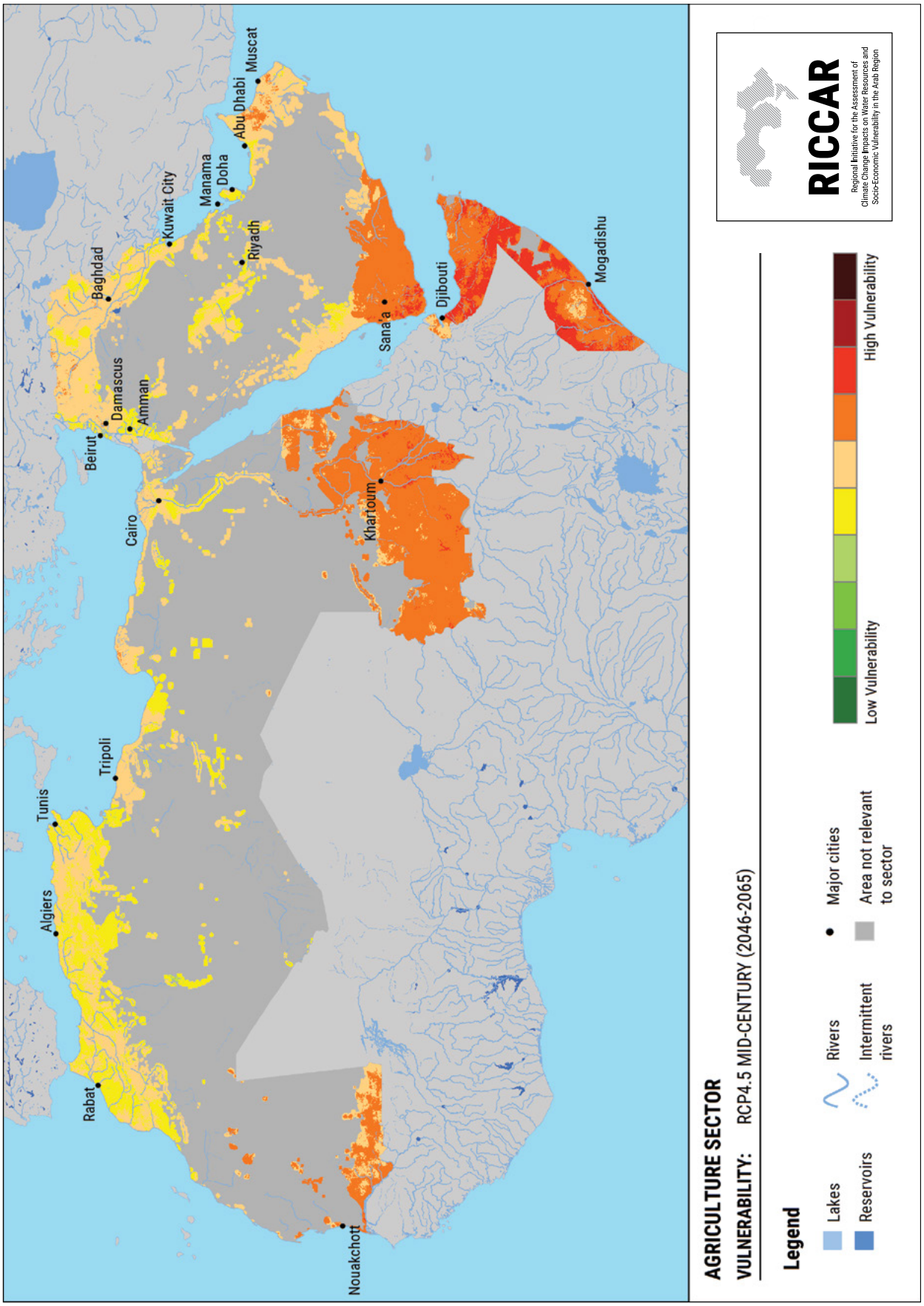



FIGURE 356

13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.3. MID-CENTURY RCP 8.5

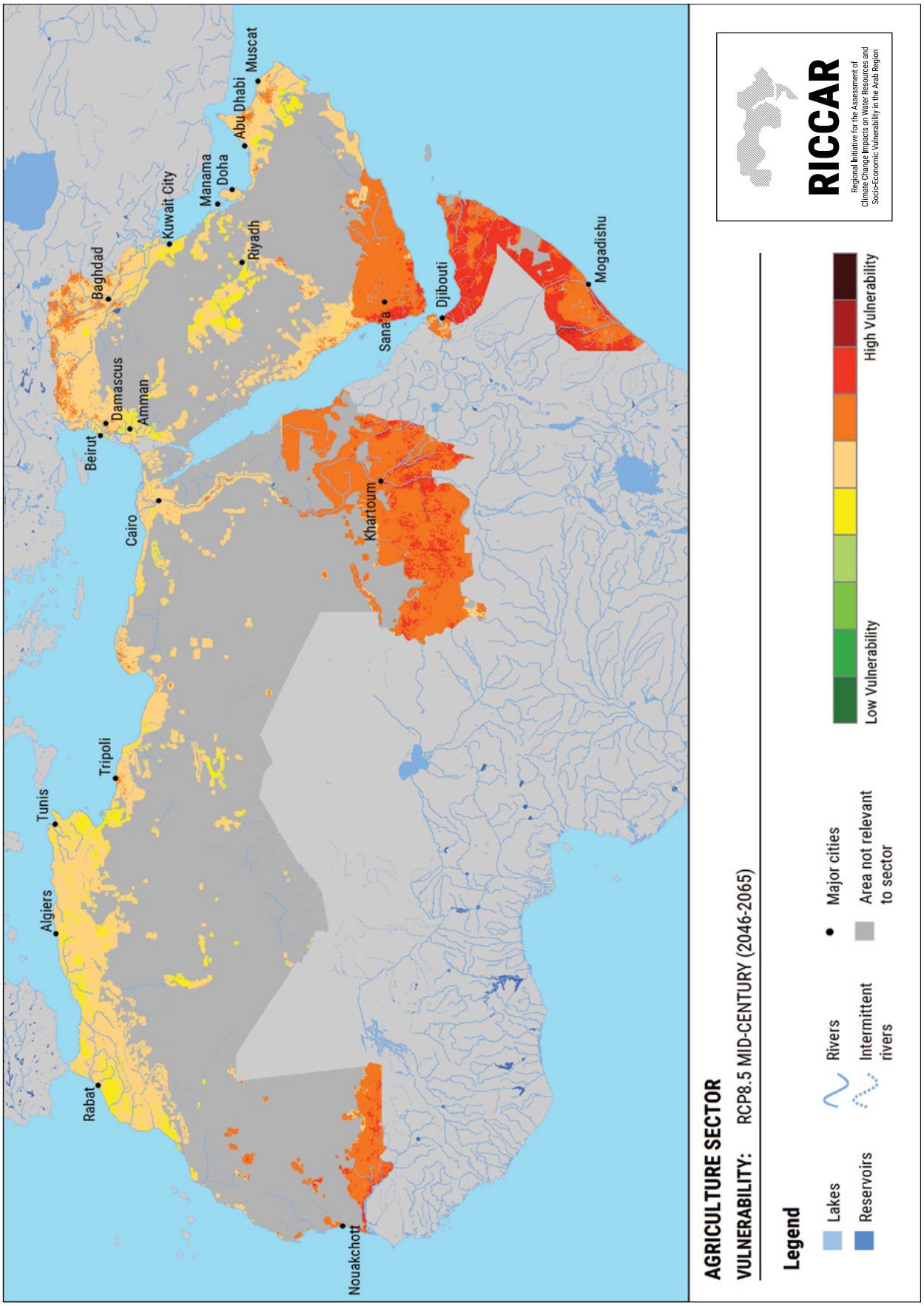



FIGURE 357

13.3. AGRICULTURE SECTOR: VULNERABILITY – **13.3.4. END-CENTURY RCP 4.5**

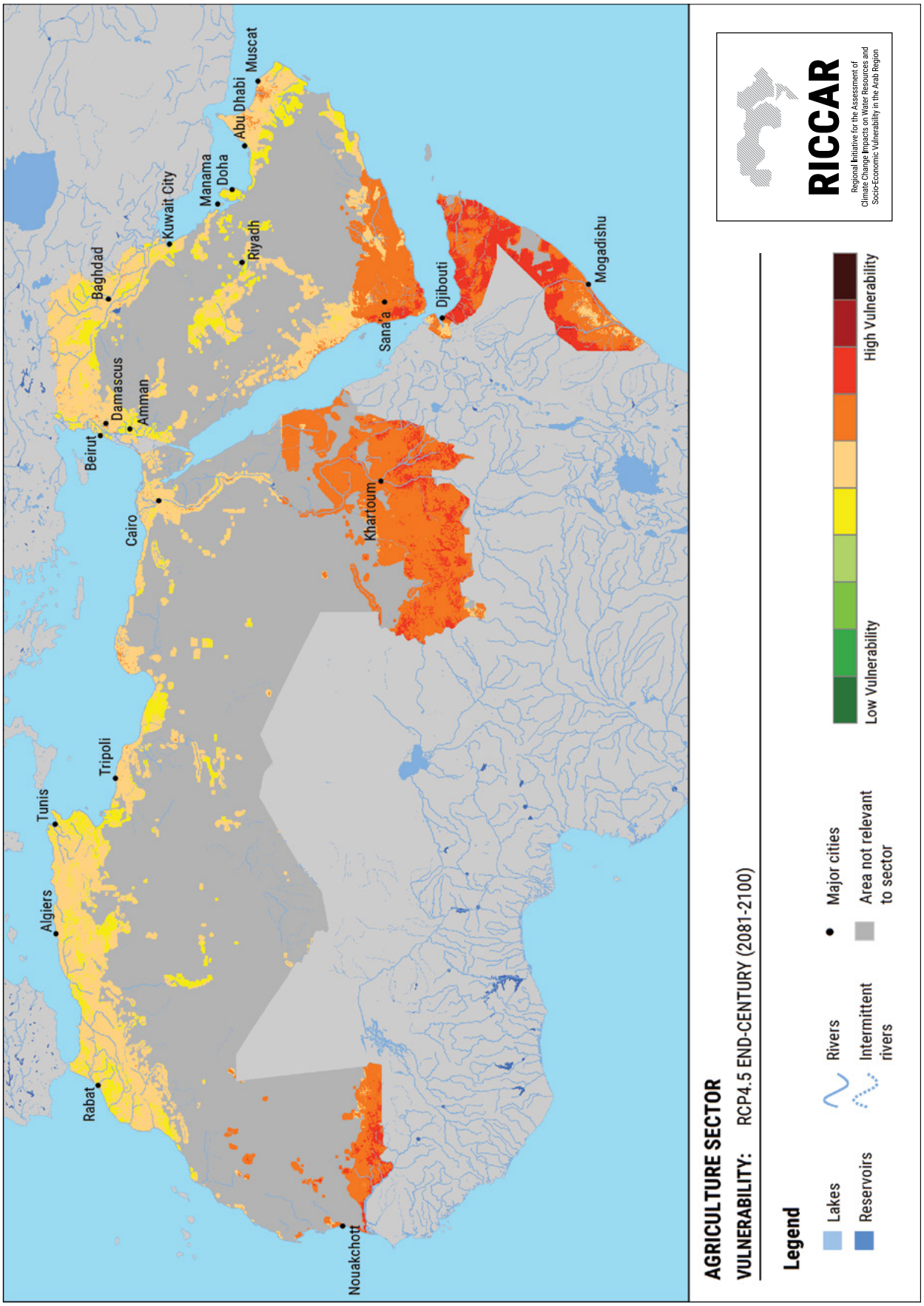



FIGURE 358

13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.5. END-CENTURY RCP 8.5

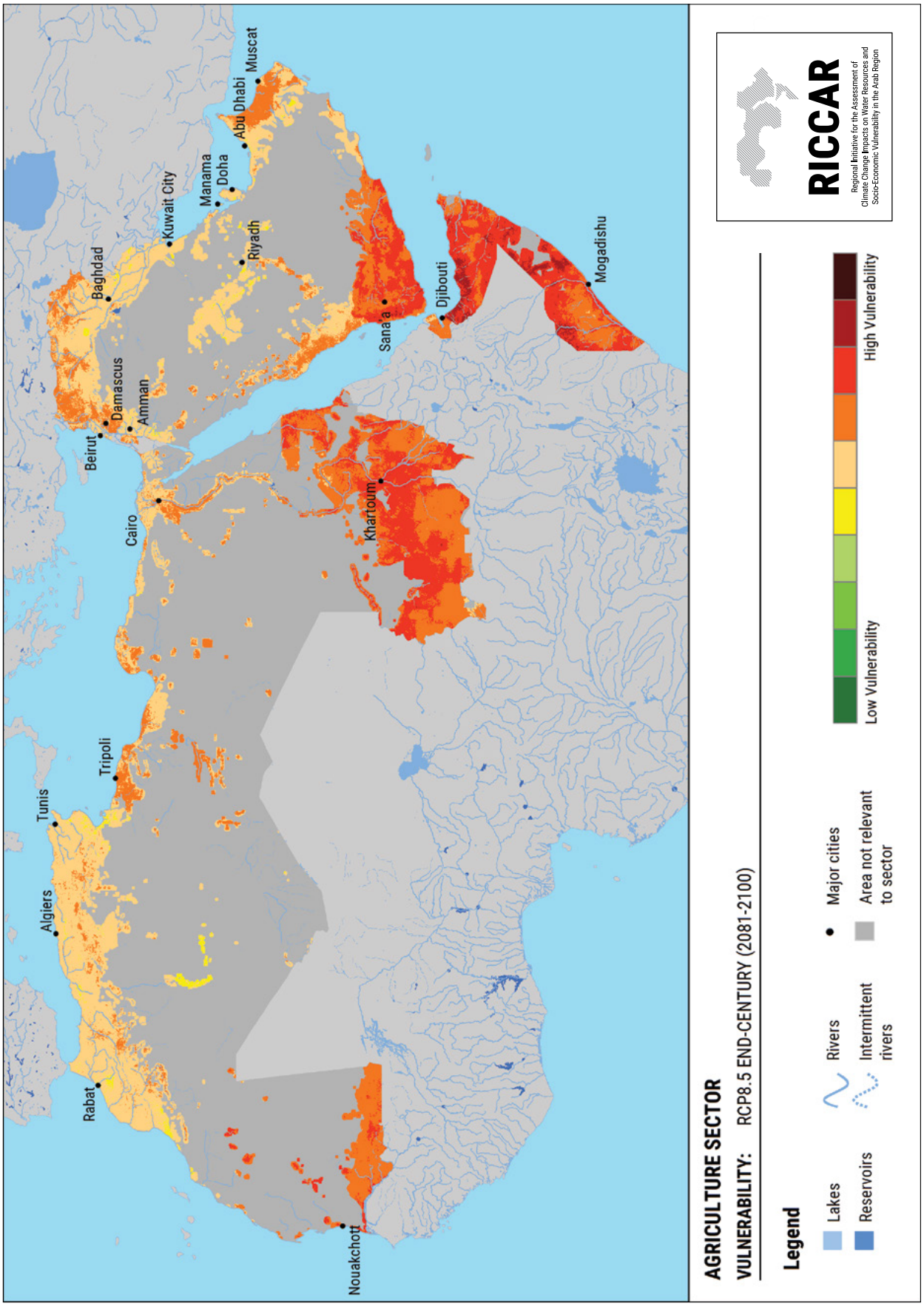



FIGURE 359

# CHAPTER 14

## INFRASTRUCTURE AND HUMAN SETTLEMENTS SECTOR

14.1. INLAND FLOODING AREA – 14.1.1. IMPACT CHAIN

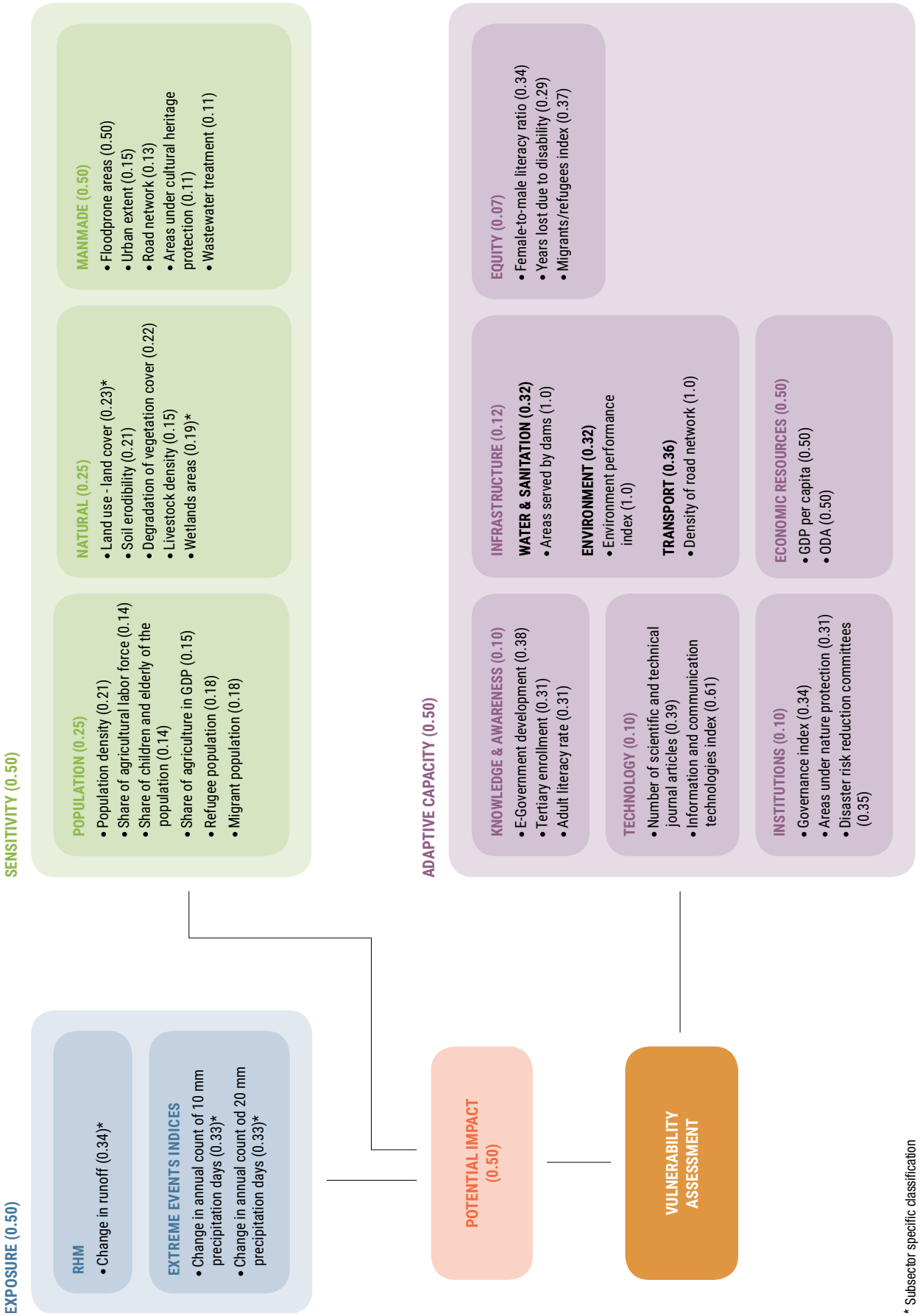
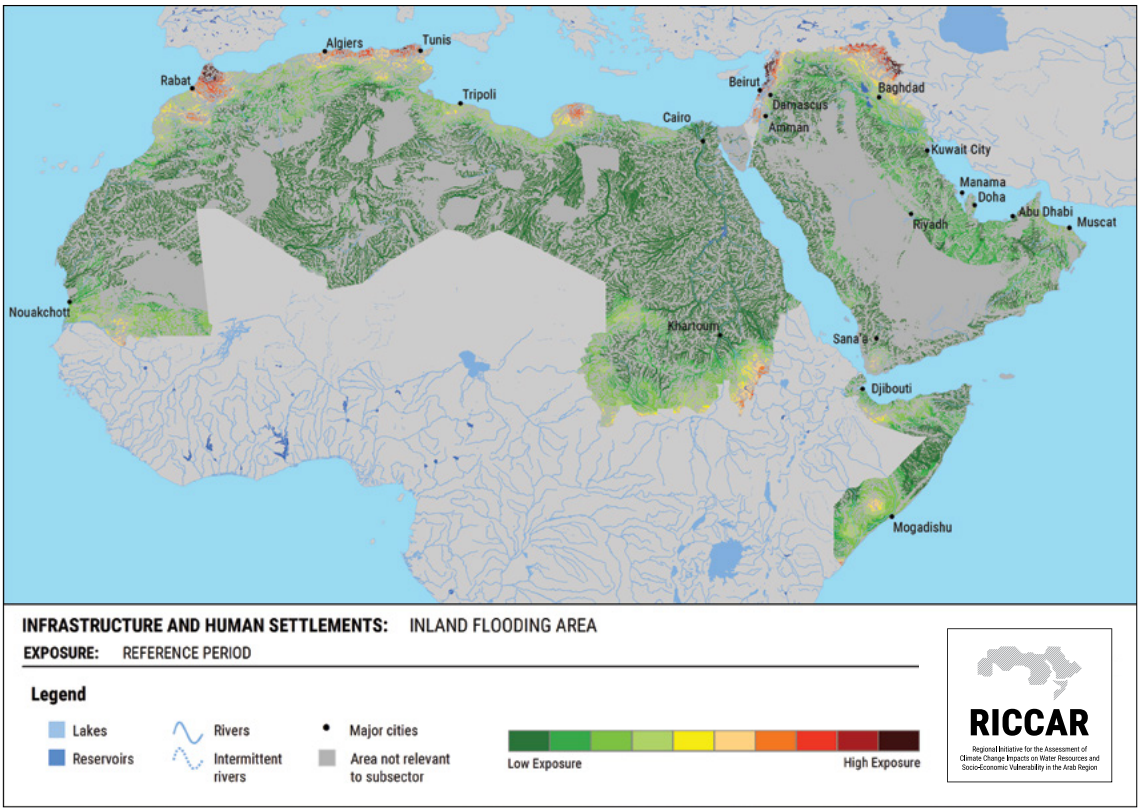



FIGURE 360

* Subsector specific classification

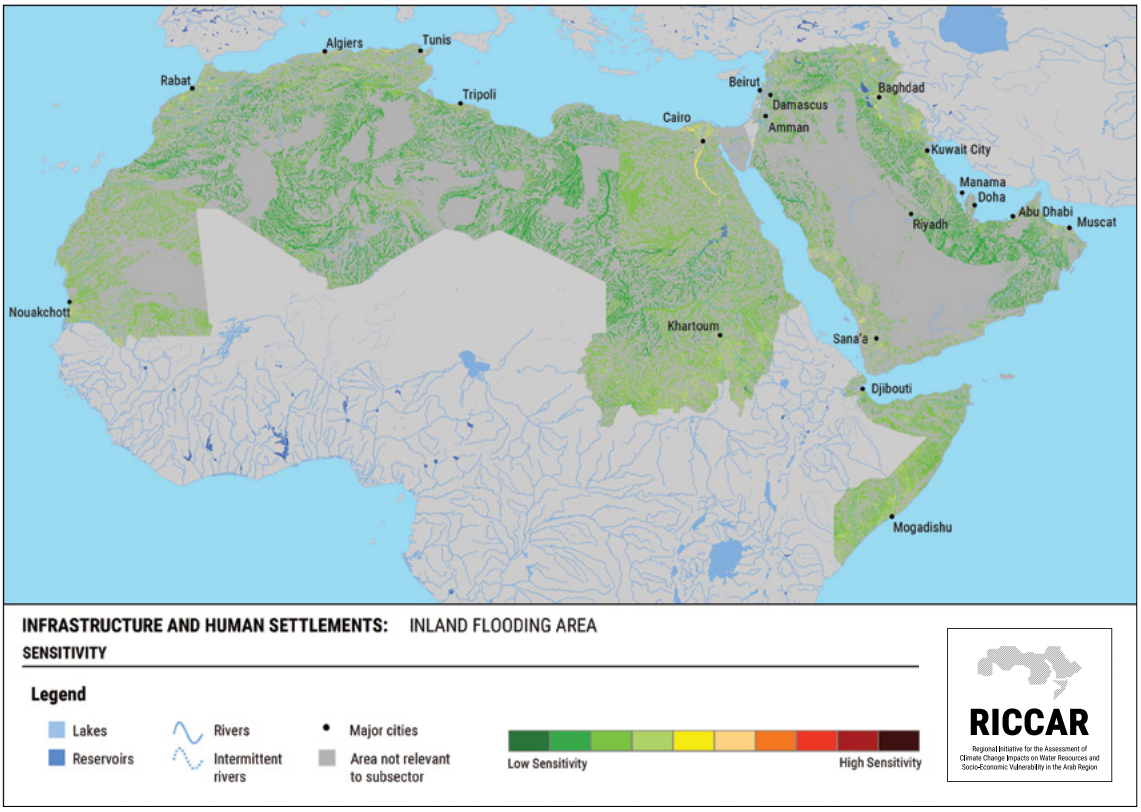
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – **14.1.2.1. EXPOSURE**

**FIGURE 361**



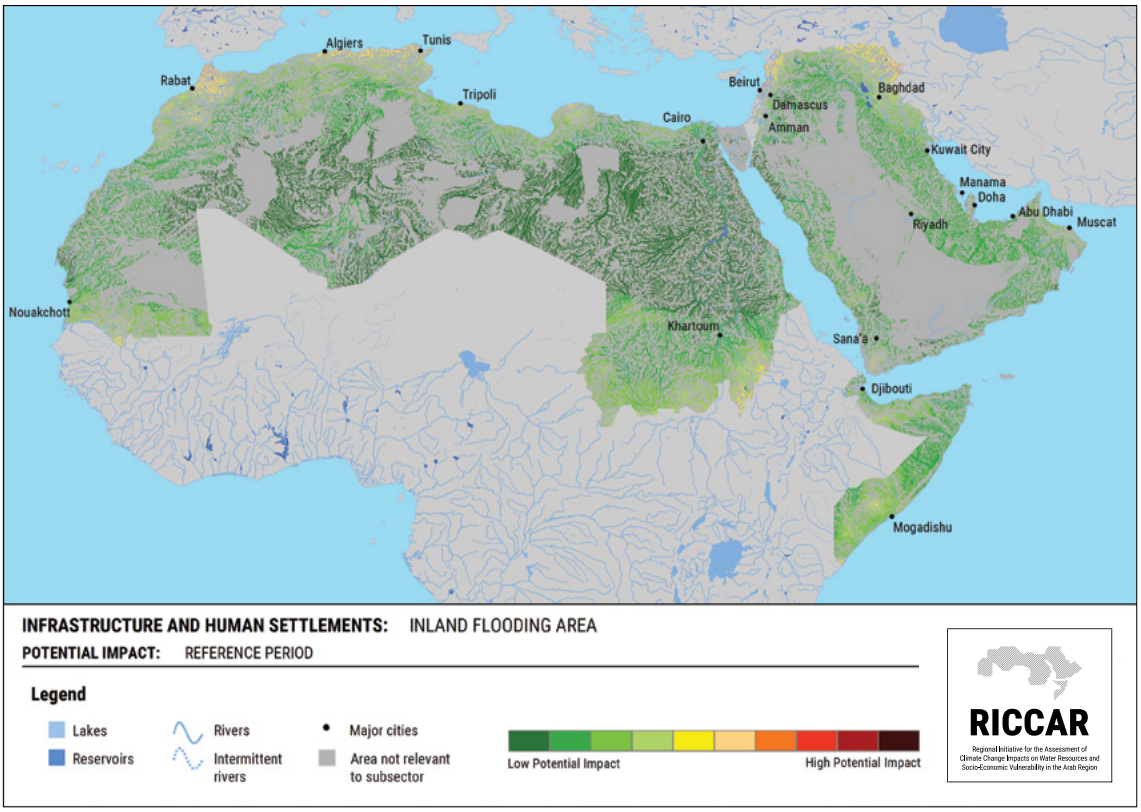

14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – **14.1.2.2. SENSITIVITY**

**FIGURE 362**



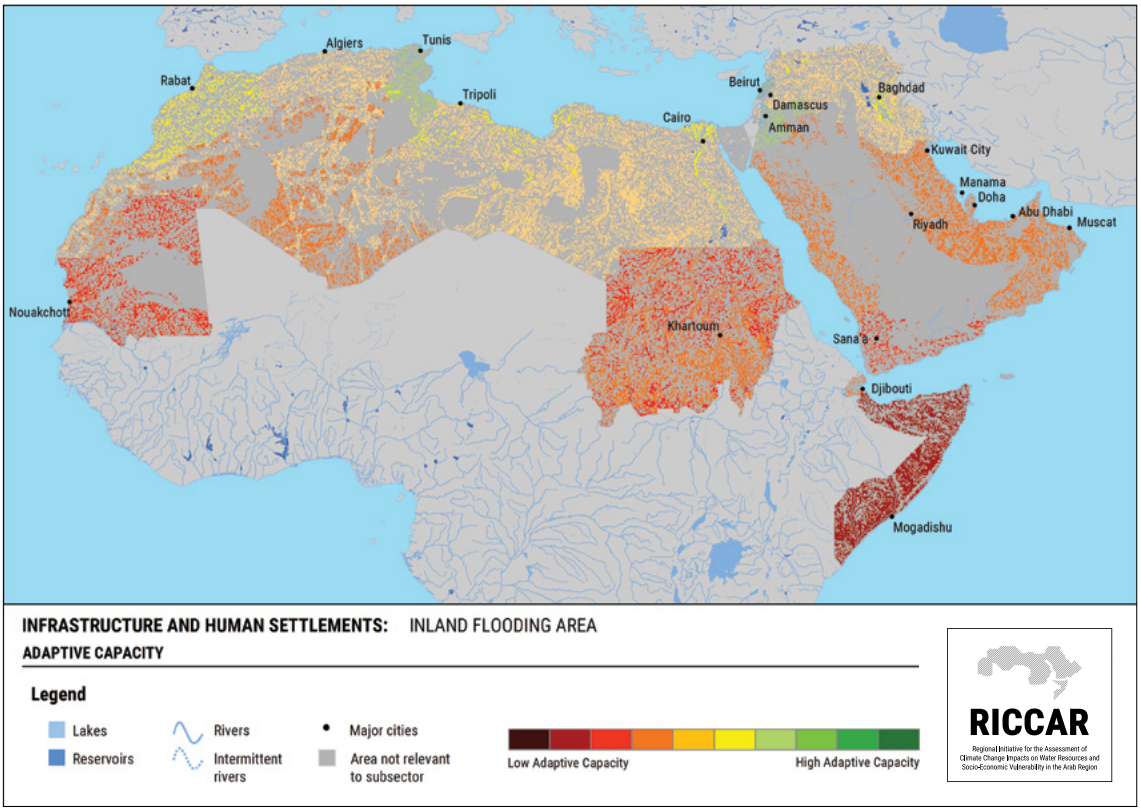
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – **14.1.1.3. POTENTIAL IMPACT**

**FIGURE 363**




14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – **14.1.1.4. ADAPTIVE CAPACITY**

**FIGURE 364**



14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – **14.1.1.5. VULNERABILITY**

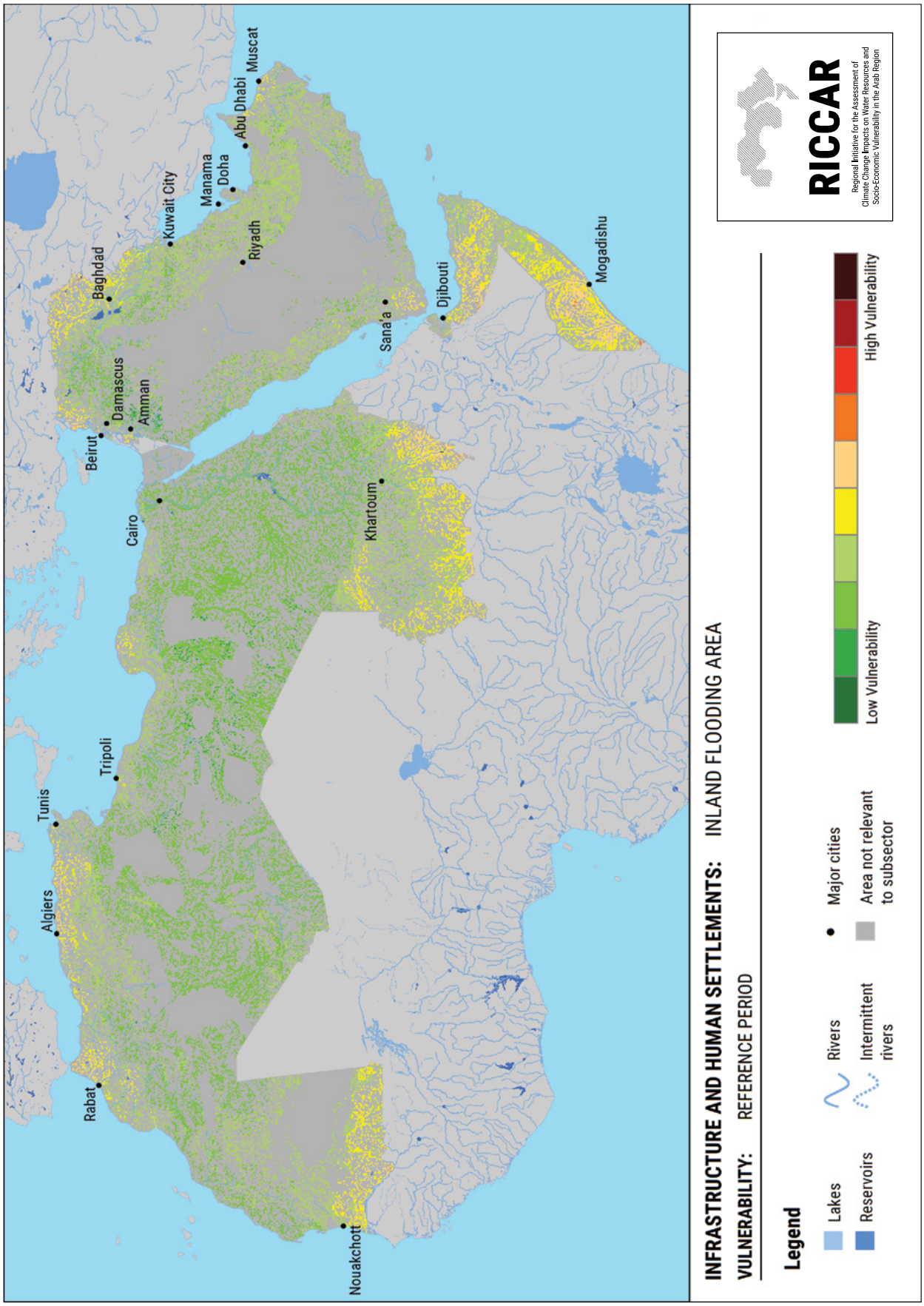
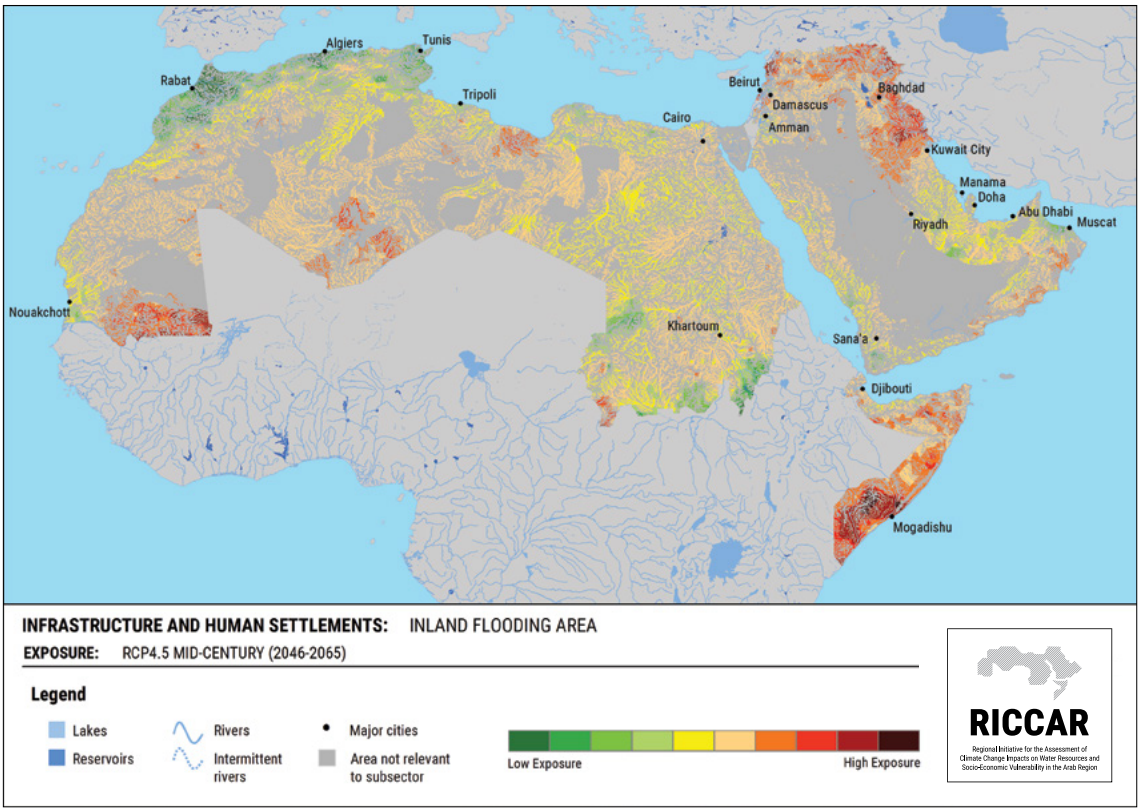



FIGURE 365

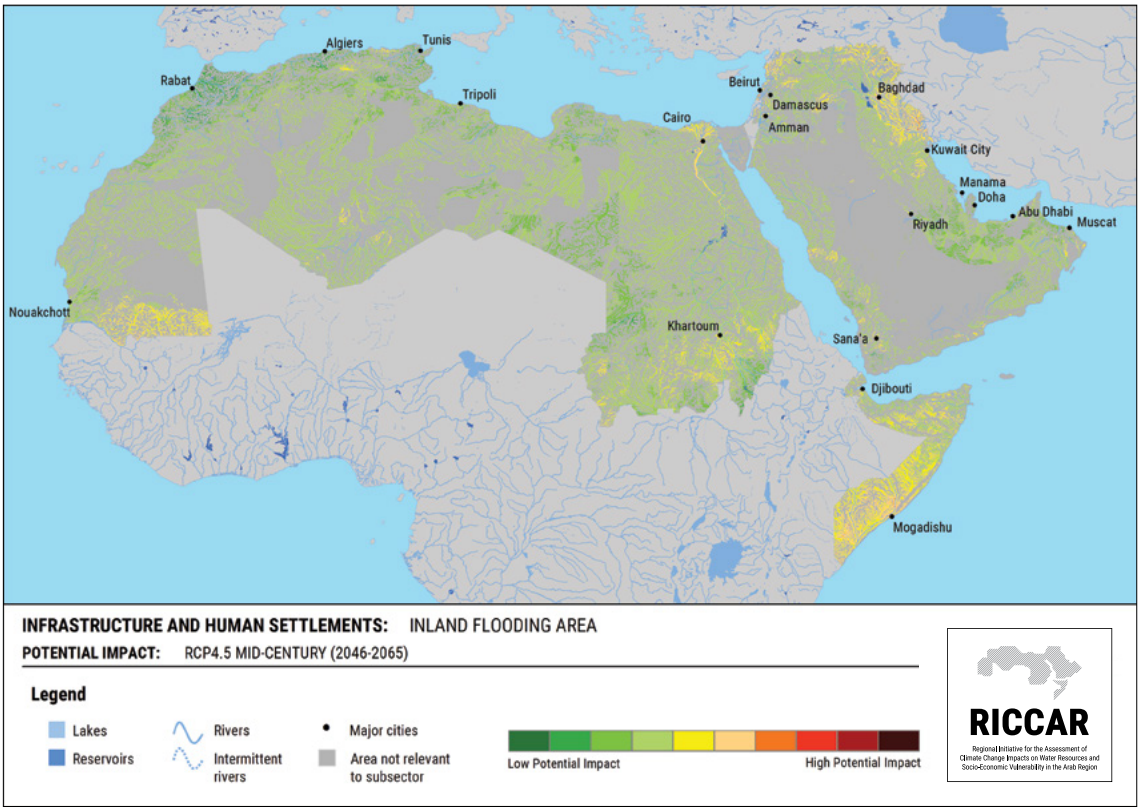
14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – 14.1.3.1. EXPOSURE

FIGURE 366




14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – 14.1.3.2. POTENTIAL IMPACT

FIGURE 367



14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – **14.1.3.3. VULNERABILITY**

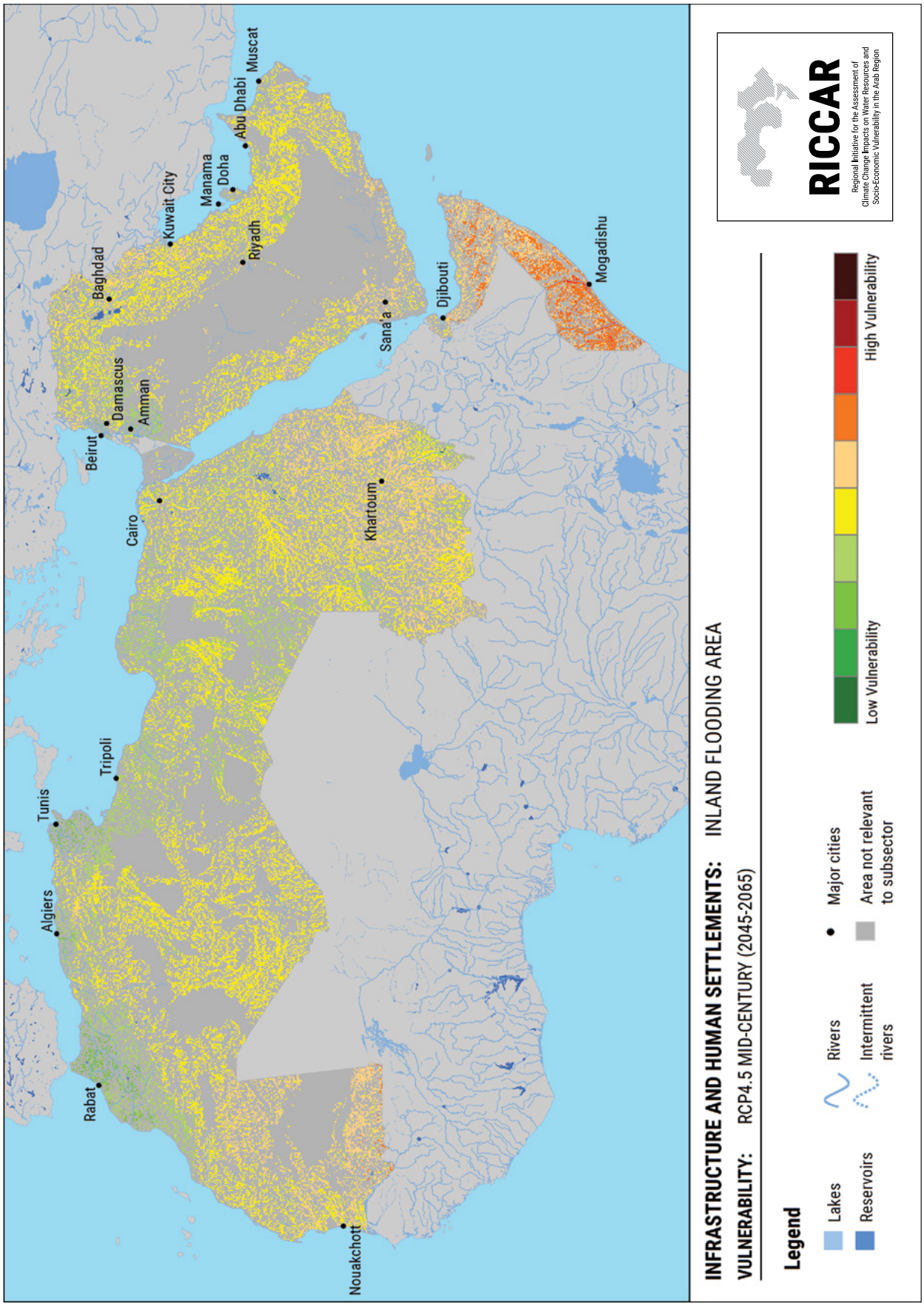
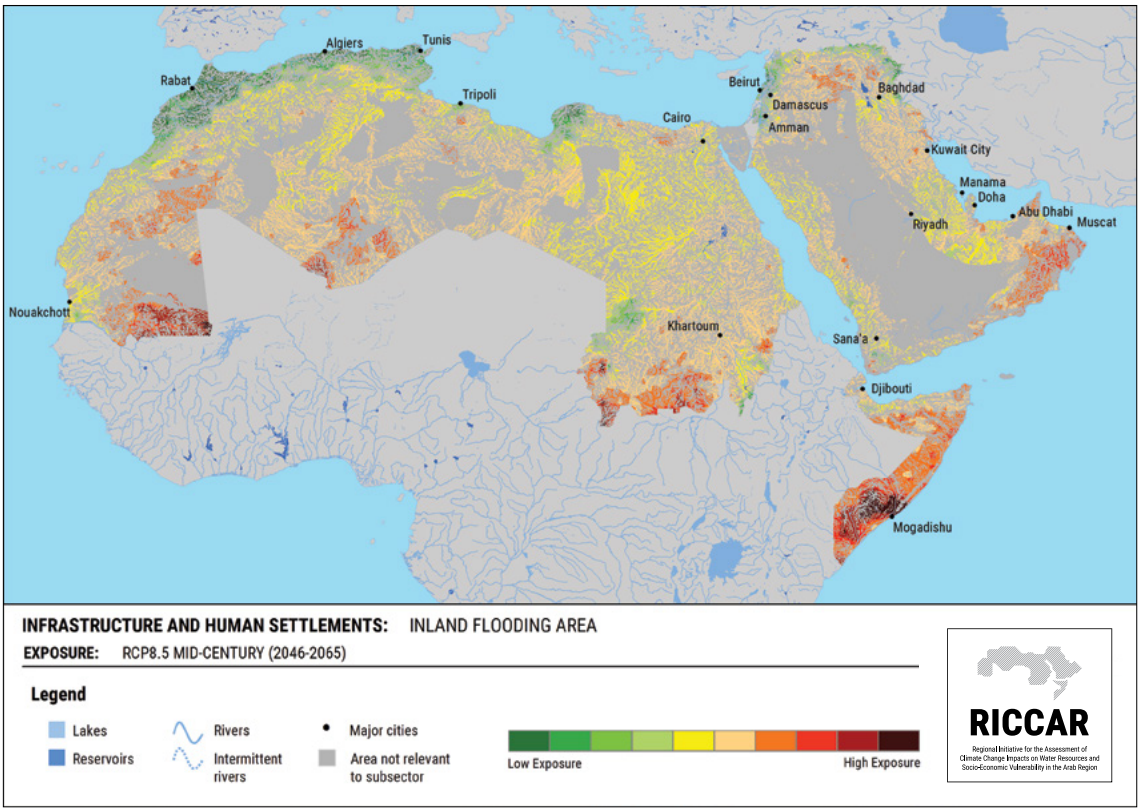



FIGURE 368

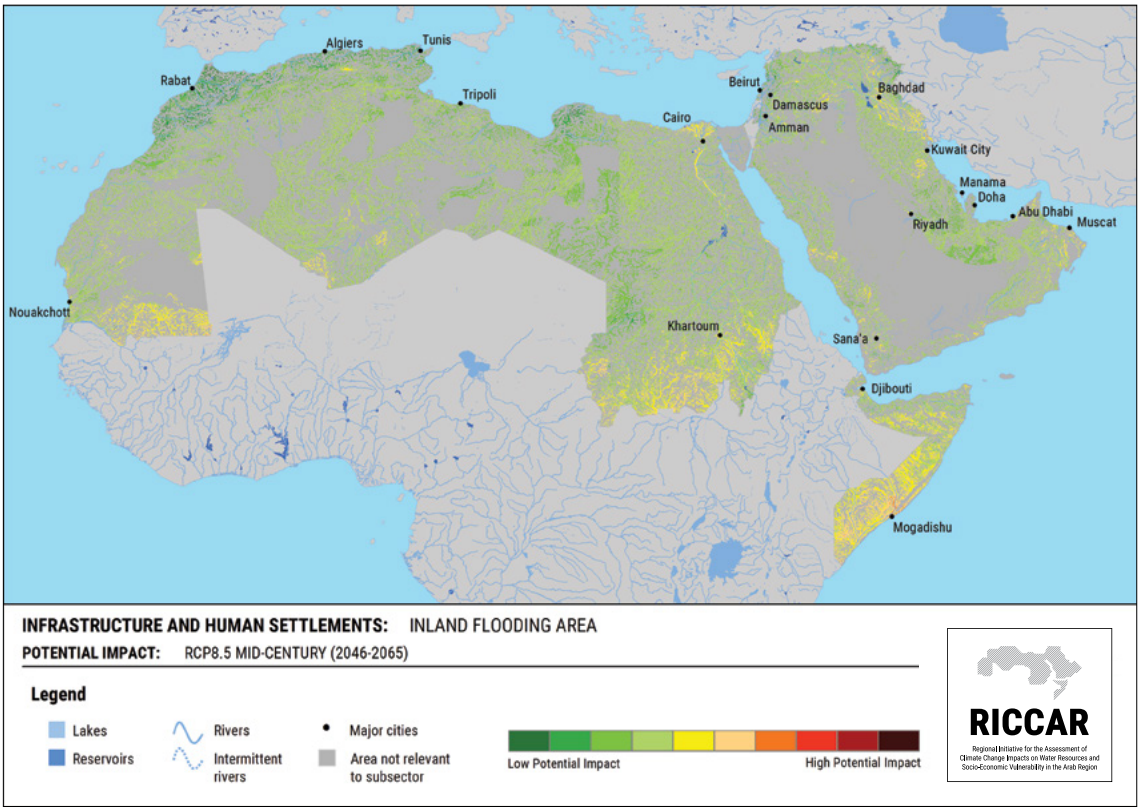
14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – 14.1.4.1. EXPOSURE

FIGURE 369




14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – 14.1.4.2. POTENTIAL IMPACT

FIGURE 370



14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – **14.1.4.3. VULNERABILITY**

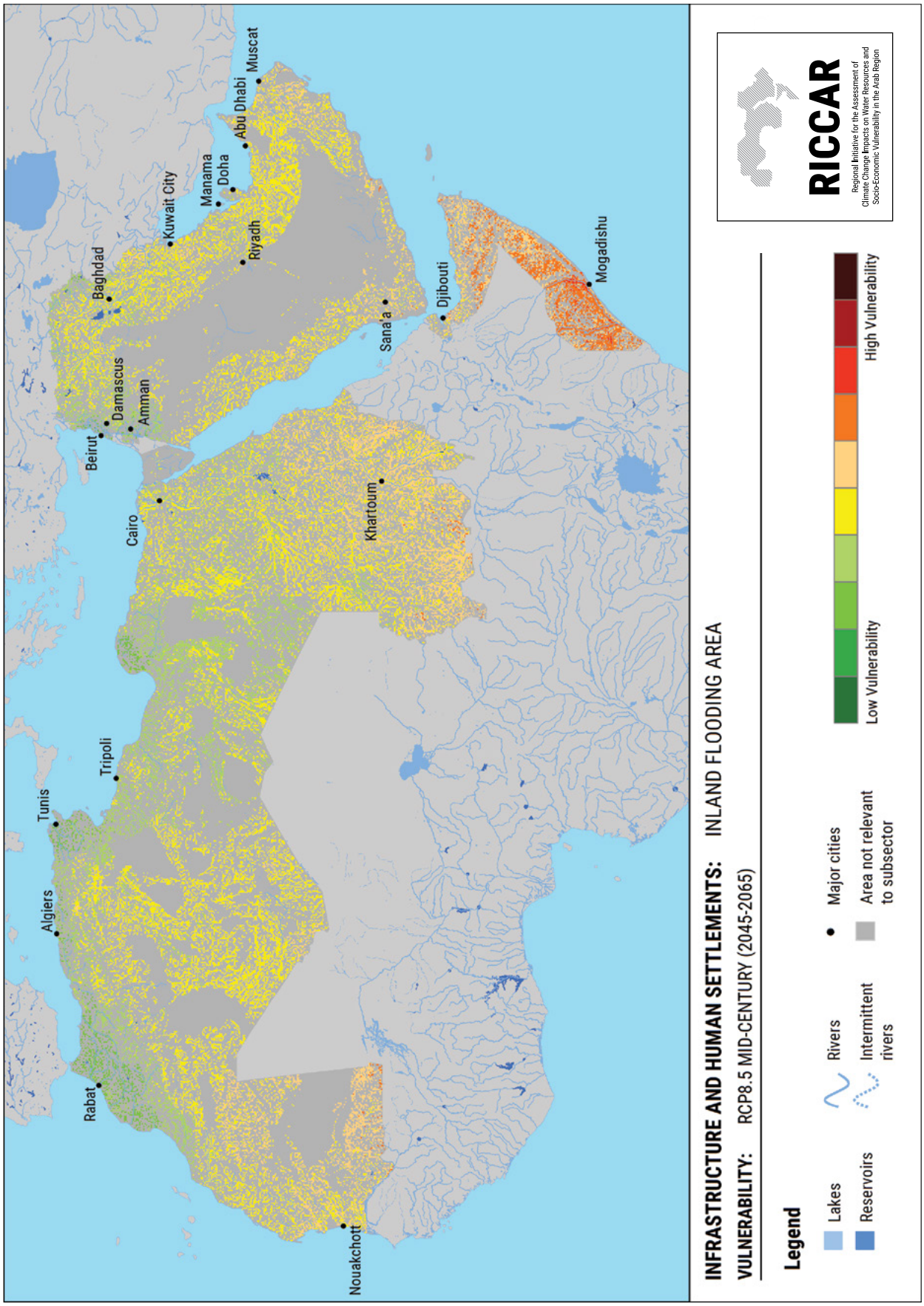
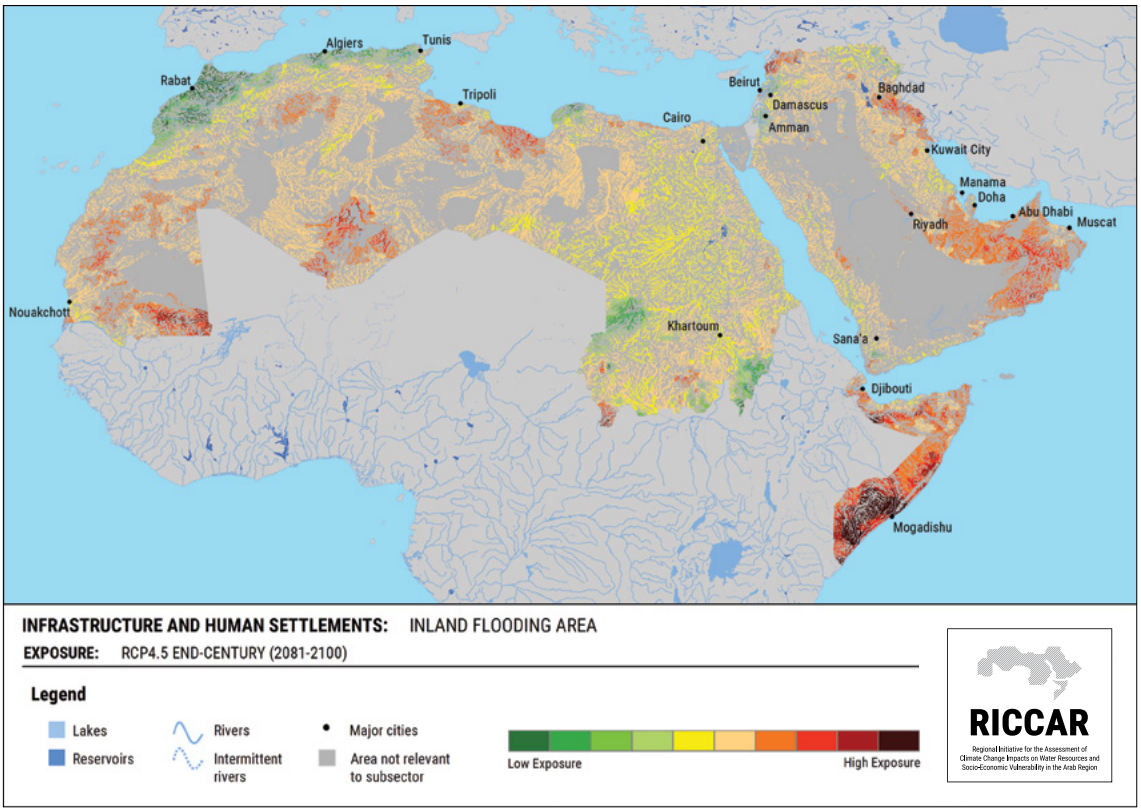



FIGURE 371

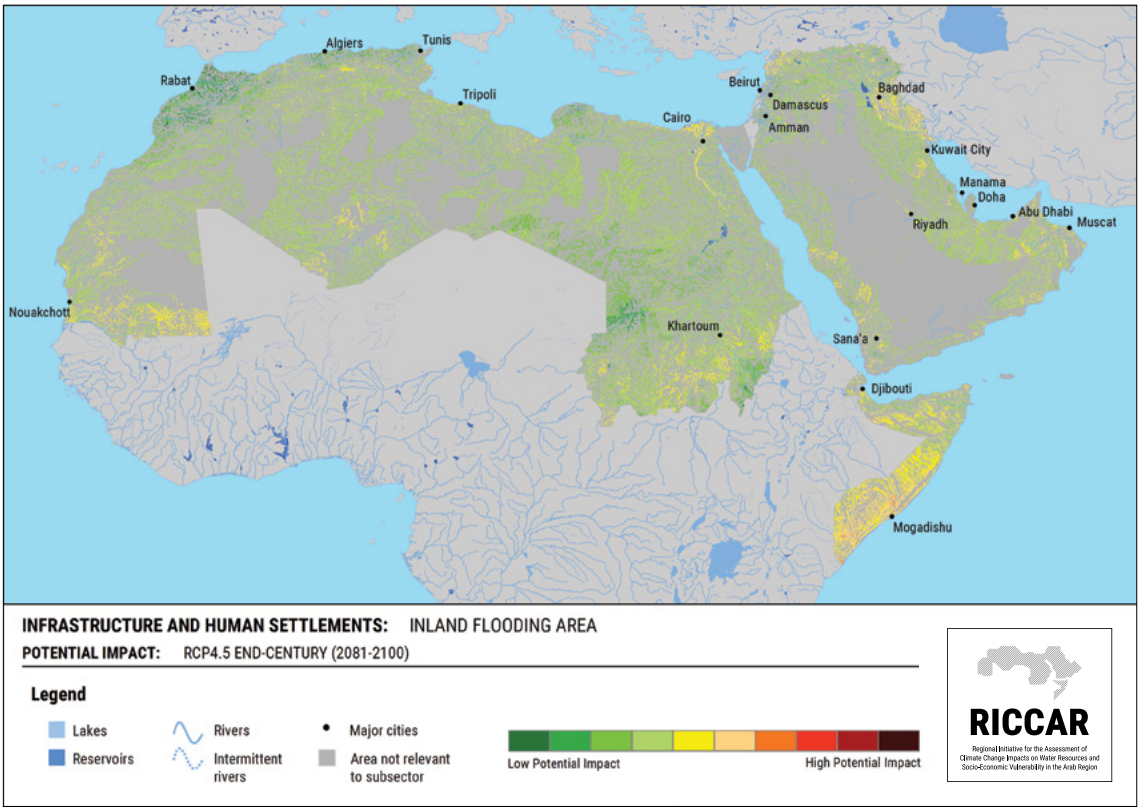
14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – 14.1.5.1. EXPOSURE

FIGURE 372




14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – 14.1.5.2. POTENTIAL IMPACT

FIGURE 373



14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – **14.1.5.3. VULNERABILITY**

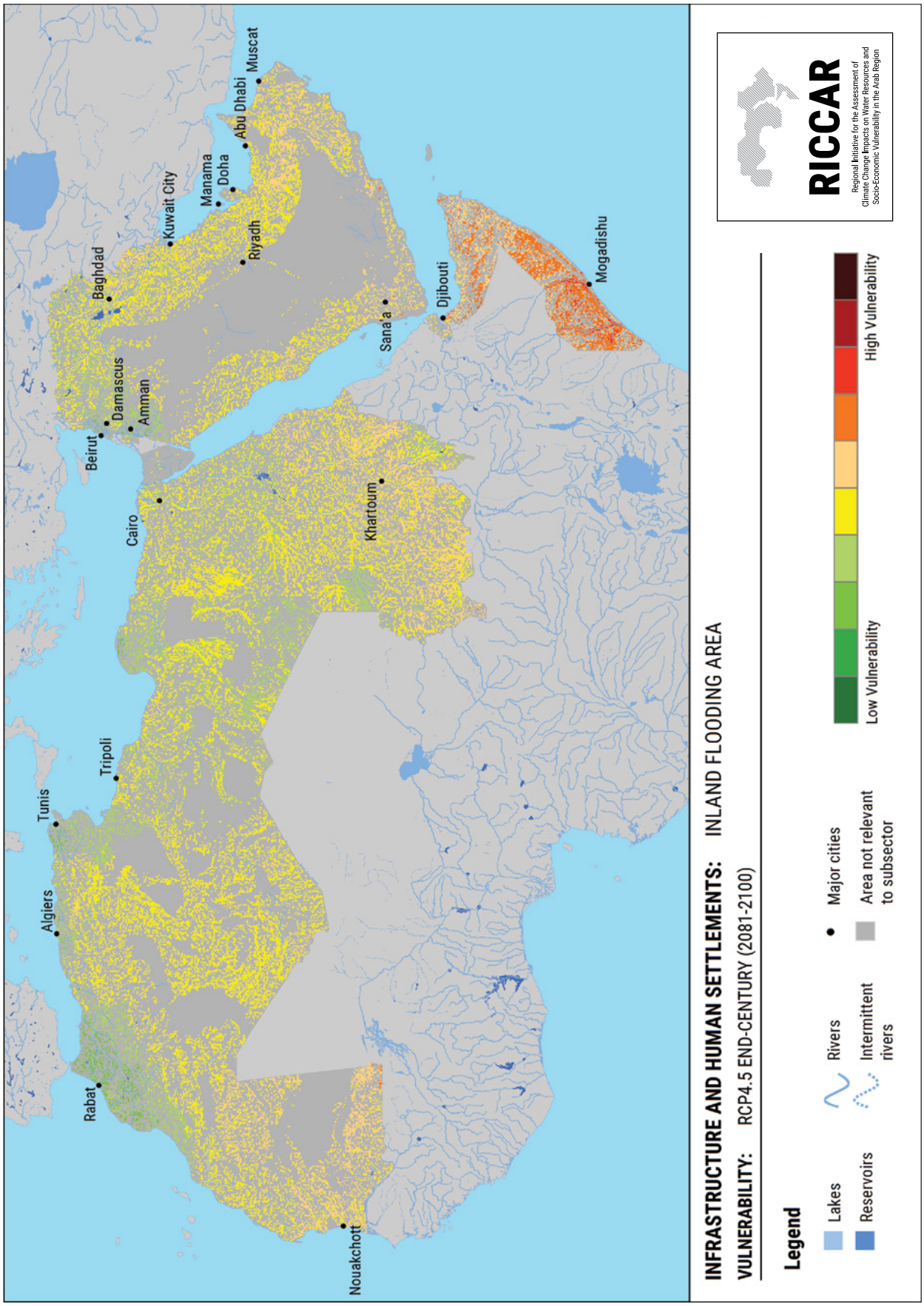
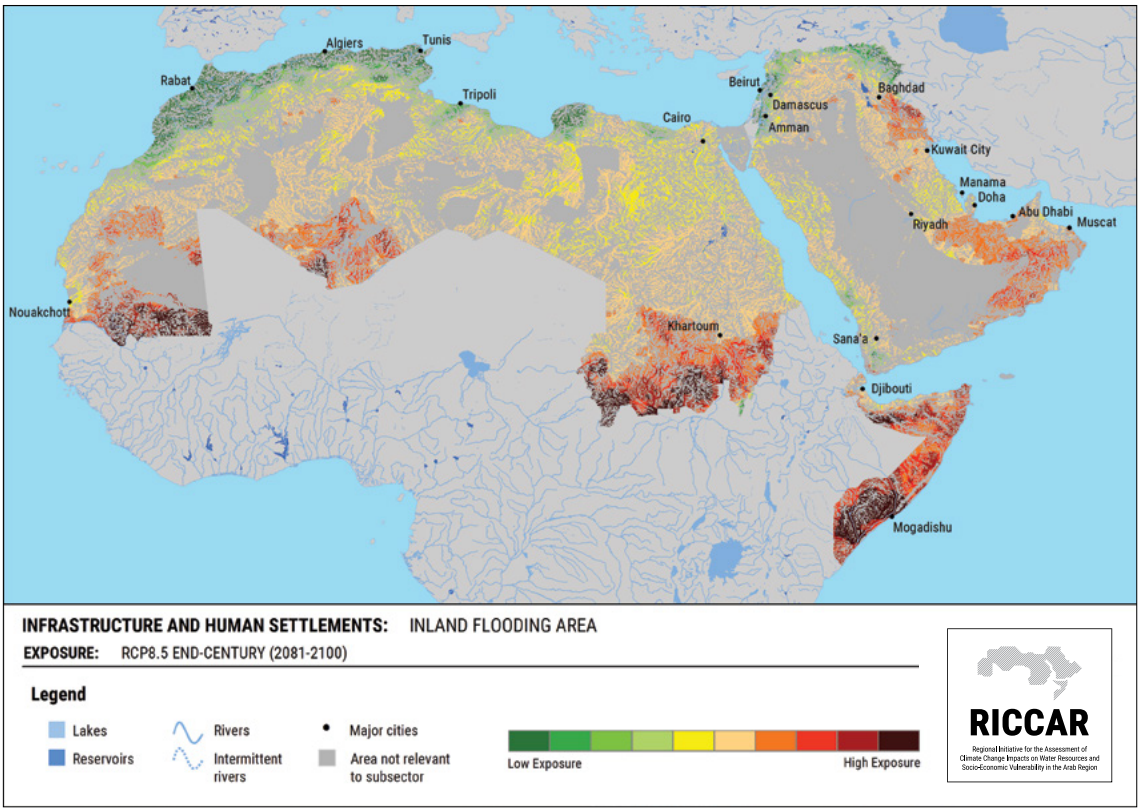



FIGURE 374

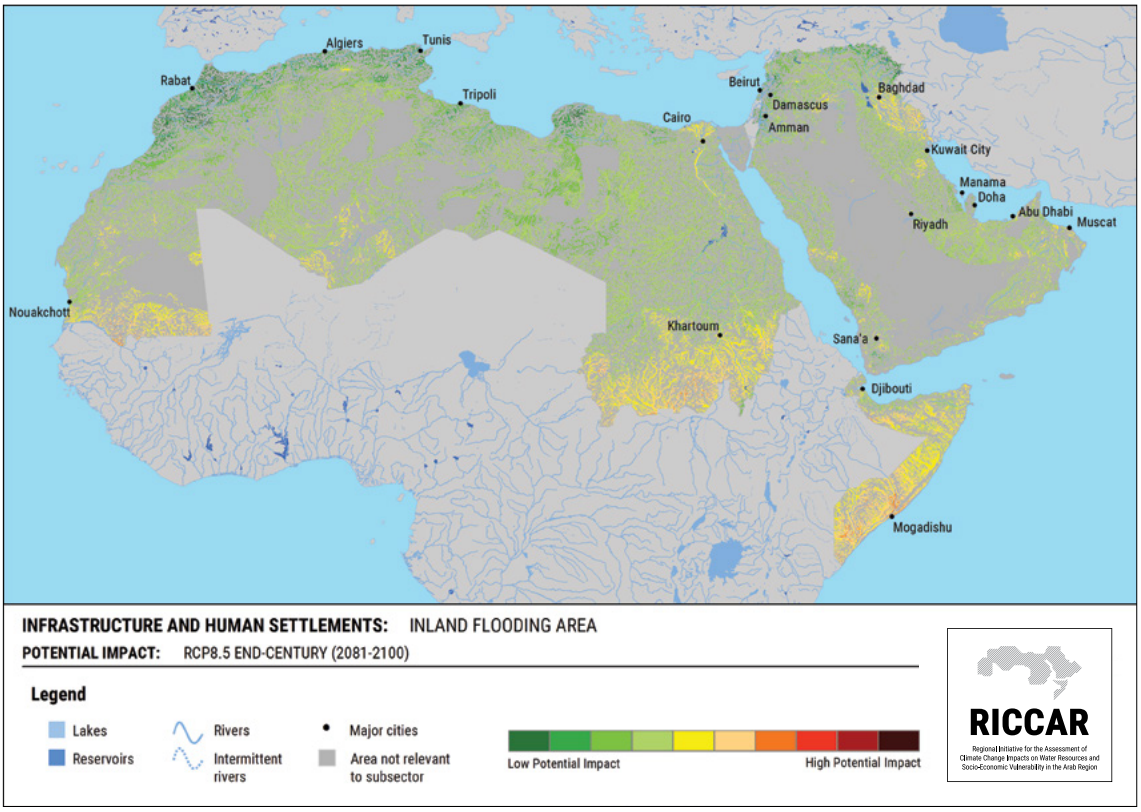
14.1. INLAND FLOODING AREA – 14.1.6. END-CENTURY RCP 8.5 – 14.1.6.1. EXPOSURE

FIGURE 375




14.1. INLAND FLOODING AREA – 14.1.6. END-CENTURY RCP 8.5 – 14.1.6.2. POTENTIAL IMPACT

FIGURE 376



14.1. INLAND FLOODING AREA – 14.1.6. END-CENTURY RCP 8.5 – **14.1.6.3. VULNERABILITY**

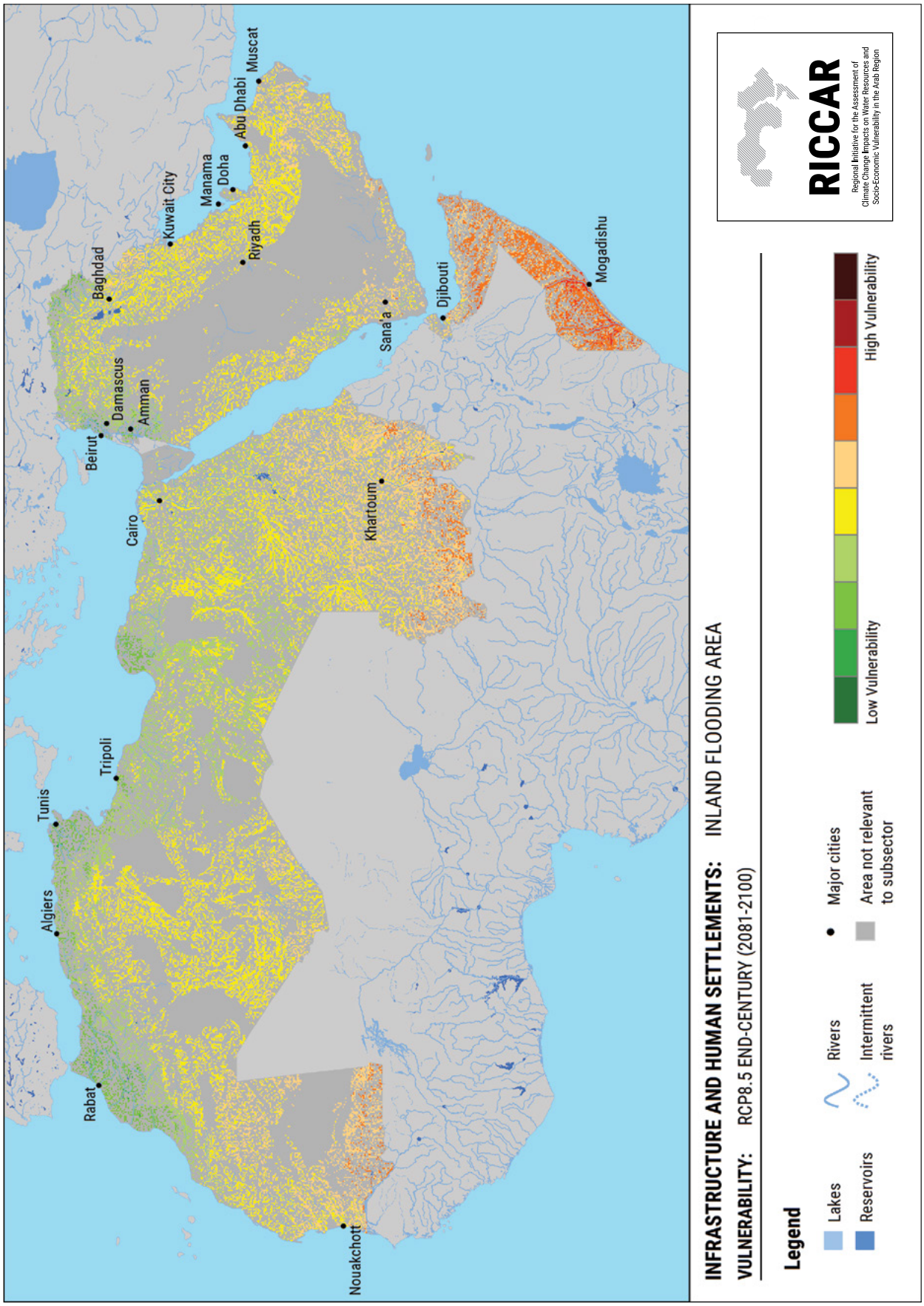



FIGURE 377

# CHAPTER 15

## PEOPLE SECTOR

15.1. WATER AVAILABLE FOR DRINKING – 15.1.1. IMPACT CHAIN

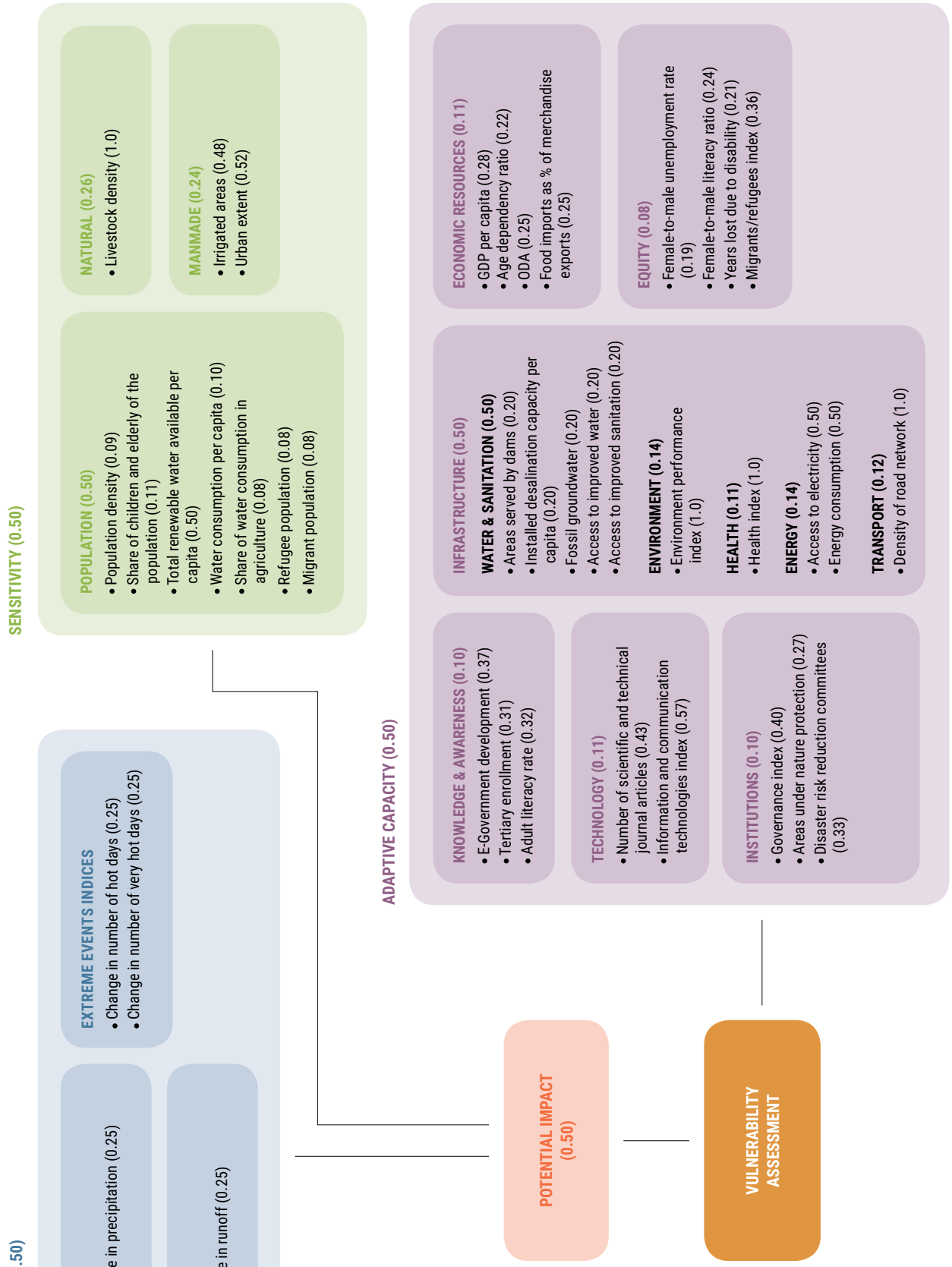
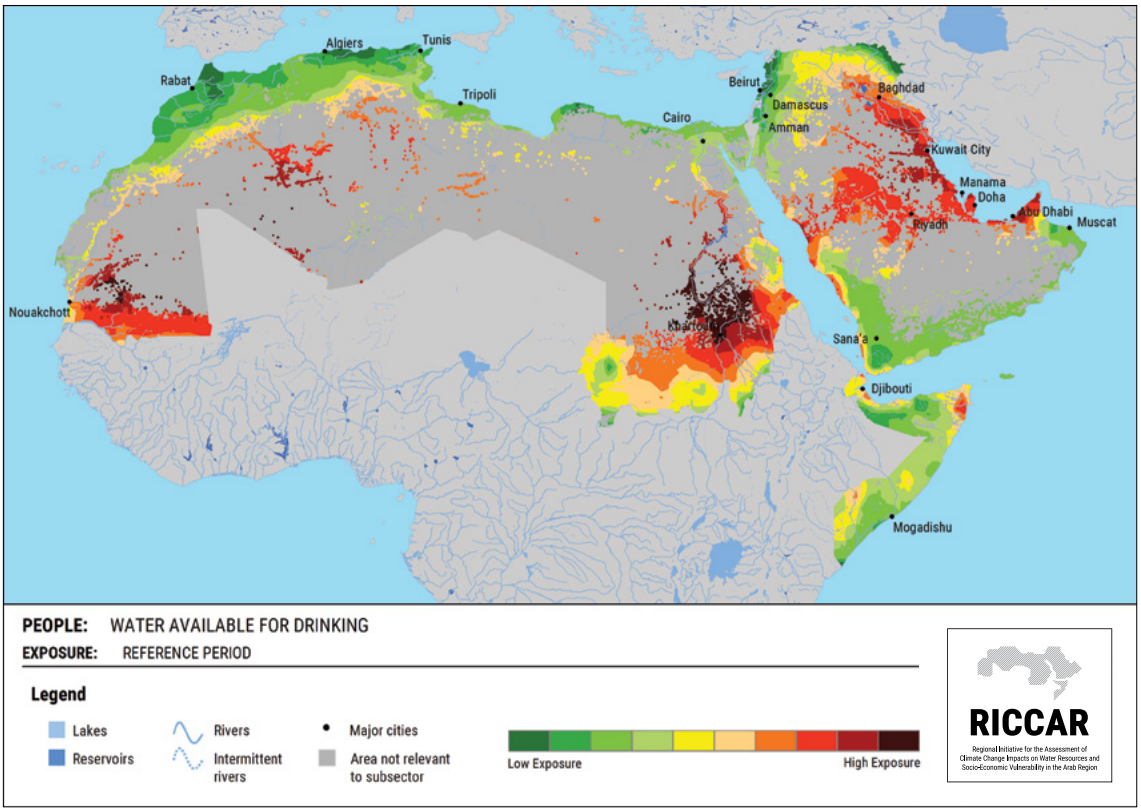



FIGURE 378

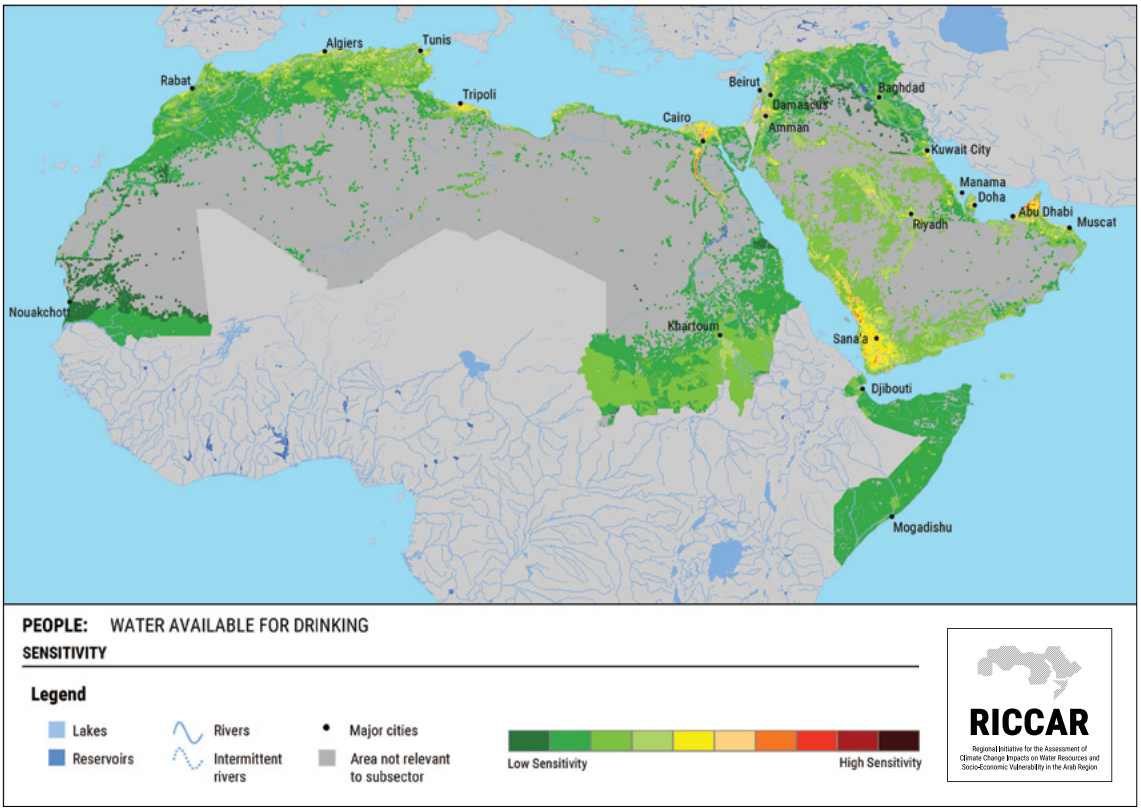
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – **15.1.2.1. EXPOSURE**

**FIGURE 379**



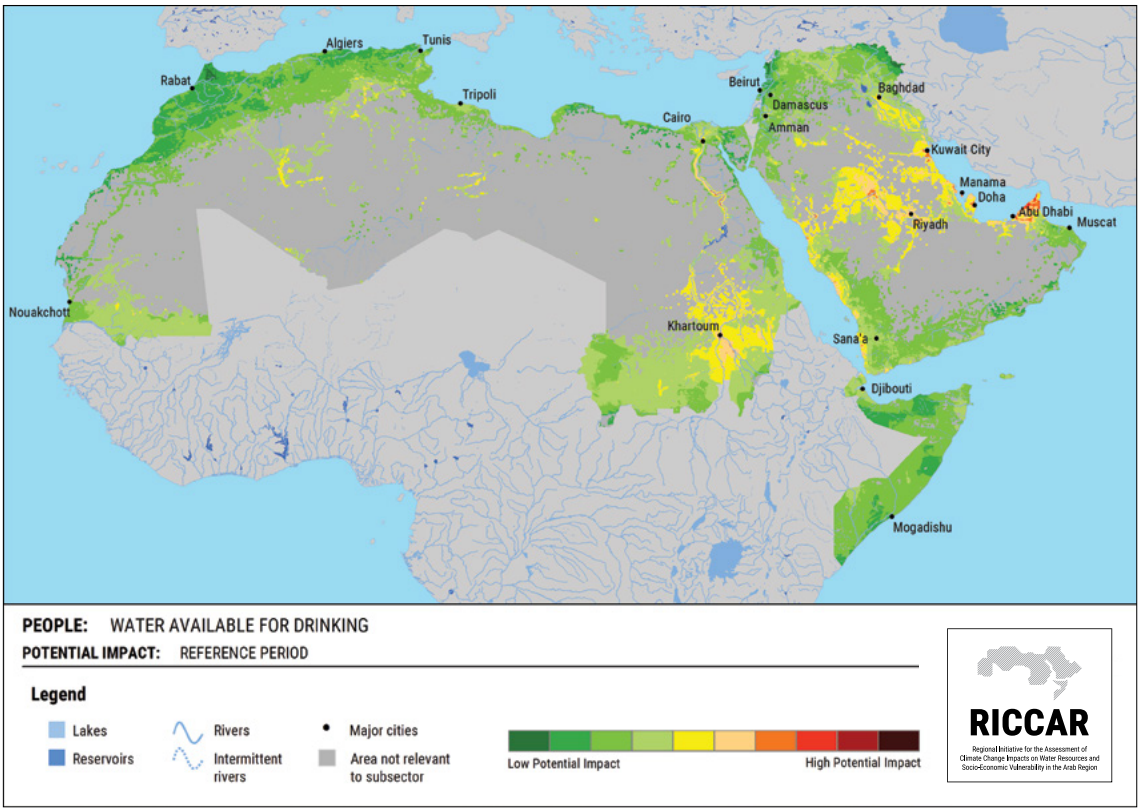

15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – **15.1.2.2. SENSITIVITY**

**FIGURE 380**



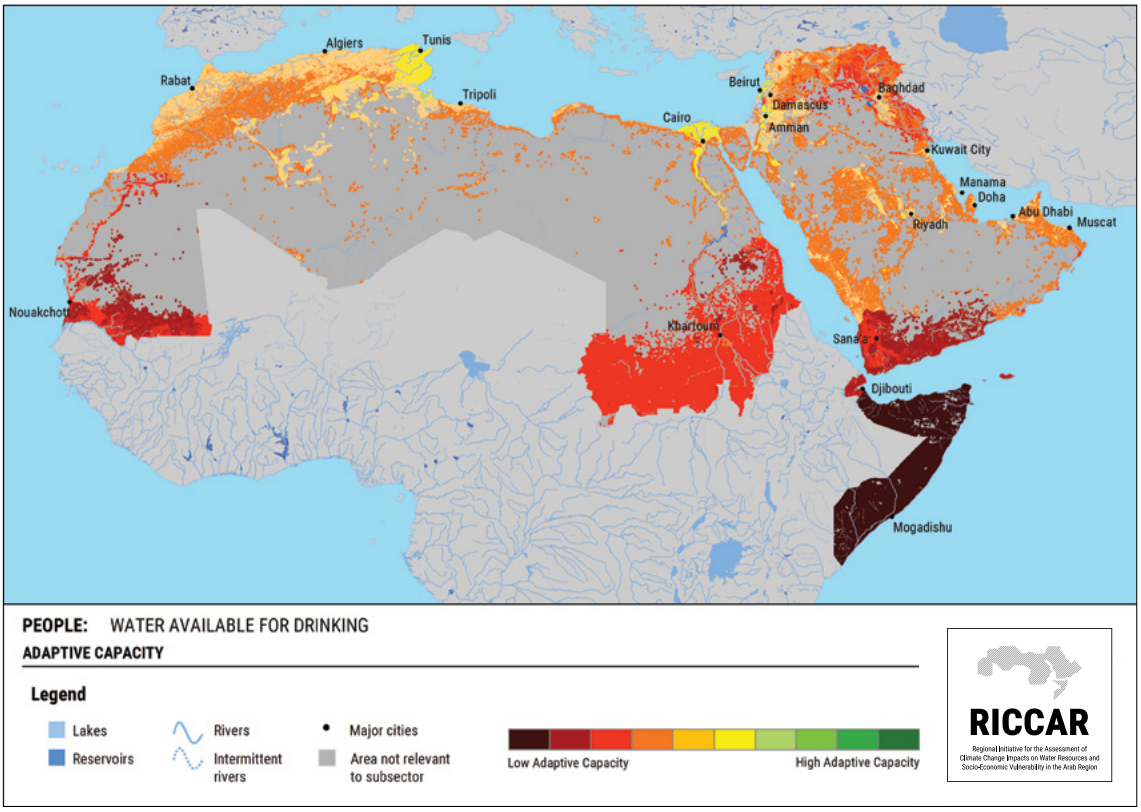
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.3. POTENTIAL IMPACT

FIGURE 381




15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.4. ADAPTIVE CAPACITY

FIGURE 382



15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – **15.1.2.5. VULNERABILITY**

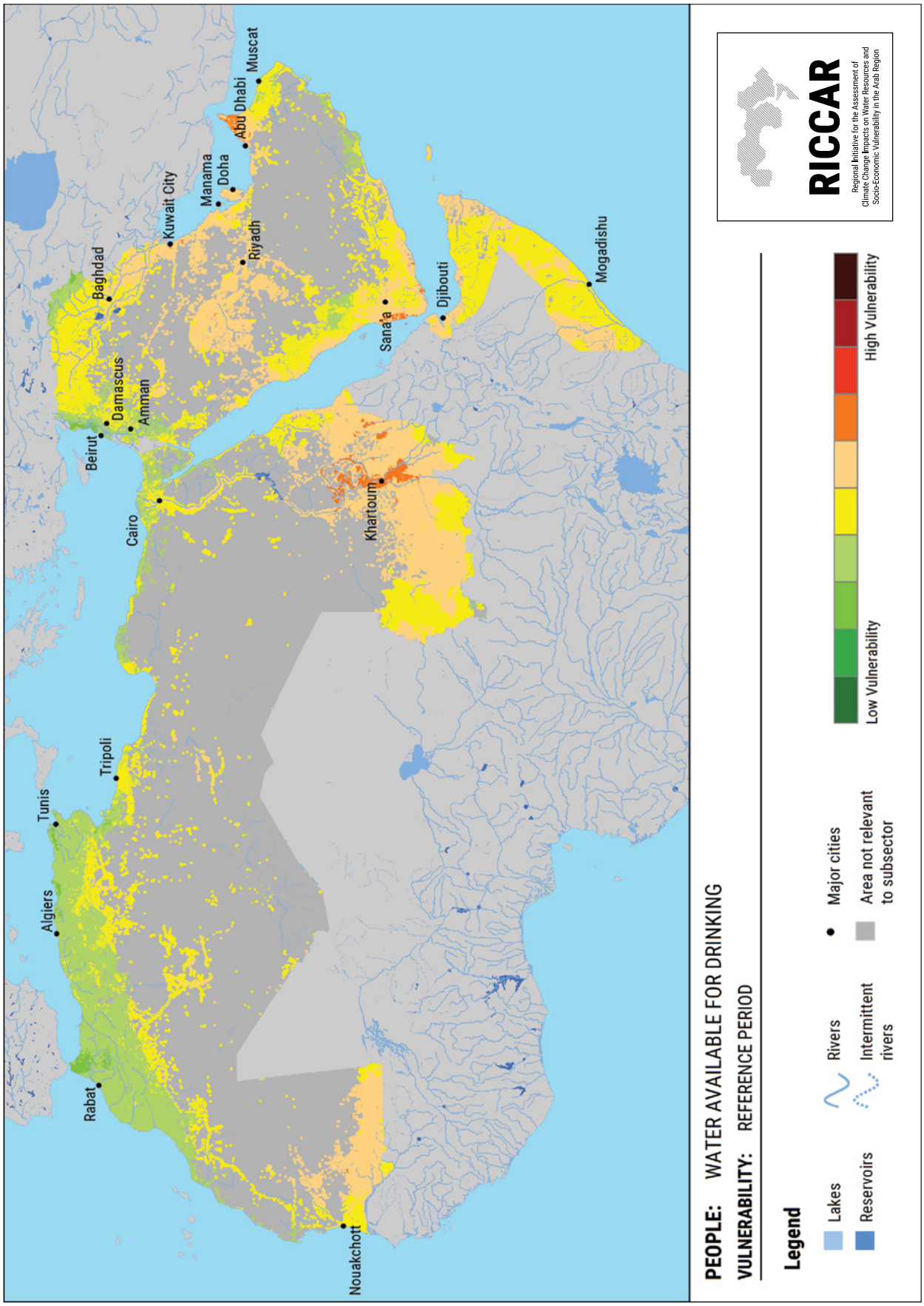
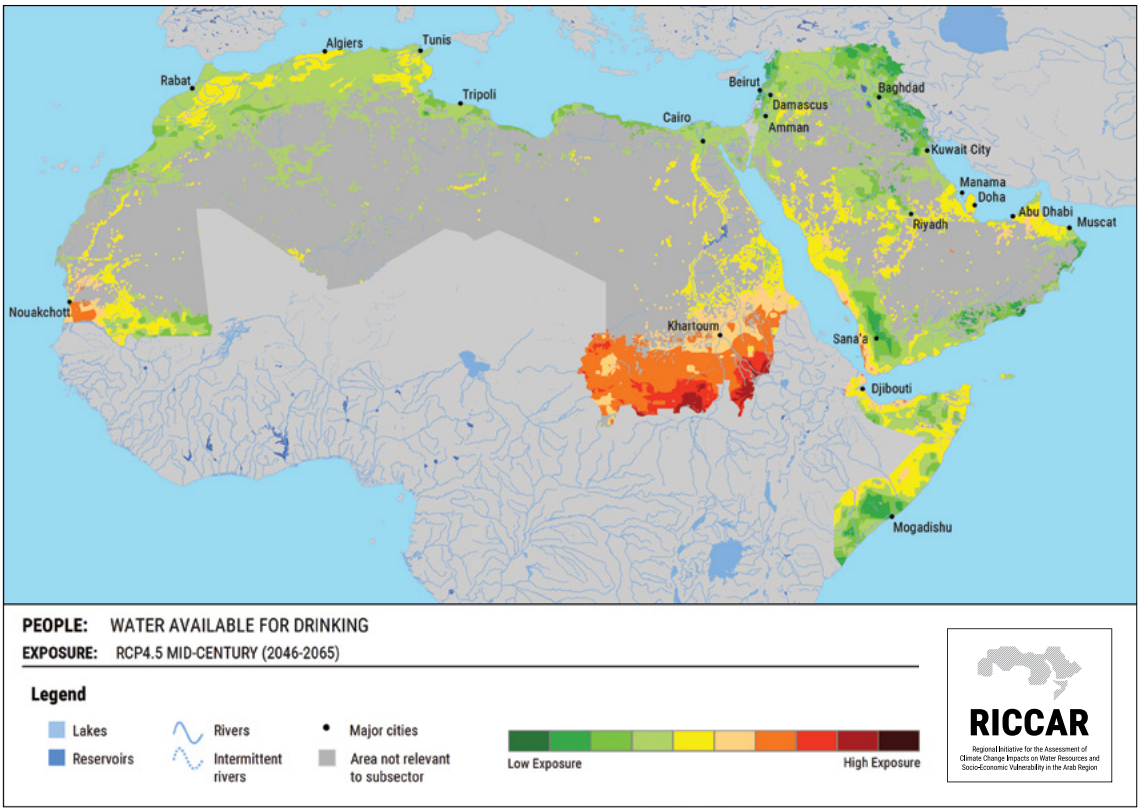



FIGURE 383

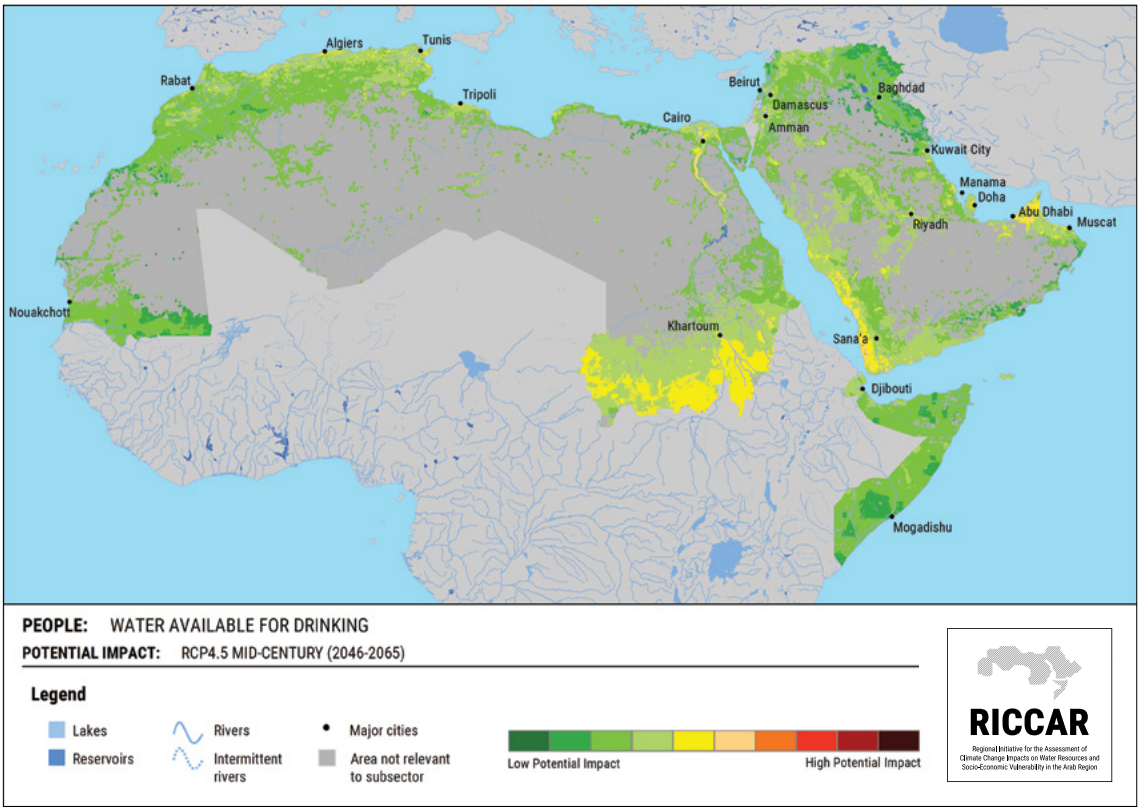
15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – 15.1.3.1. EXPOSURE

FIGURE 384




15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – 15.1.3.2. POTENTIAL IMPACT

FIGURE 385



15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – **15.1.3.3. VULNERABILITY**

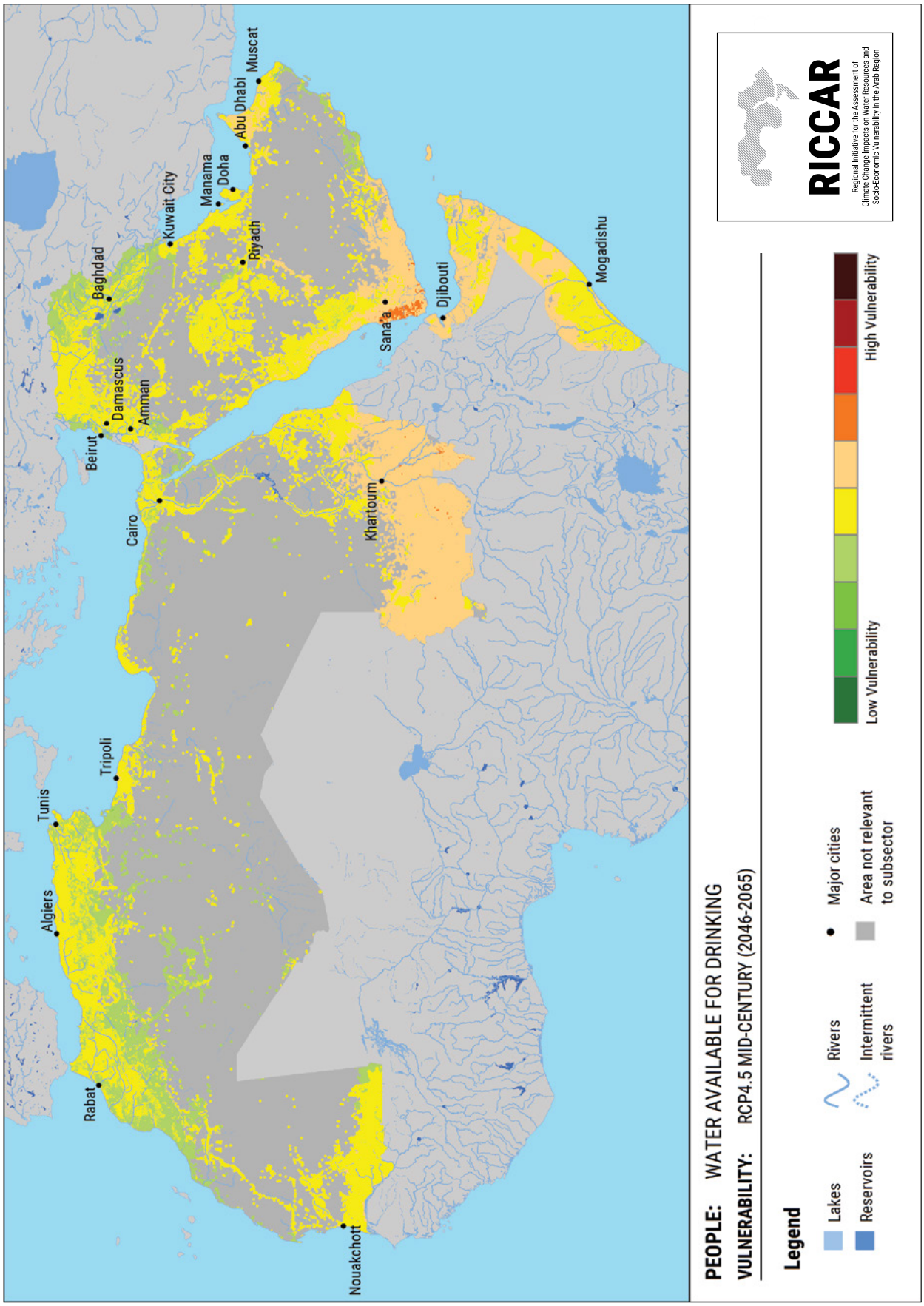
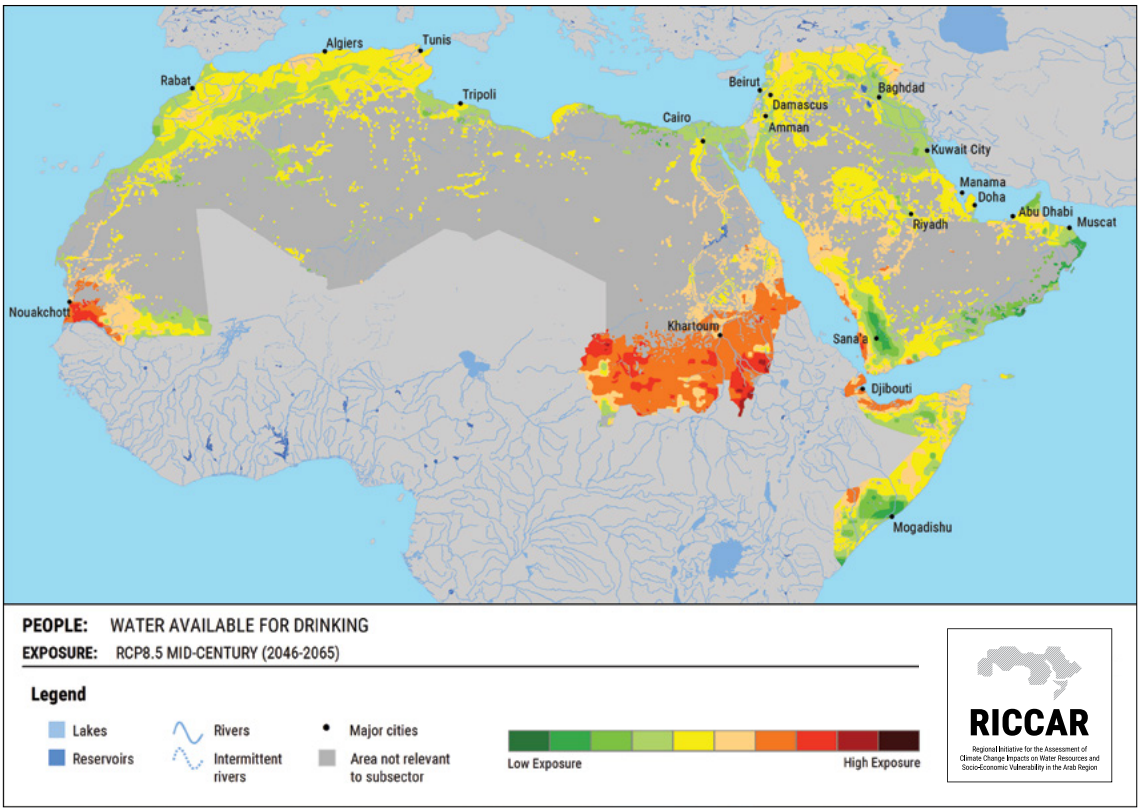



FIGURE 386

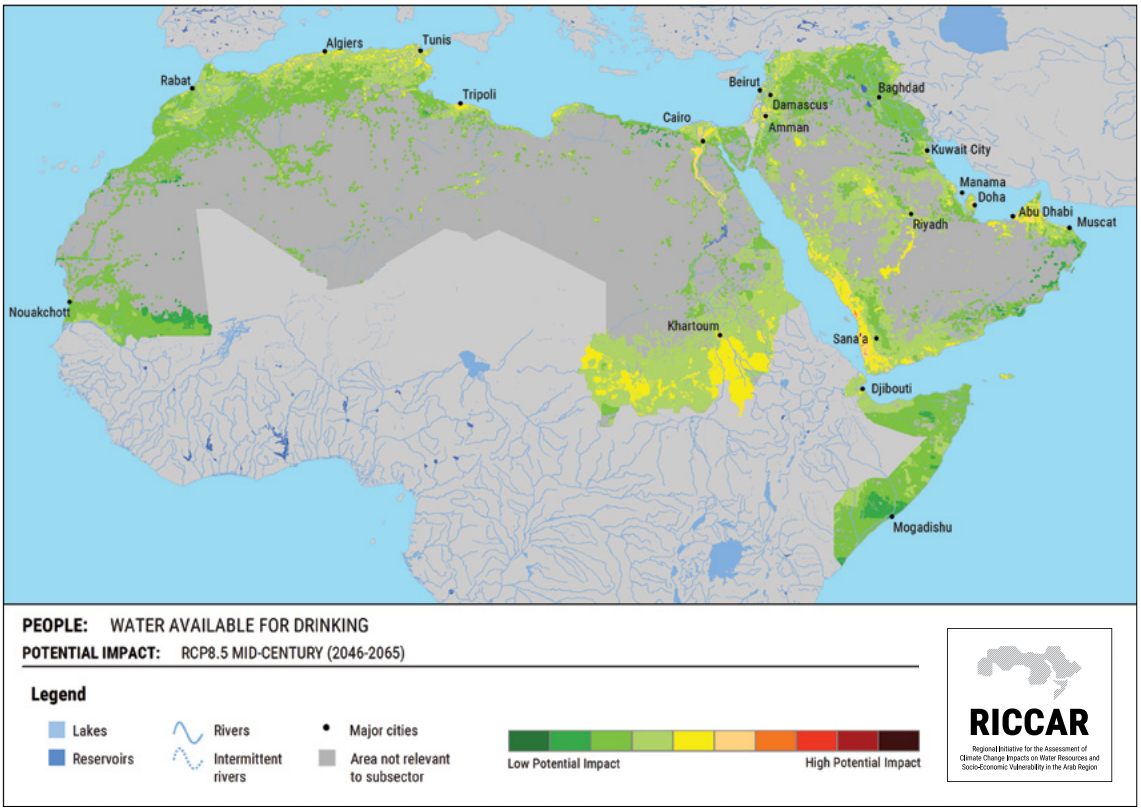
15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – 15.1.4.1. EXPOSURE

FIGURE 387




15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – 15.1.4.2. POTENTIAL IMPACT

FIGURE 388



15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – **15.1.4.3. VULNERABILITY**

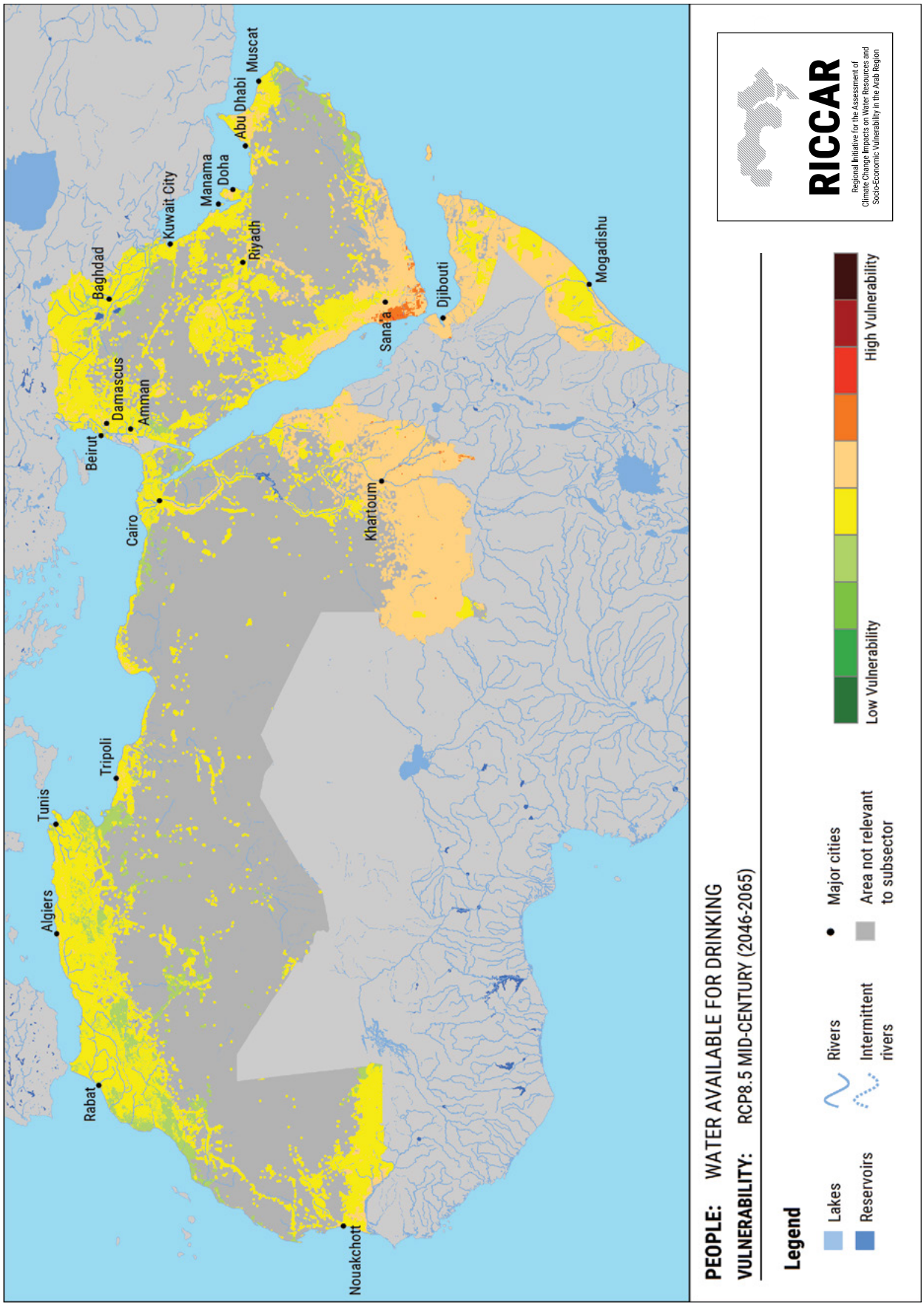
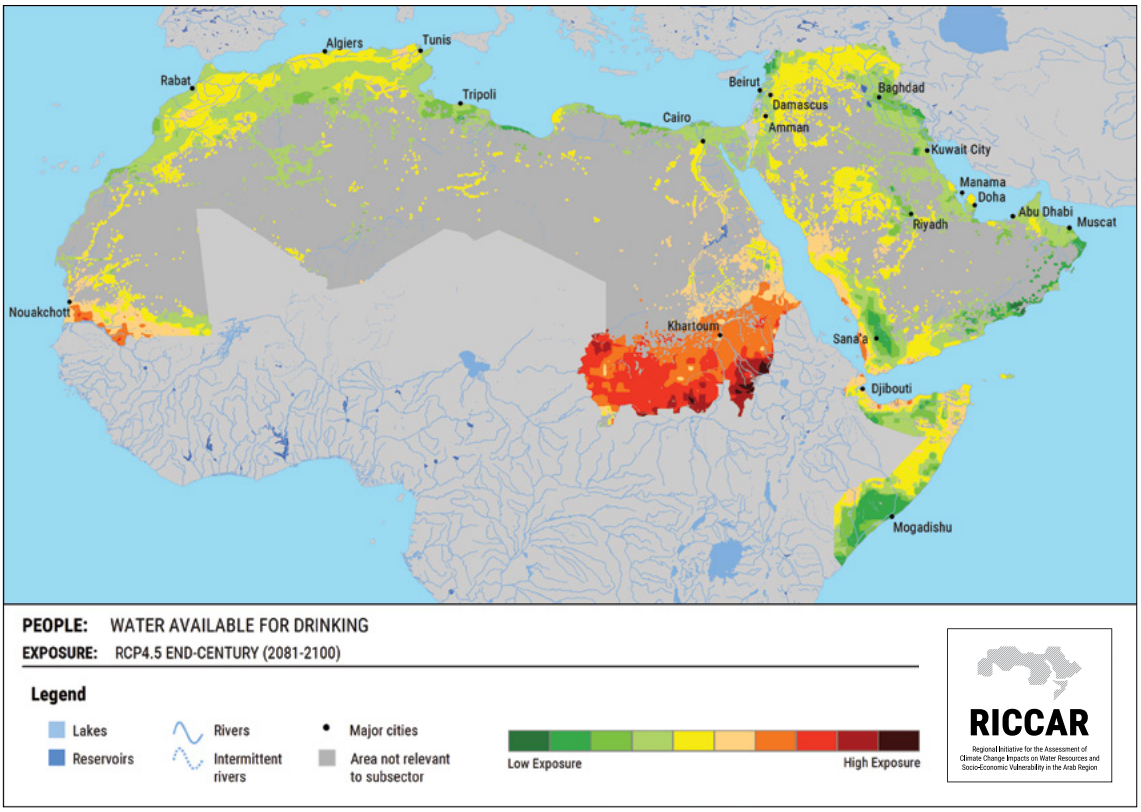



FIGURE 389

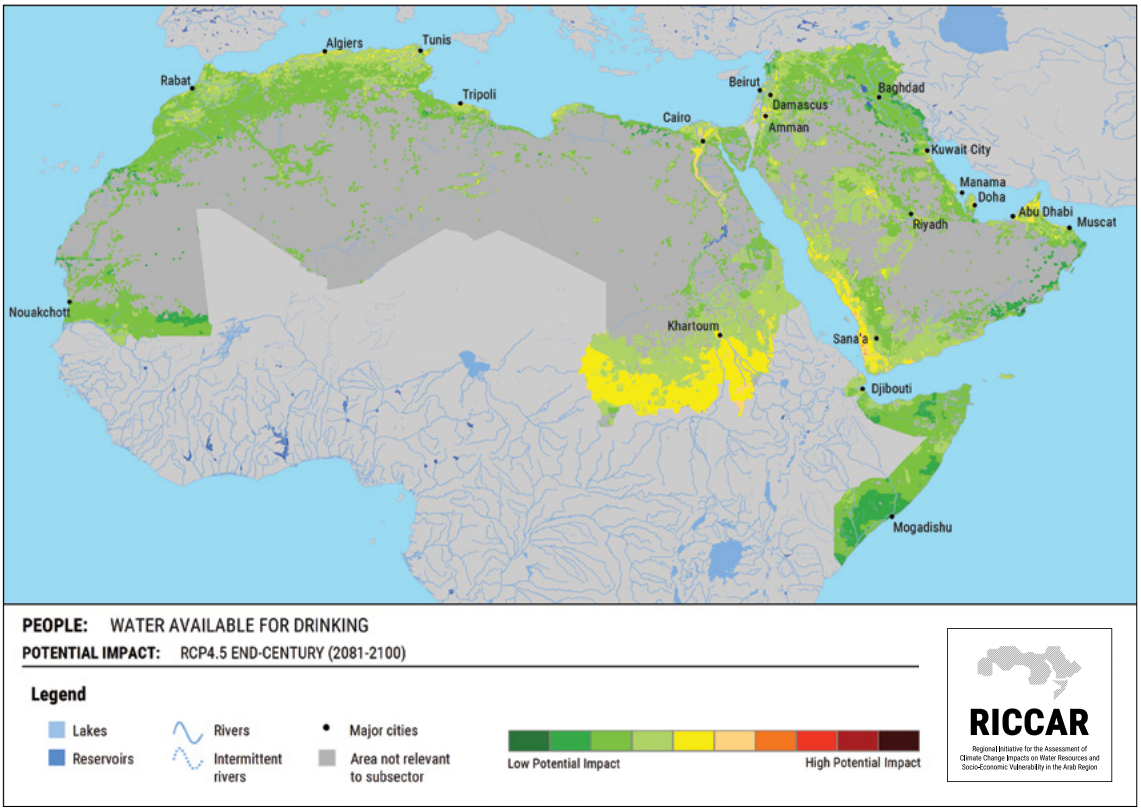
15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – 15.1.5.1. EXPOSURE

FIGURE 390




15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – 15.1.5.2. POTENTIAL IMPACT

FIGURE 391



15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – **15.1.5.3. VULNERABILITY**

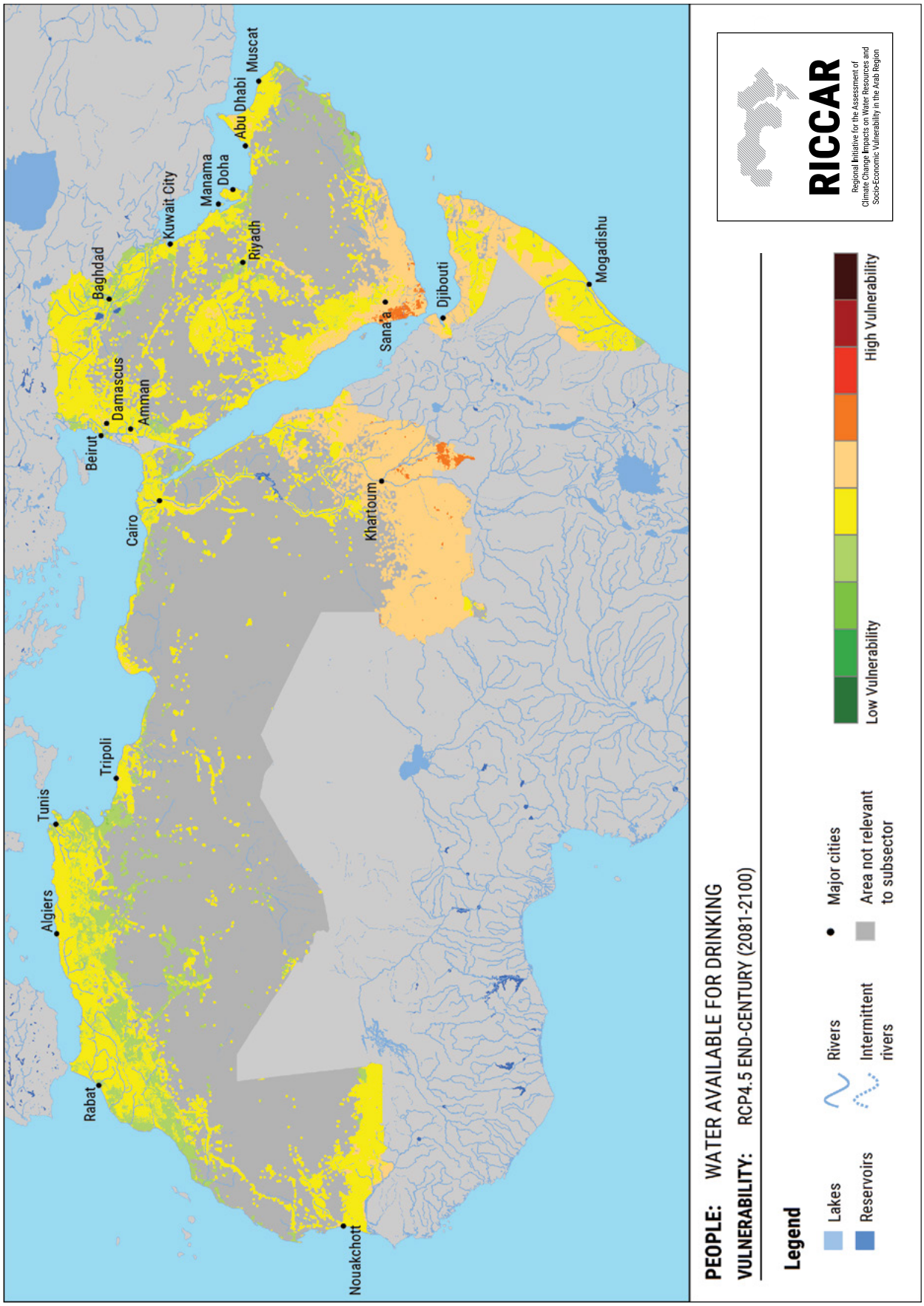
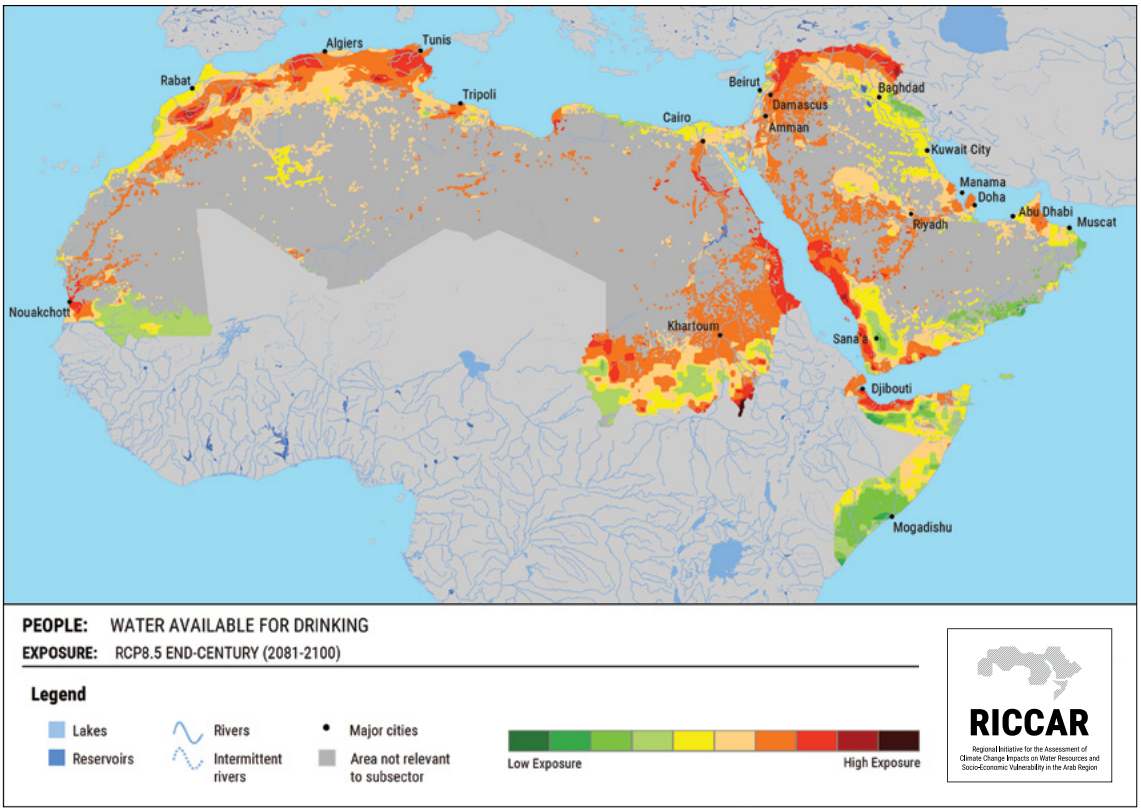



FIGURE 392

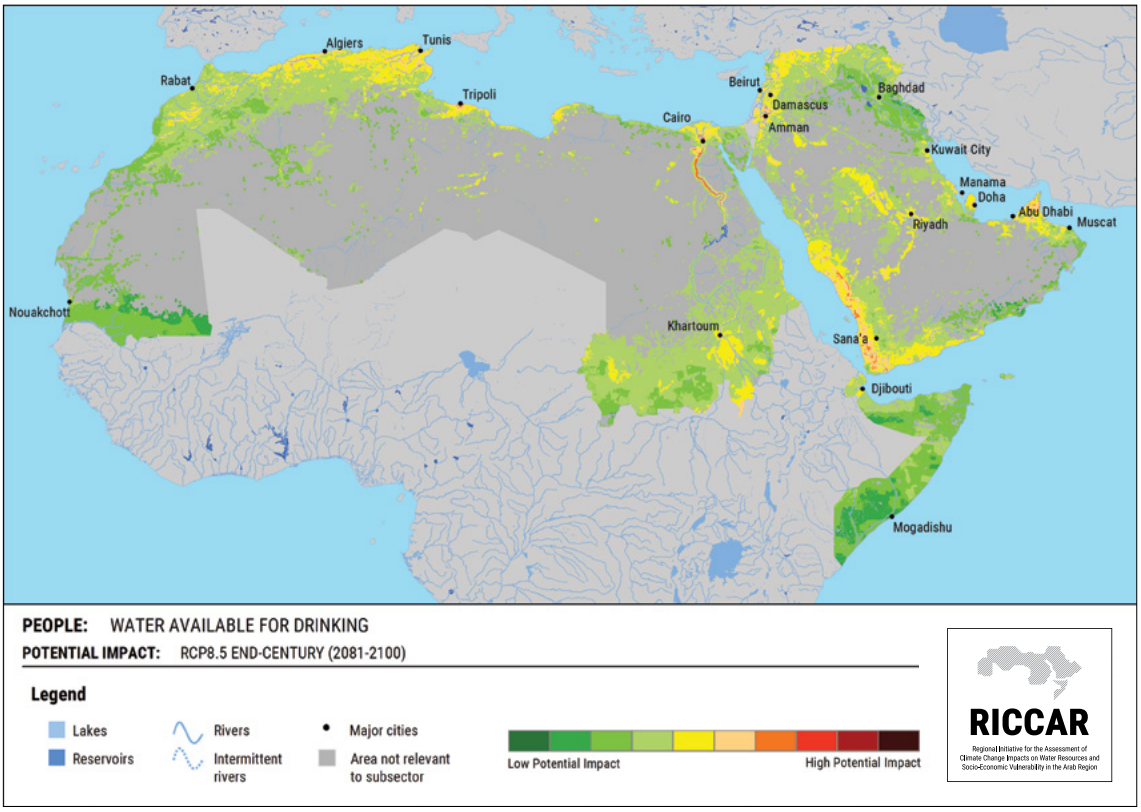
15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – 15.1.6.1. EXPOSURE

FIGURE 393




15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – 15.1.6.2. POTENTIAL IMPACT

FIGURE 394



15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – **15.1.6.3. VULNERABILITY**

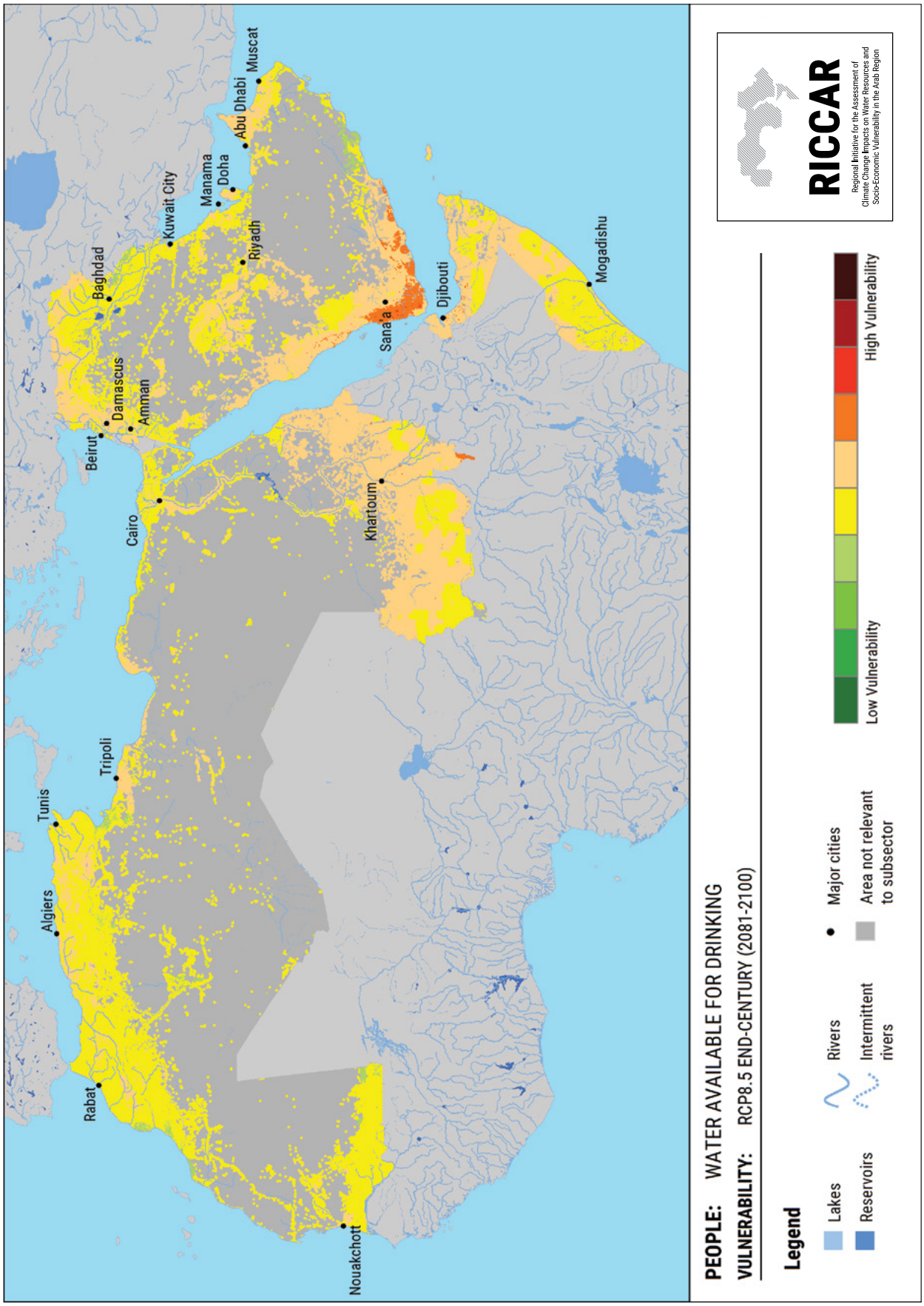



FIGURE 395

15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.1. IMPACT CHAIN

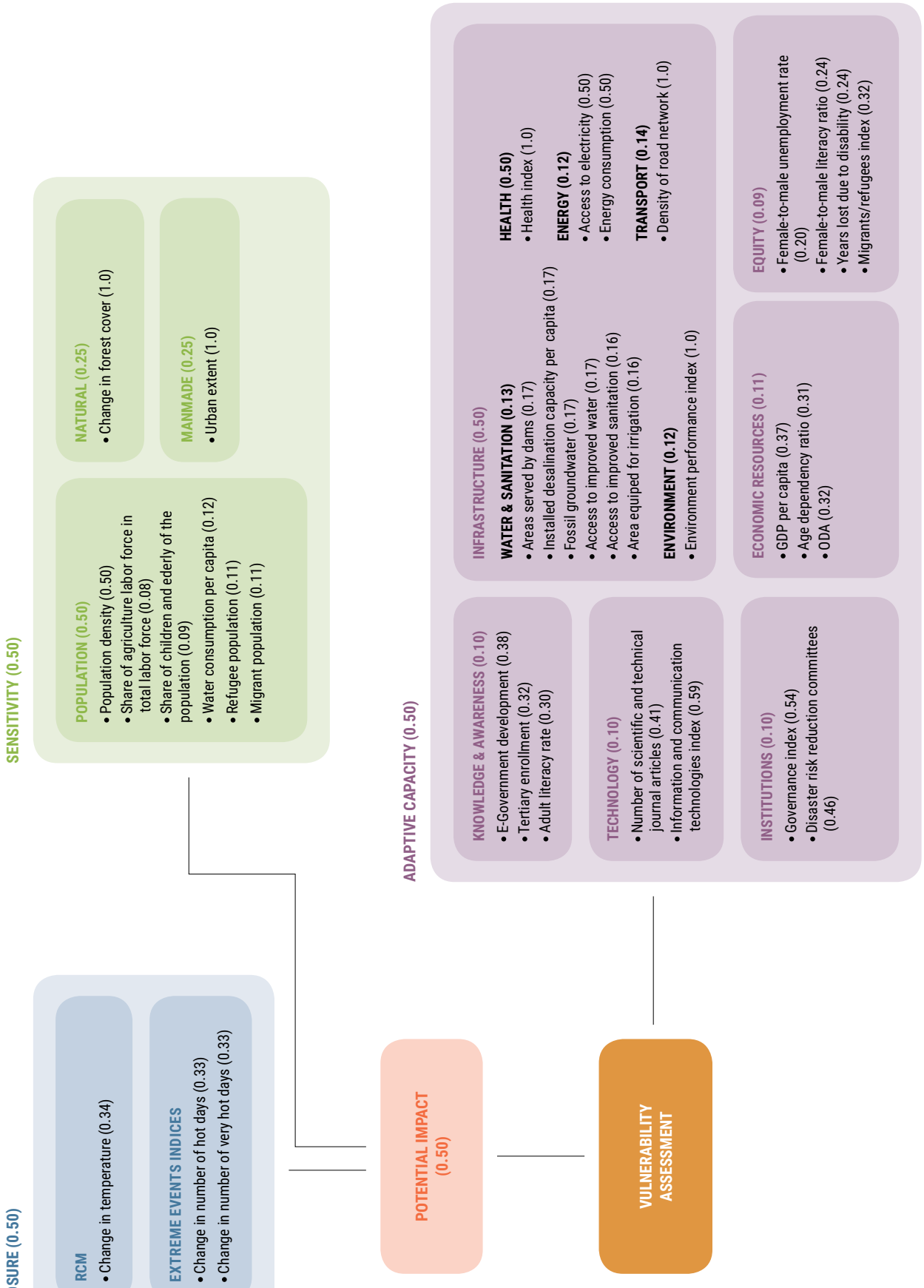
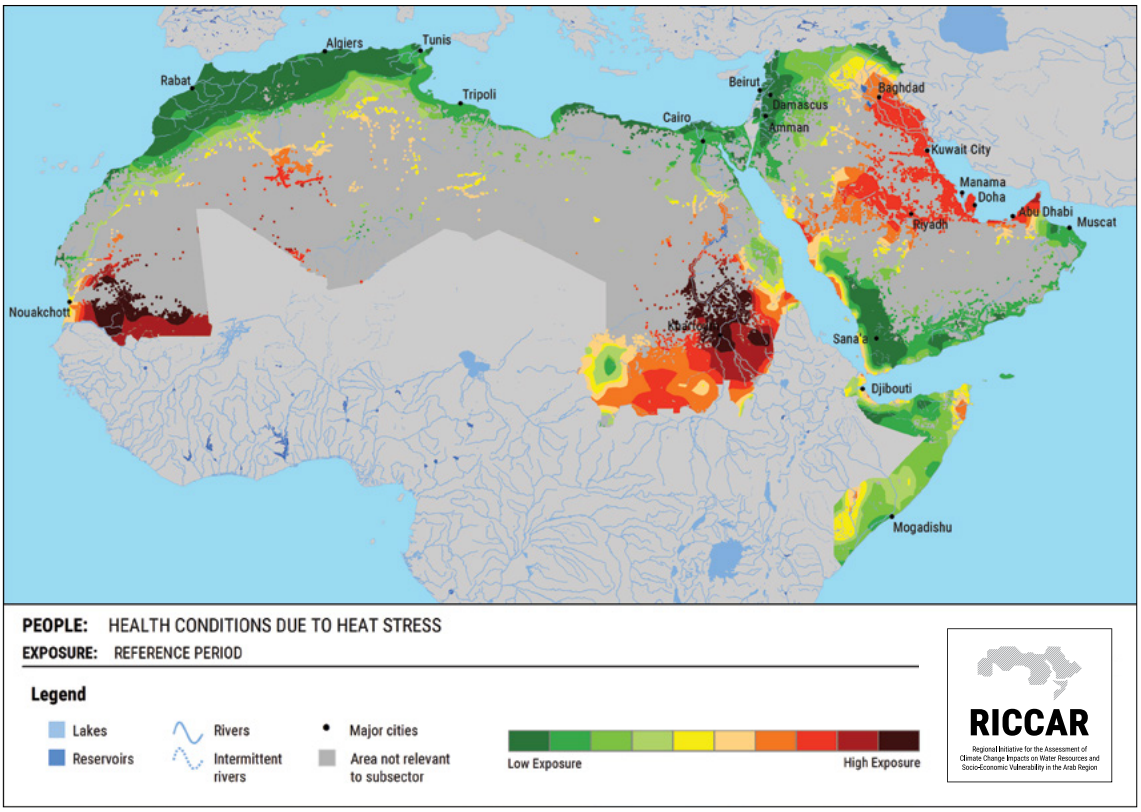



FIGURE 396

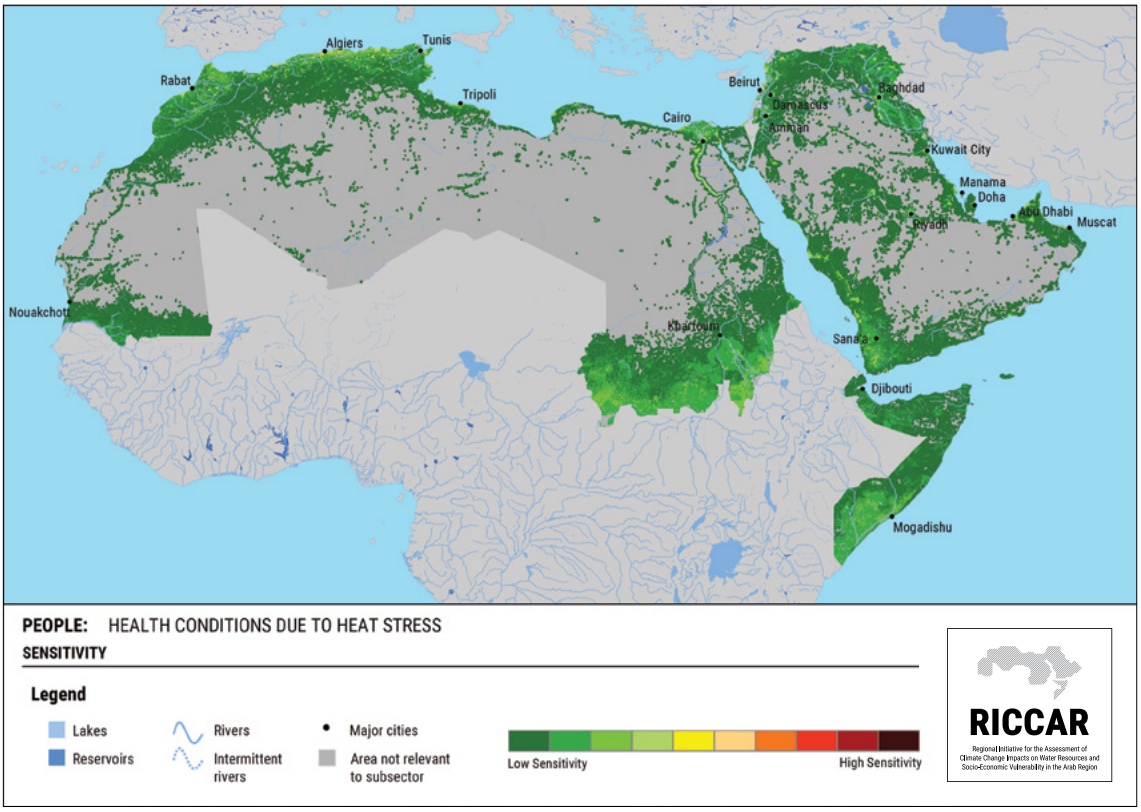
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – **15.2.2.1. EXPOSURE**

**FIGURE 397**



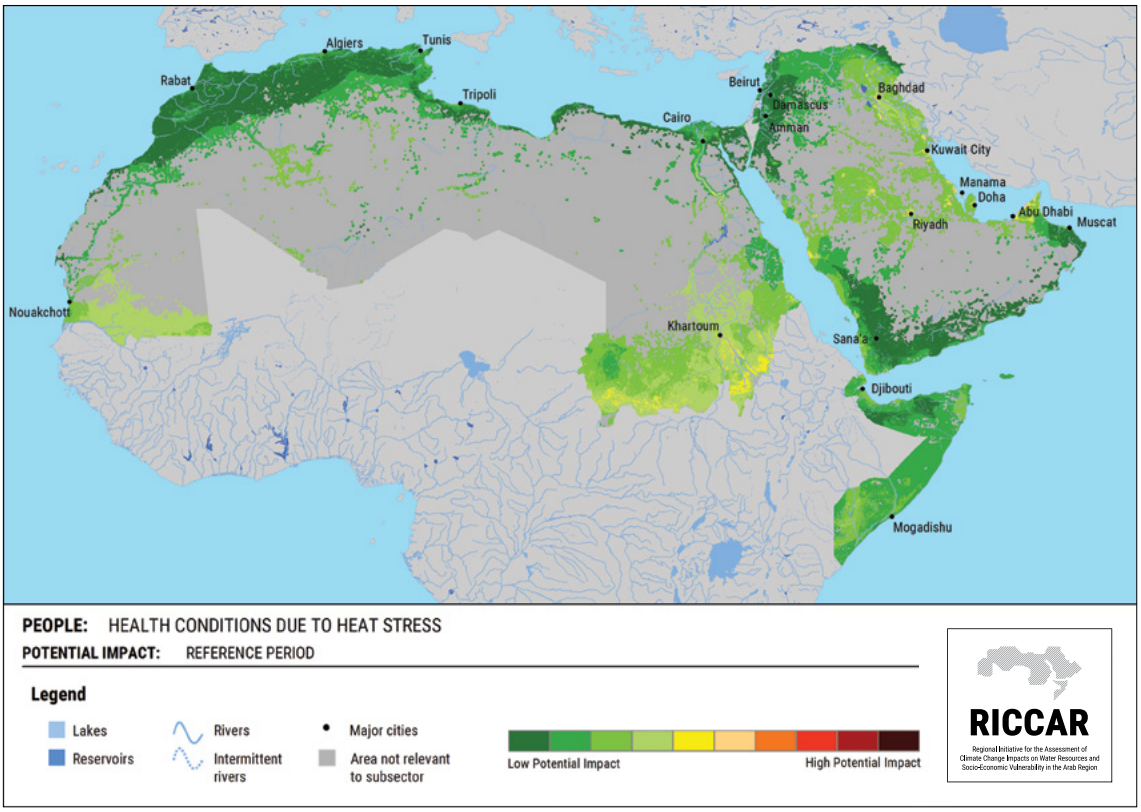

15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – **15.2.2.2. SENSITIVITY**

**FIGURE 398**



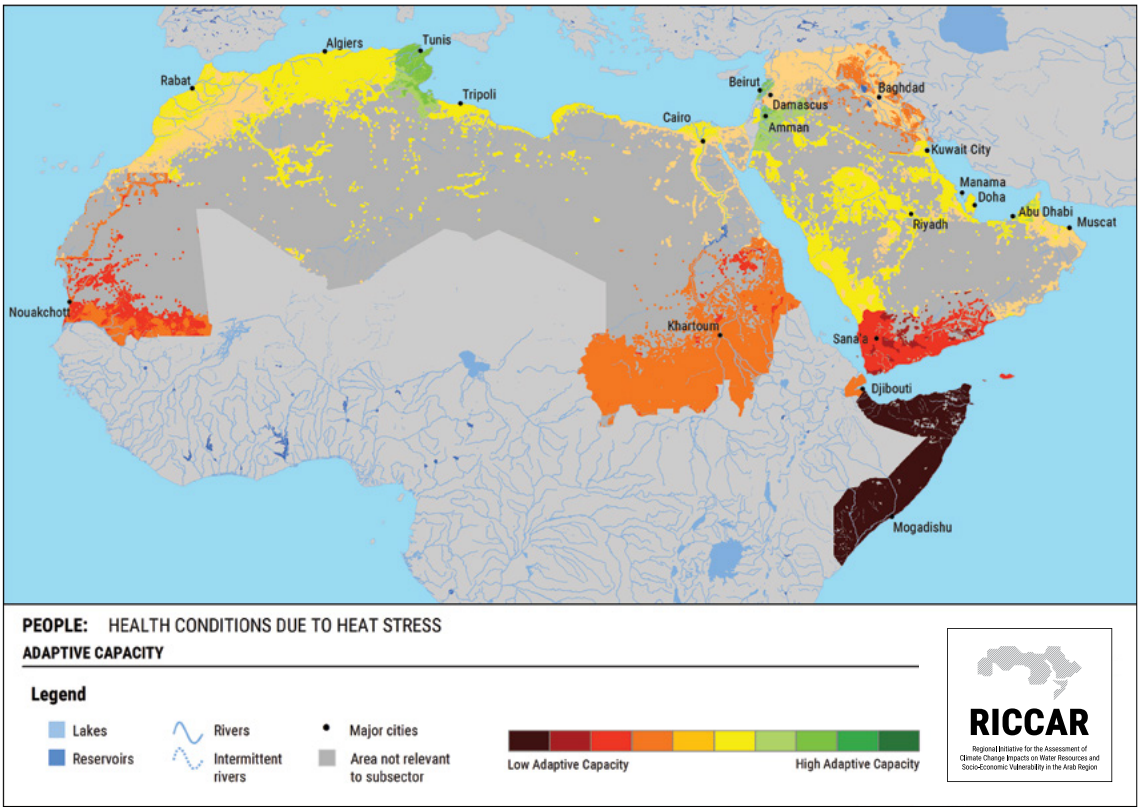
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.3. POTENTIAL IMPACT

FIGURE 399




15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.4. ADAPTIVE CAPACITY

FIGURE 400



15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – **15.2.2.5. VULNERABILITY**

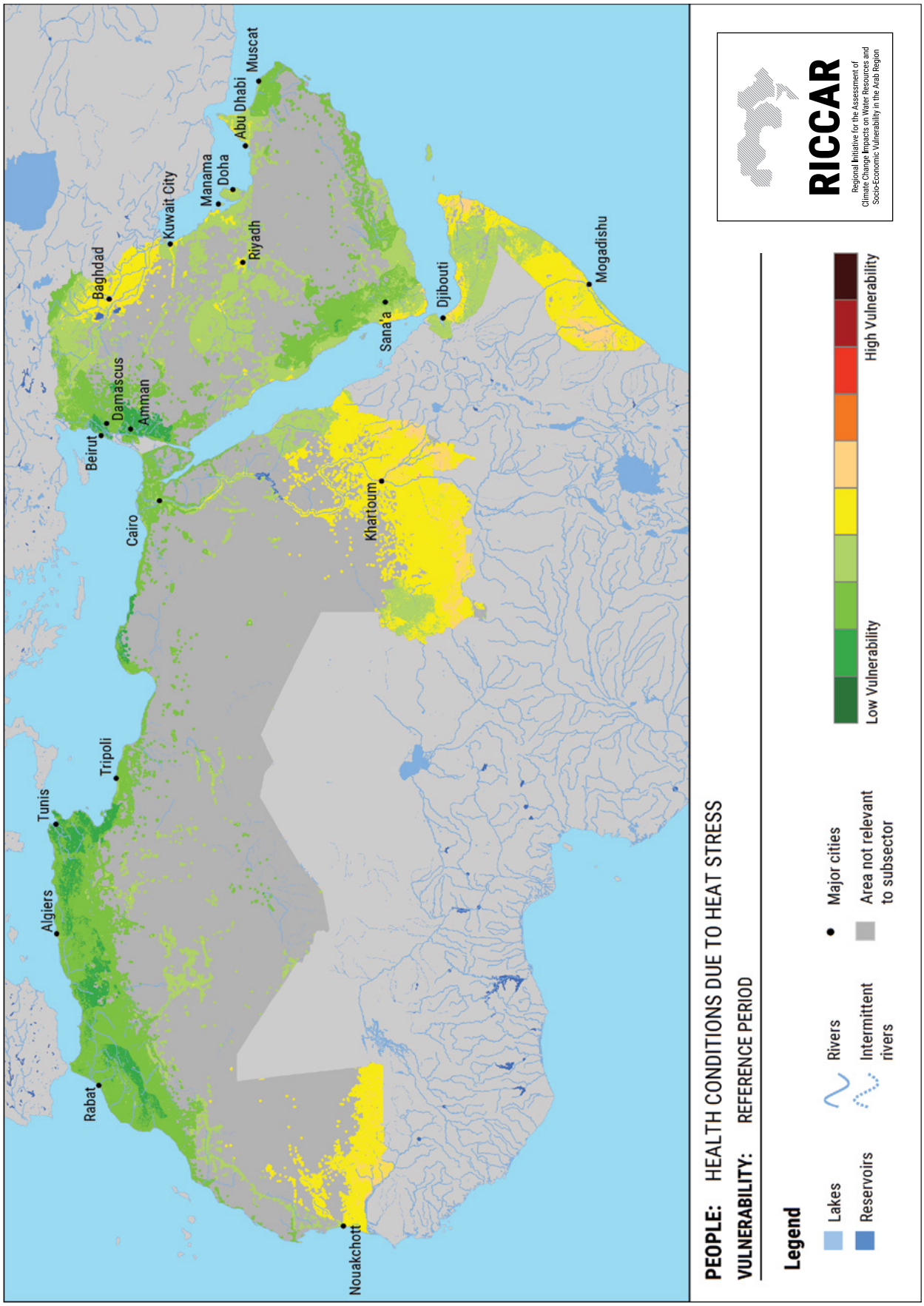
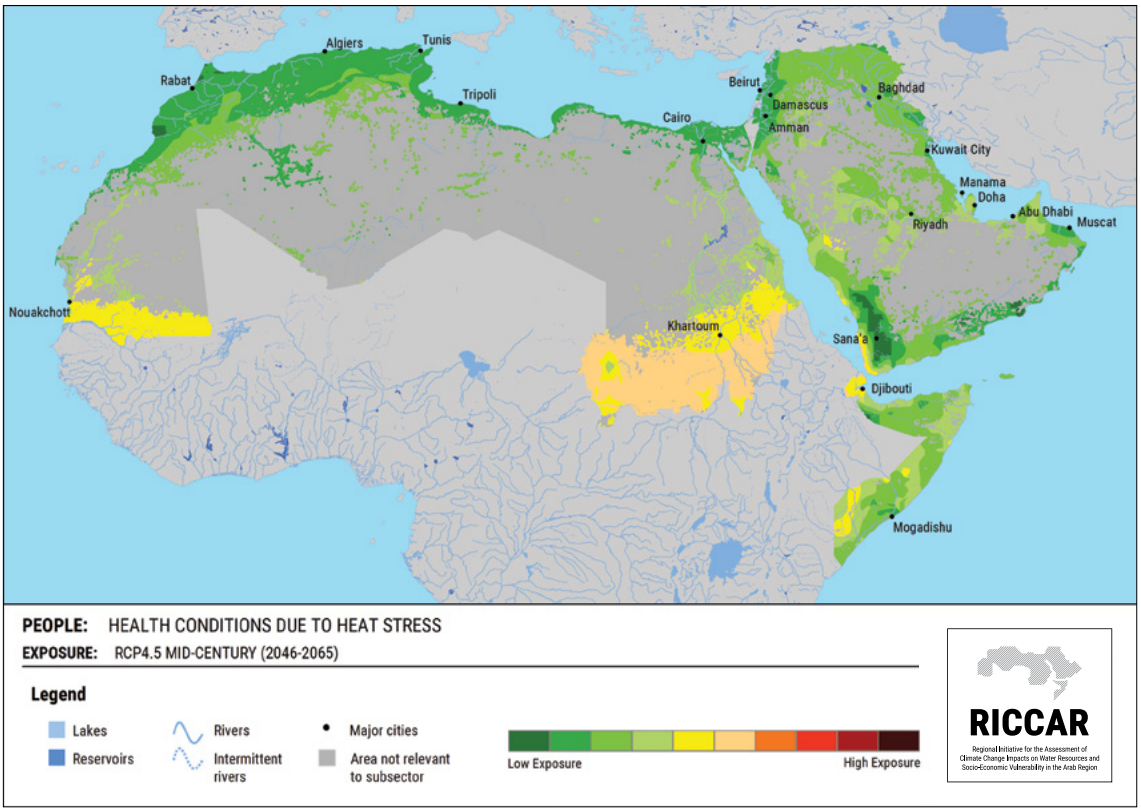



FIGURE 401

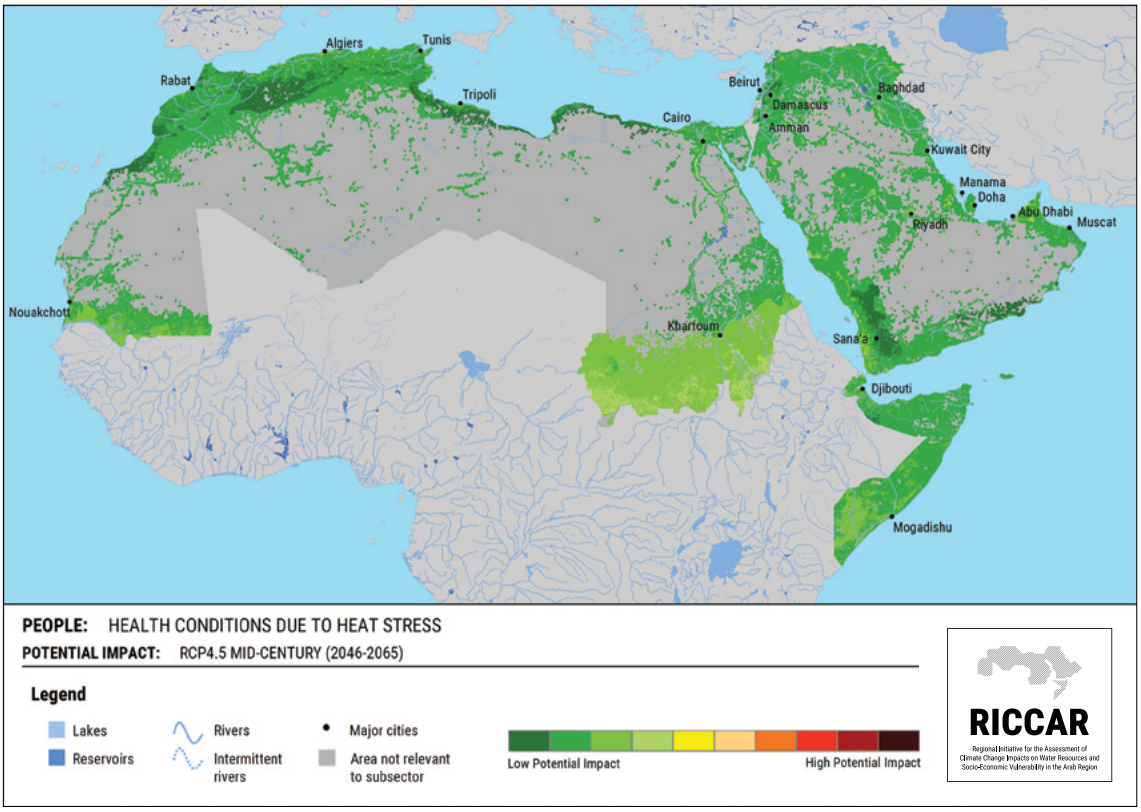
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – 15.2.3.1. EXPOSURE

FIGURE 402




15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – 15.2.3.2. POTENTIAL IMPACT

FIGURE 403



15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – **15.2.3.3. VULNERABILITY**

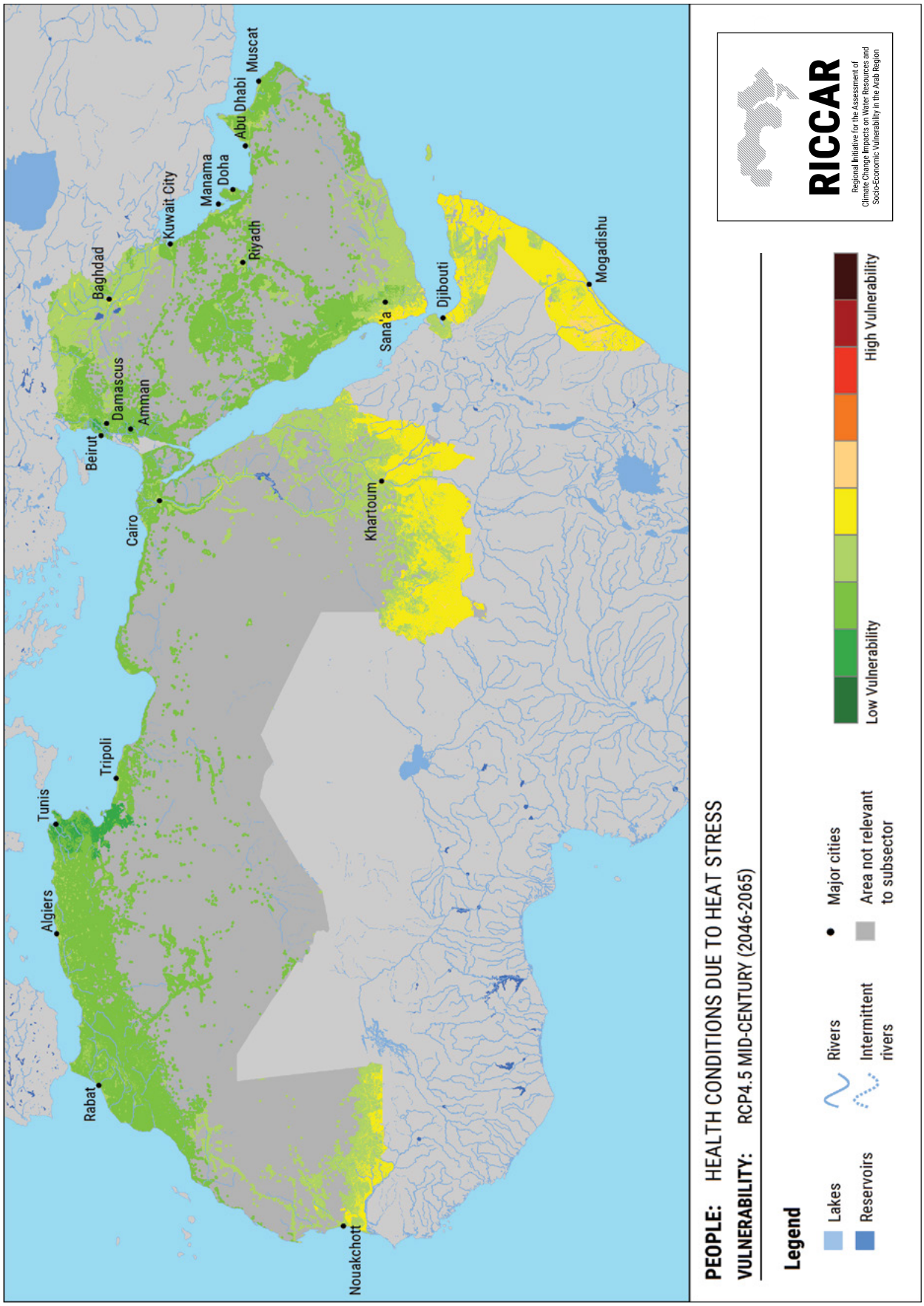
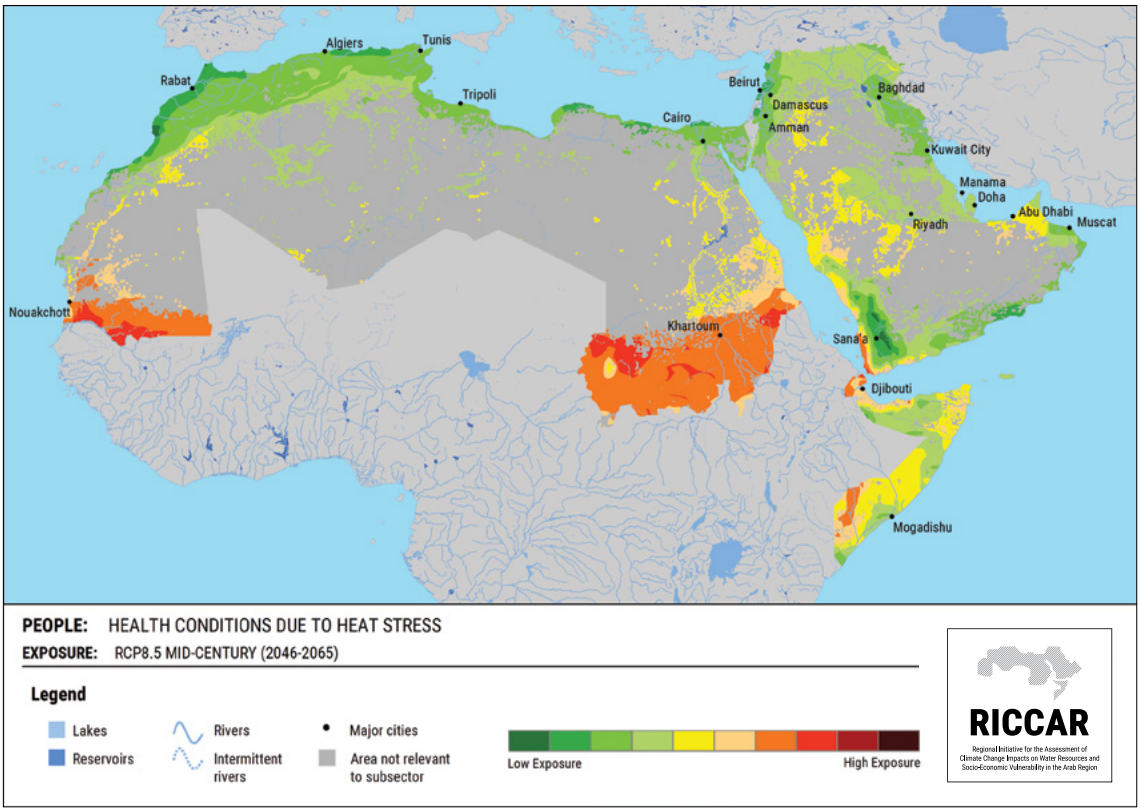



FIGURE 404

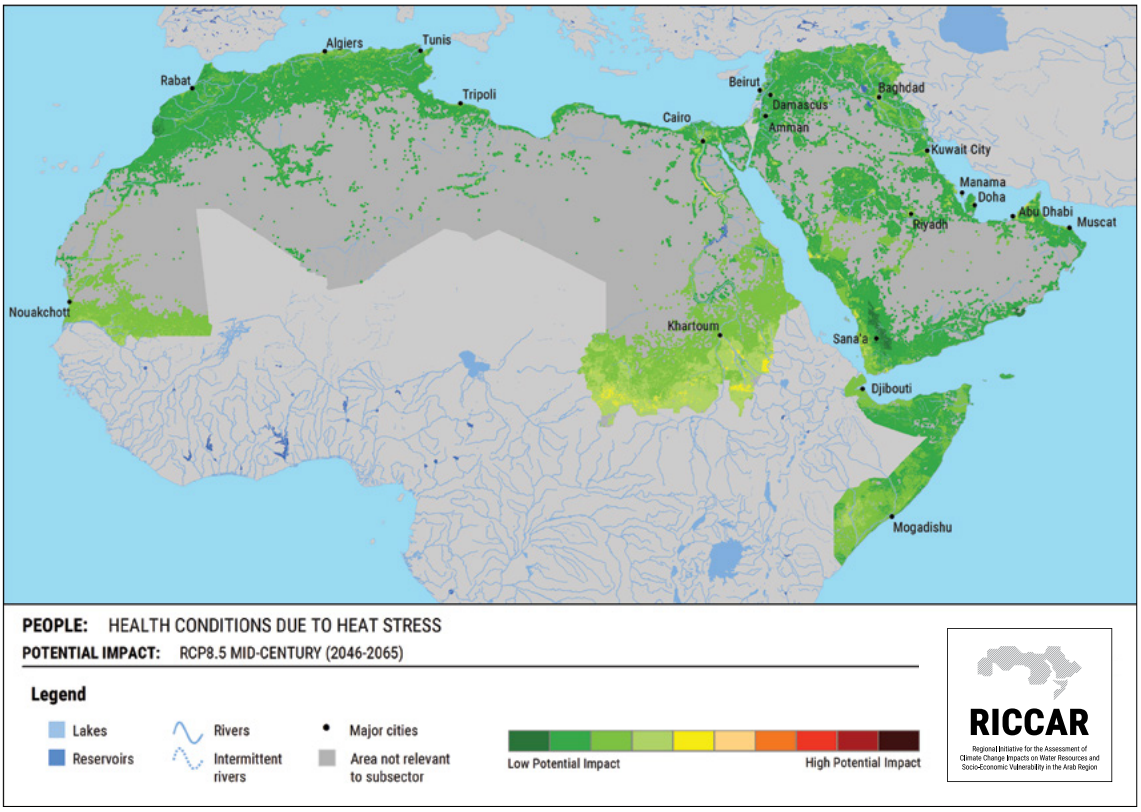
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – 15.2.4.1. EXPOSURE

FIGURE 405




15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – 15.2.4.2. POTENTIAL IMPACT

FIGURE 406



15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – **15.2.4.3. VULNERABILITY**

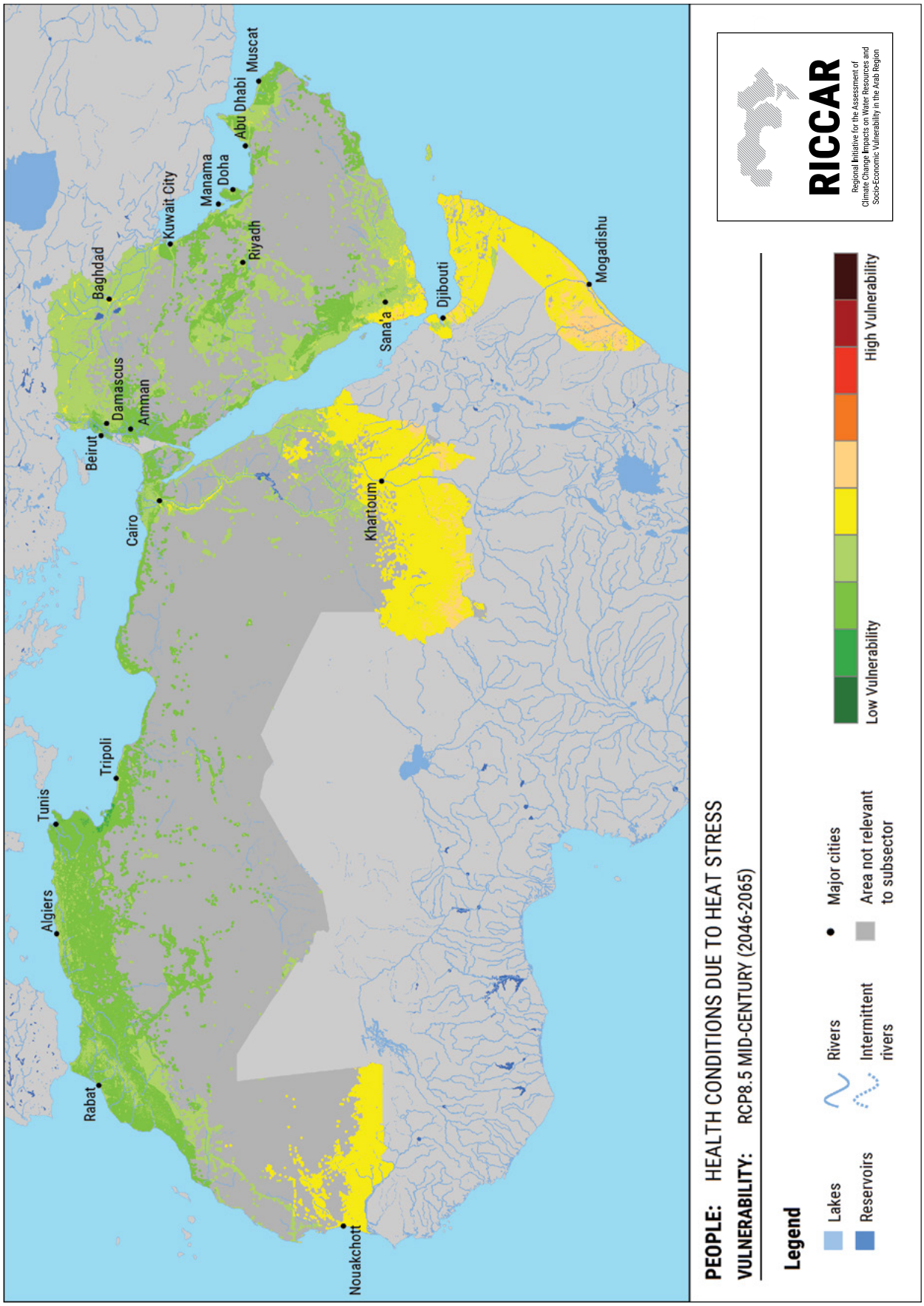
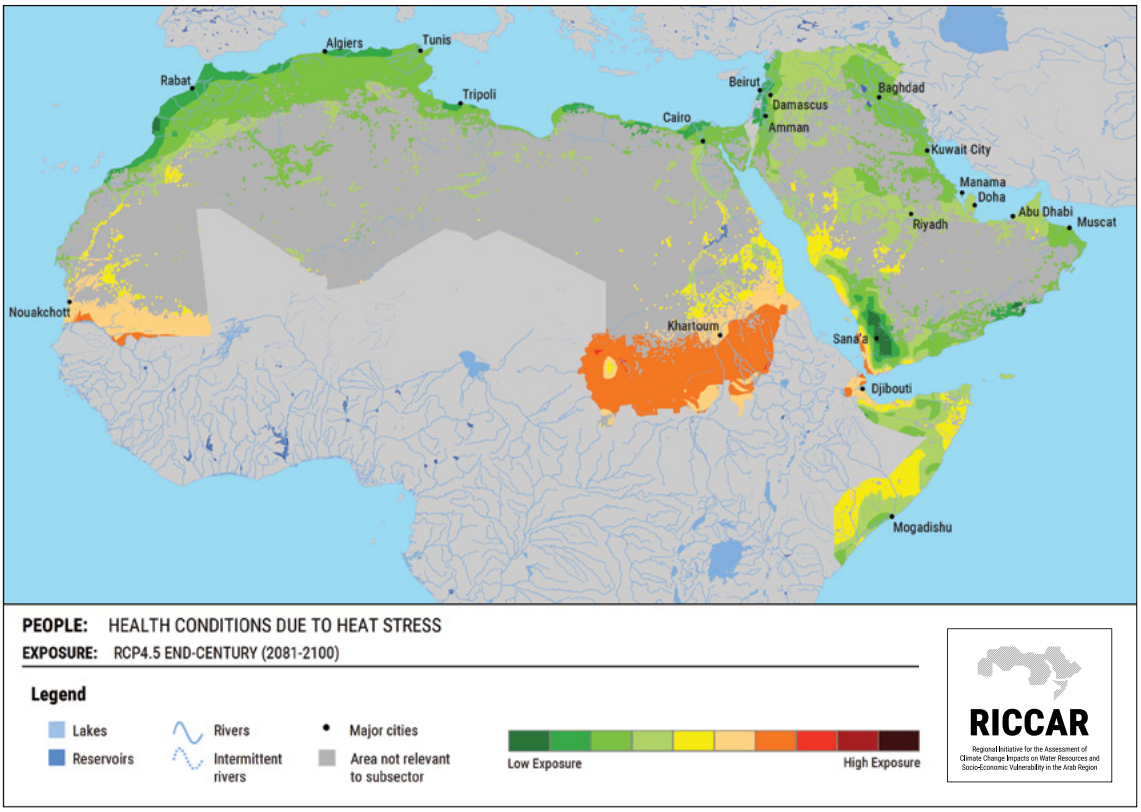



FIGURE 407

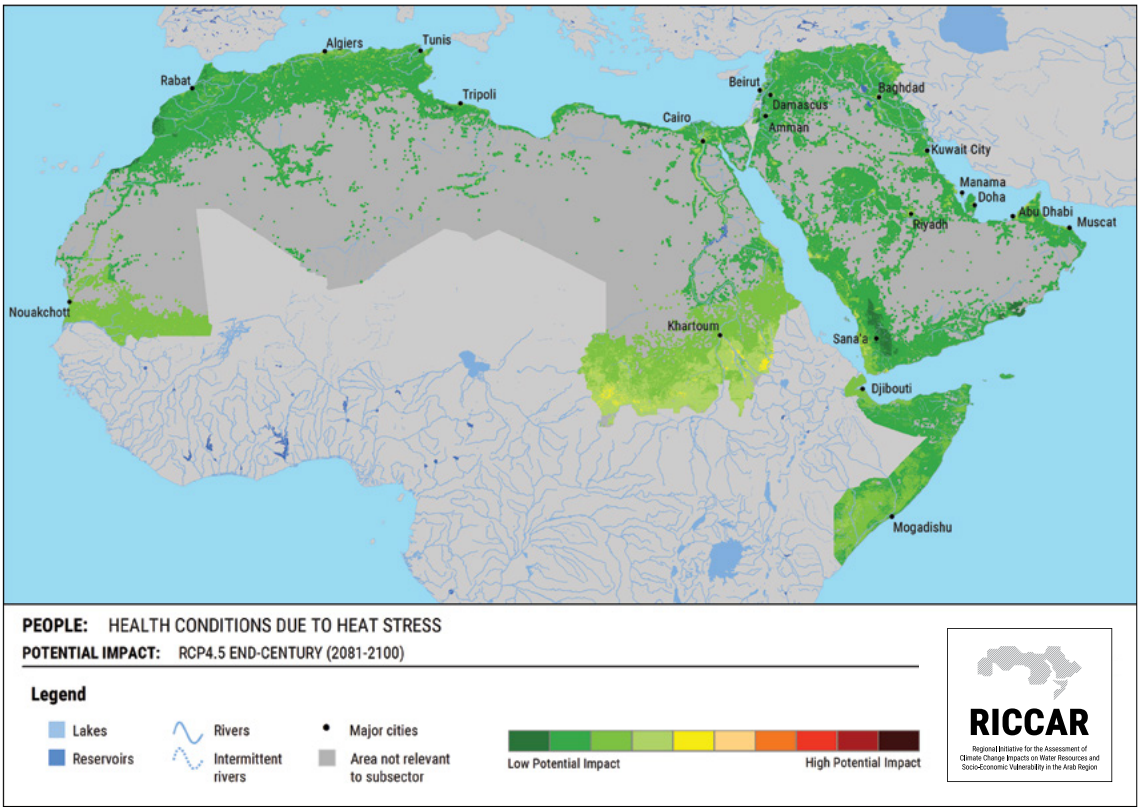
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – 15.2.5.1. EXPOSURE

FIGURE 408




15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – 15.2.5.2. POTENTIAL IMPACT

FIGURE 409



15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – **15.2.5.3. VULNERABILITY**

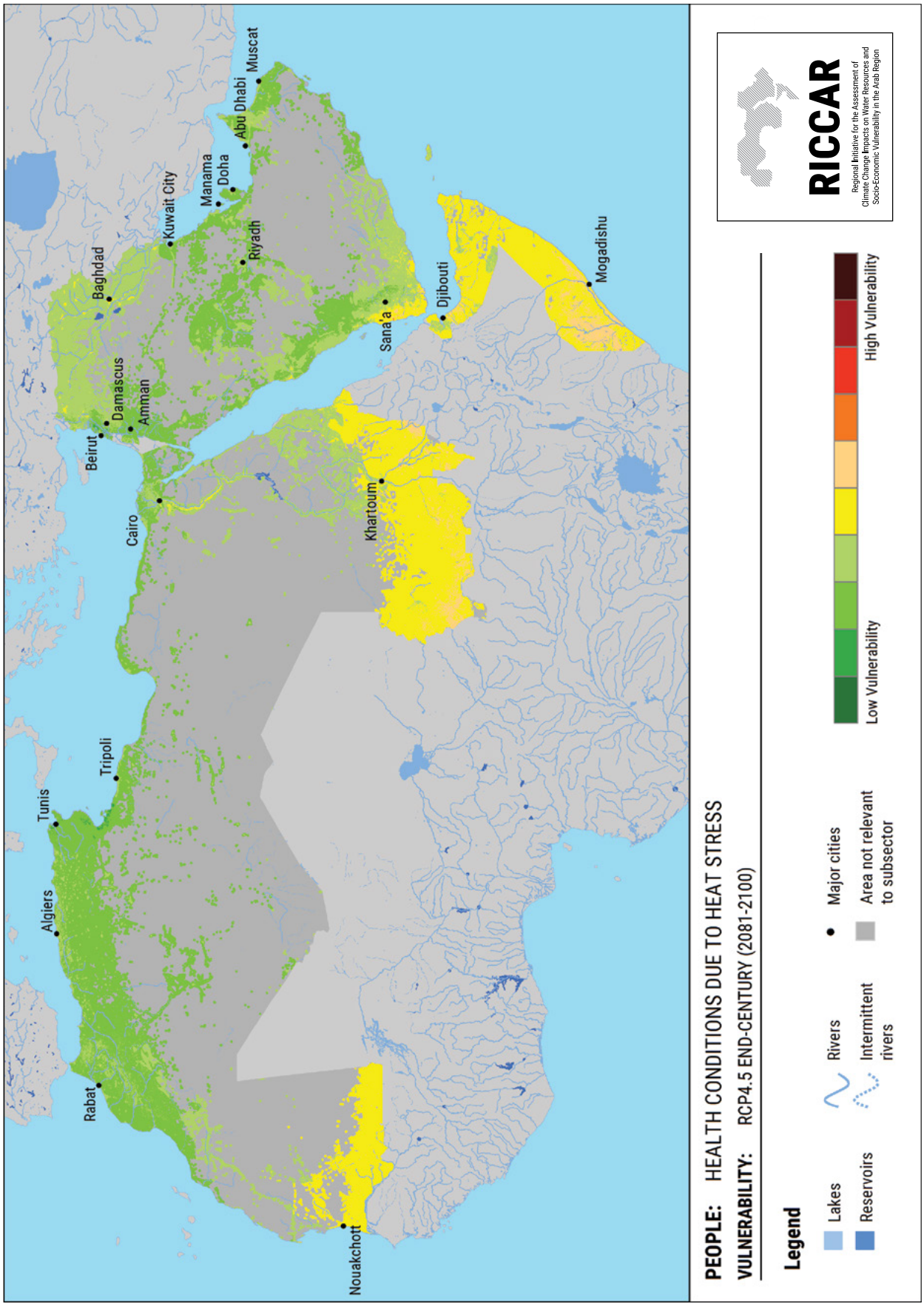
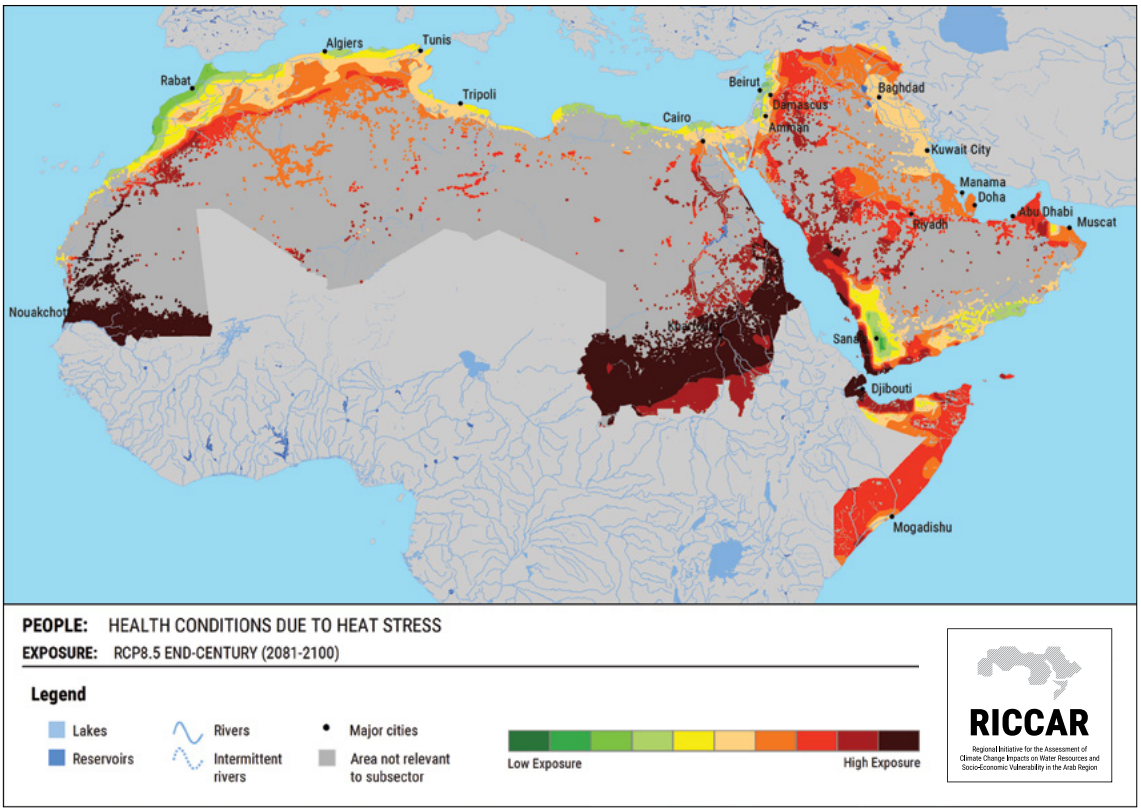



FIGURE 410

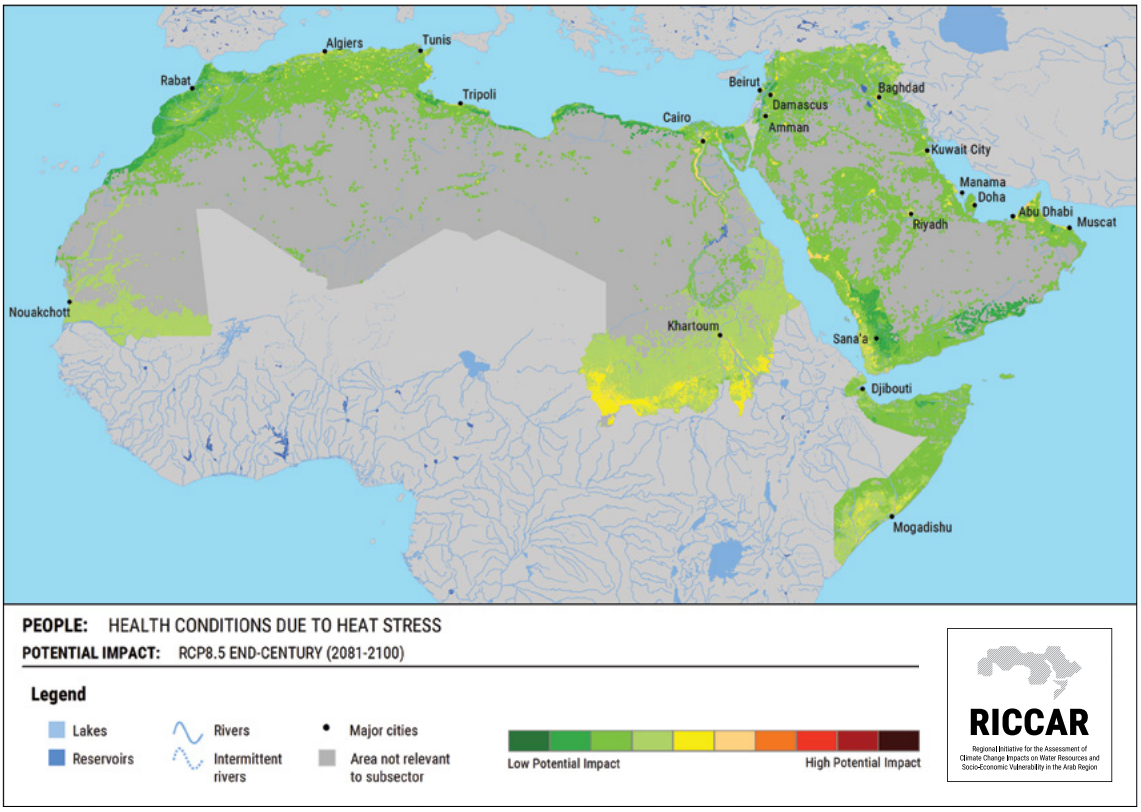
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – 15.2.6.1. EXPOSURE

FIGURE 411




15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – 15.2.6.2. POTENTIAL IMPACT

FIGURE 412



15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – **15.2.6.3. VULNERABILITY**

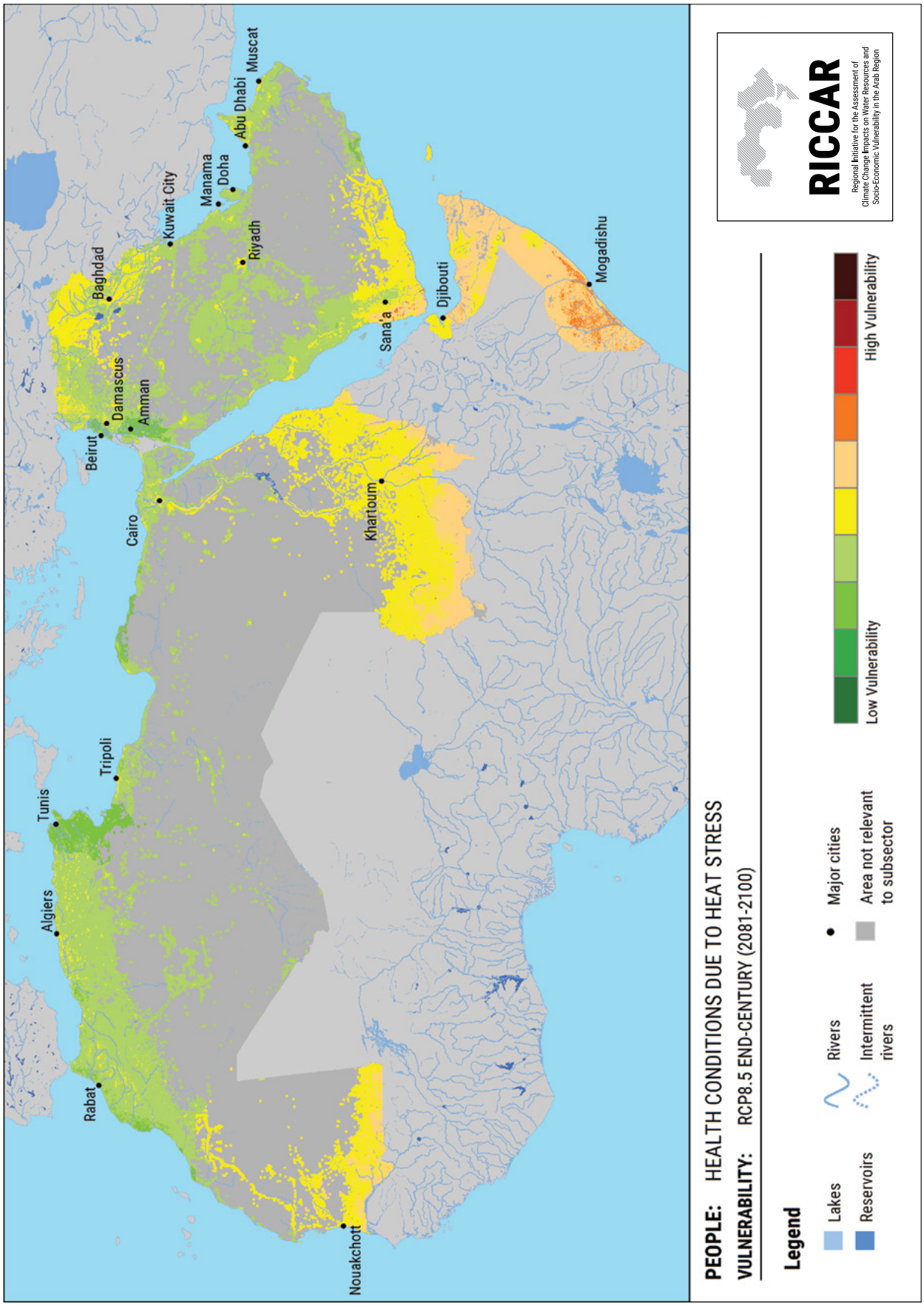
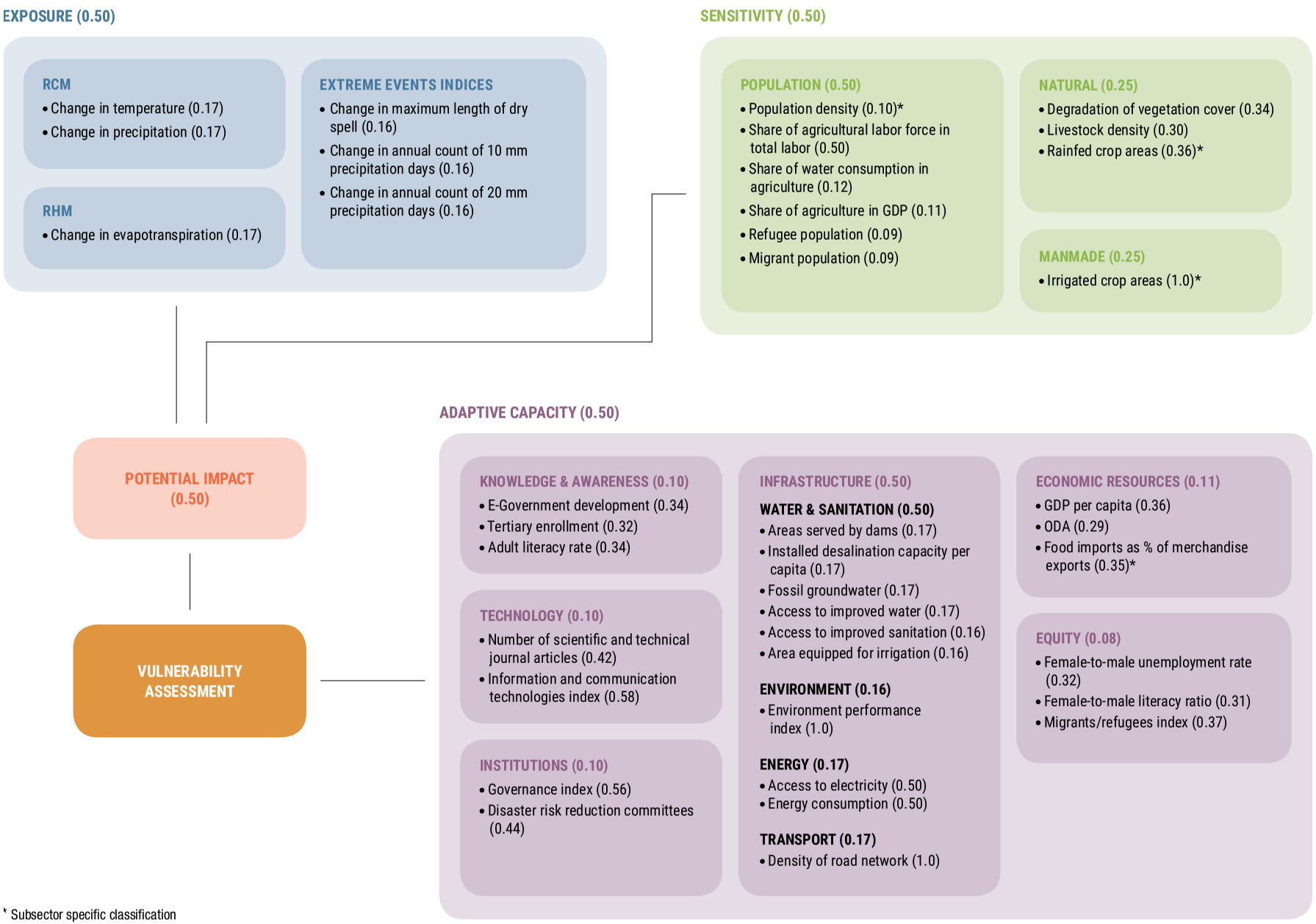



FIGURE 413

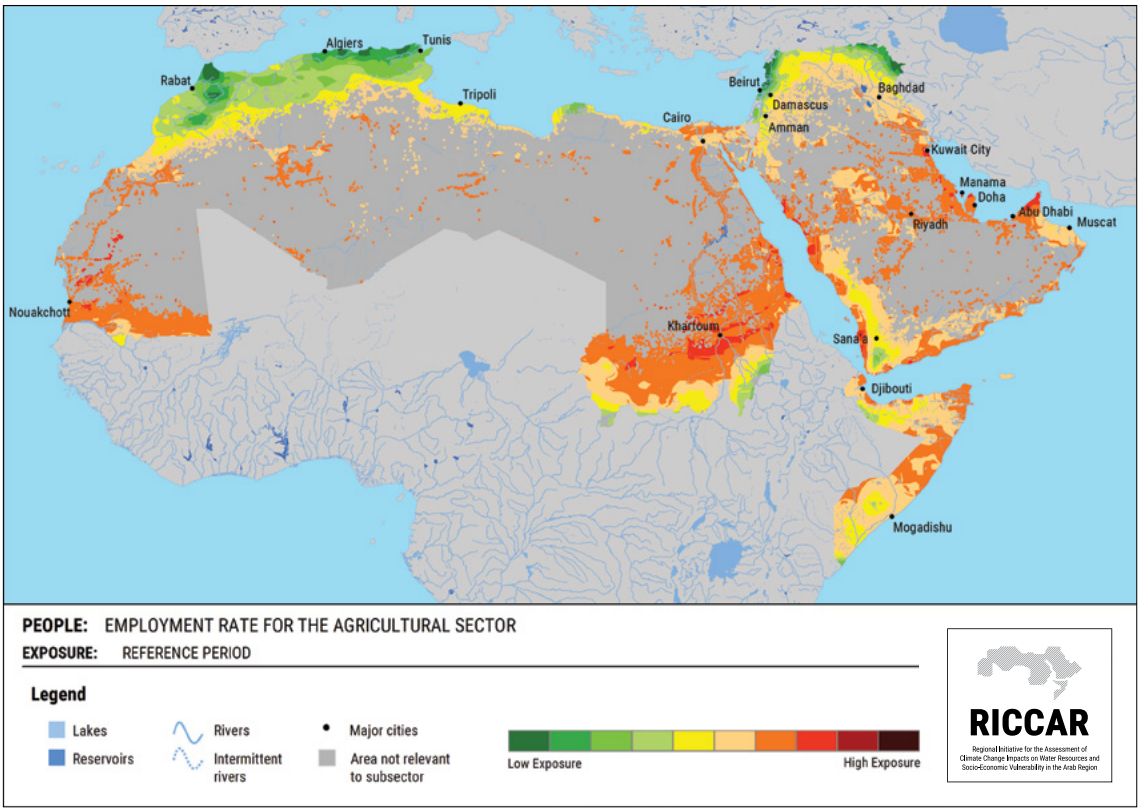
FIGURE 414




* Subsector specific classification

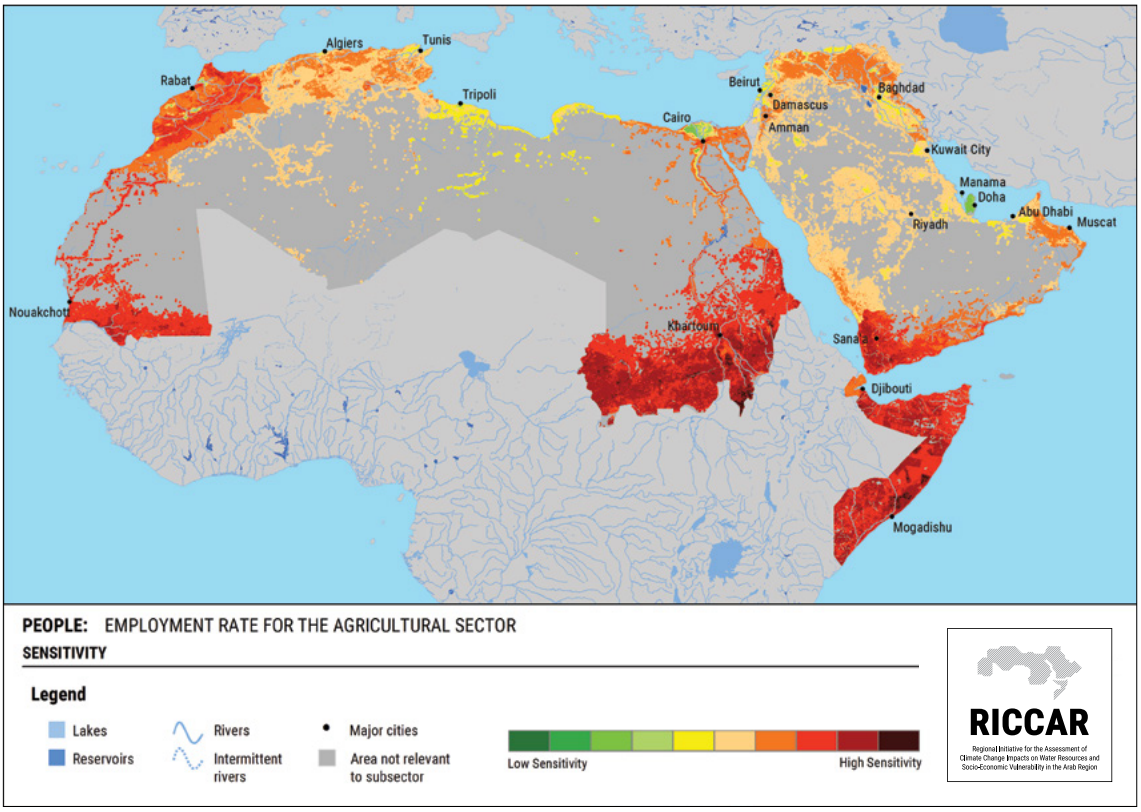
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – **15.3.2.1. EXPOSURE**

**FIGURE 415**



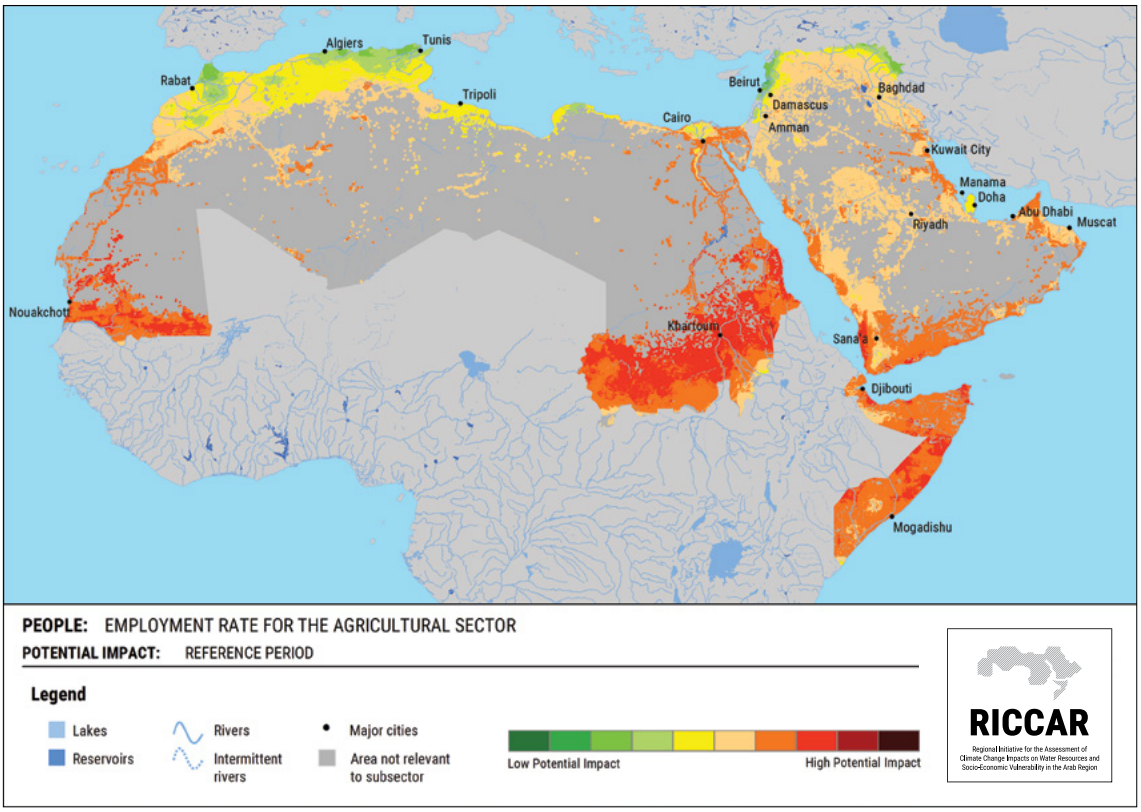

15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – **15.3.2.2. SENSITIVITY**

**FIGURE 416**



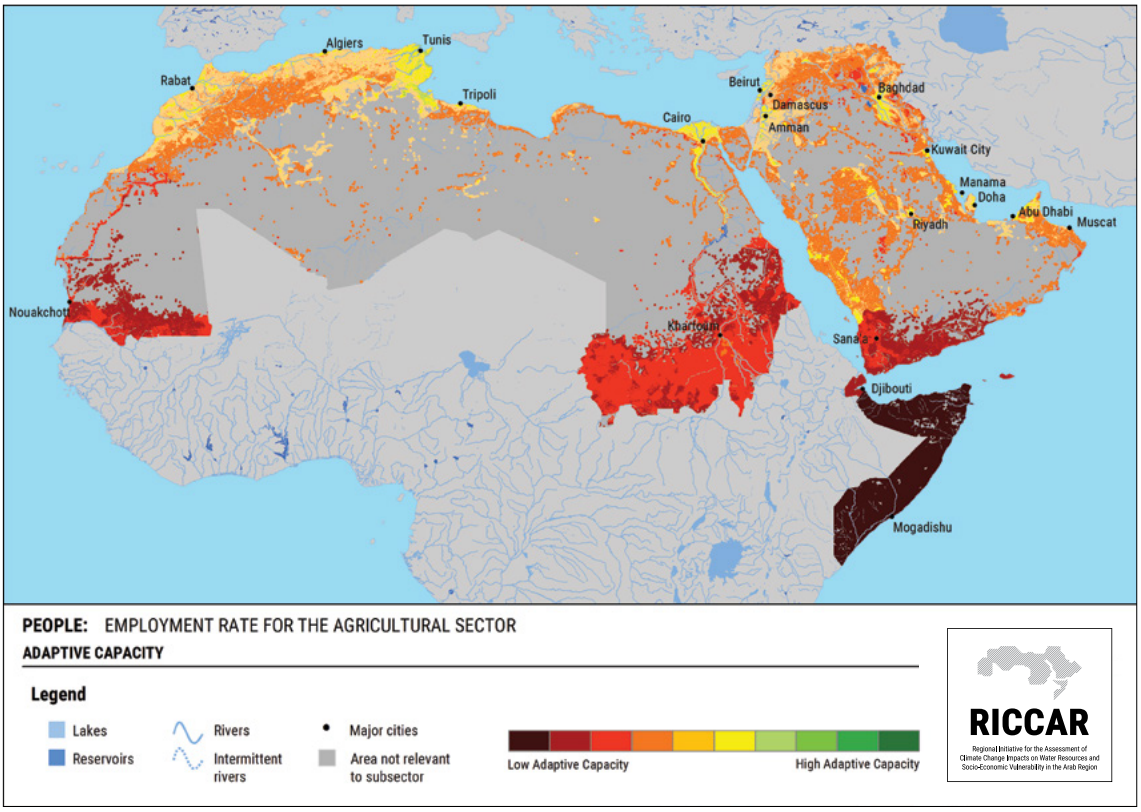
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.3. POTENTIAL IMPACT

FIGURE 417




15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.4. ADAPTIVE CAPACITY

FIGURE 418



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – **15.3.2.5. VULNERABILITY**

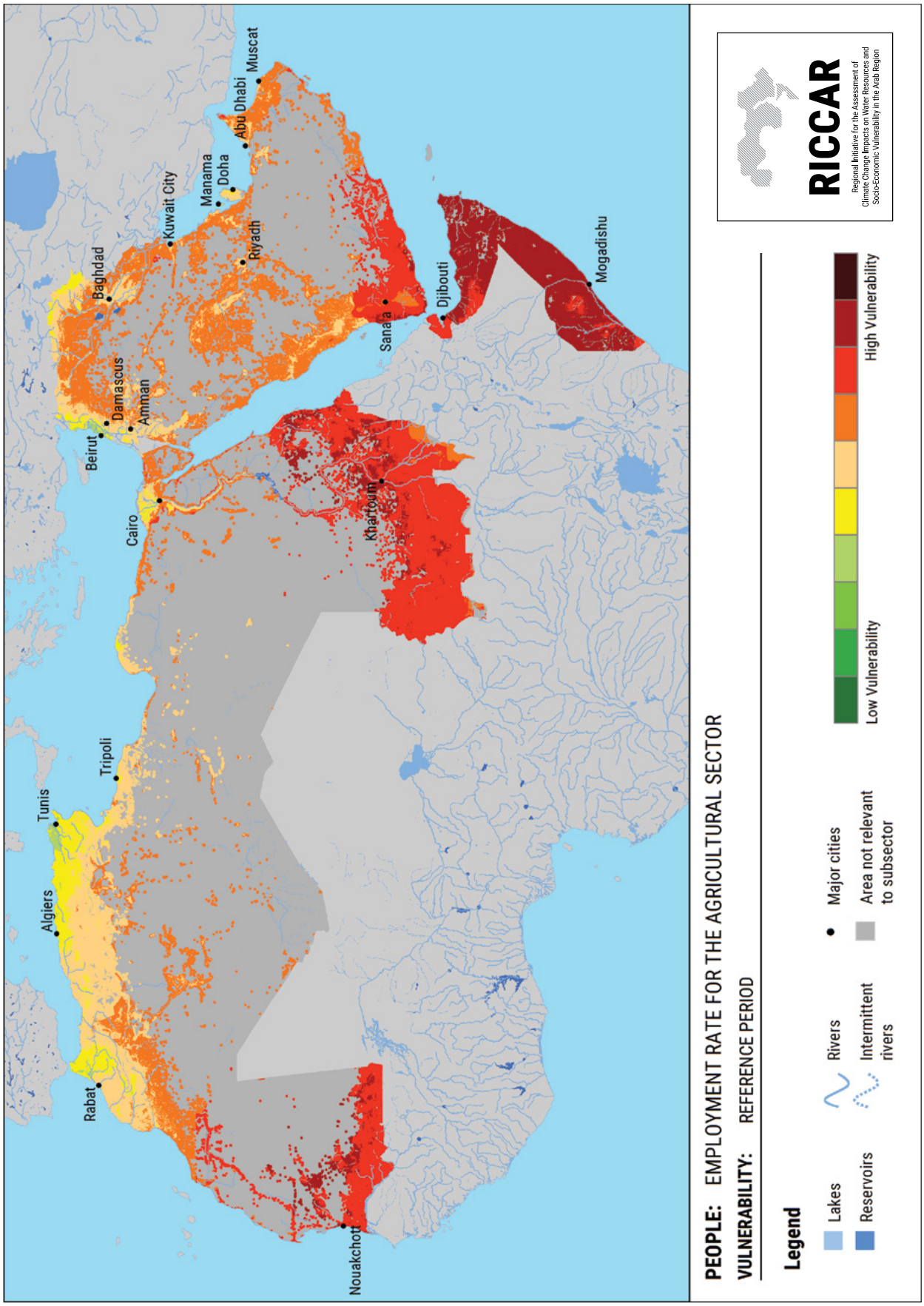
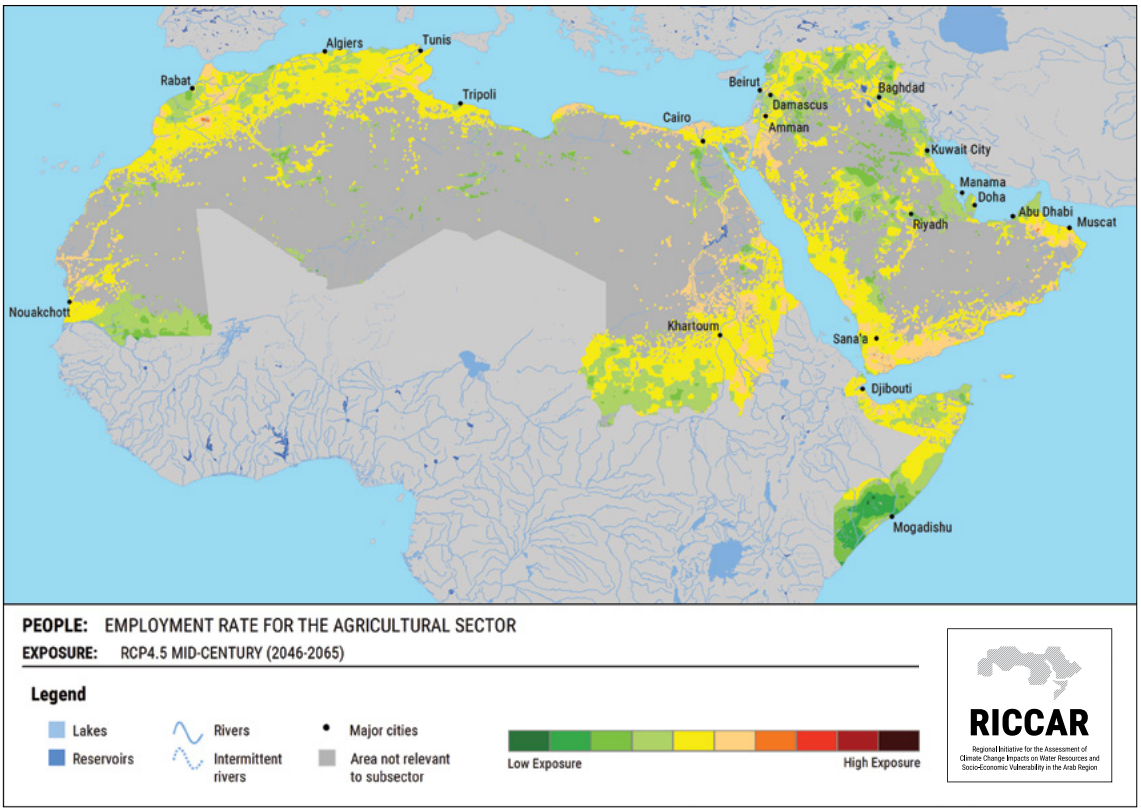



FIGURE 419

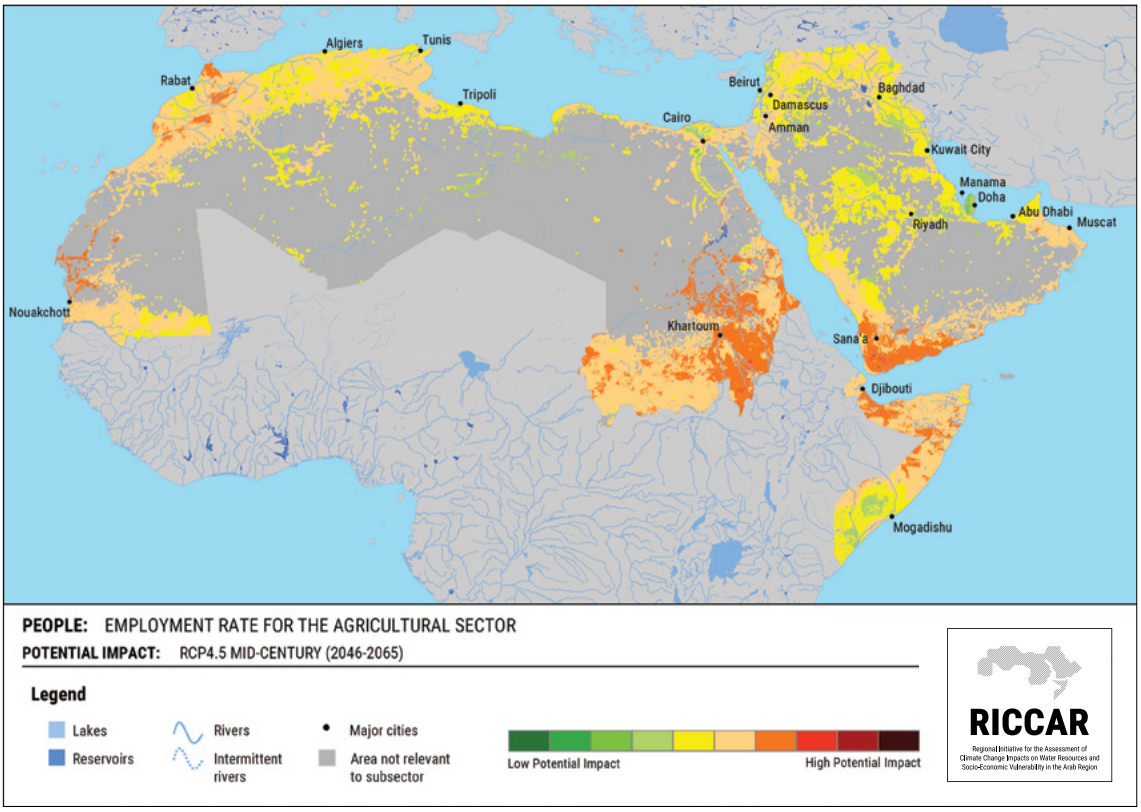
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – 15.3.3.1. EXPOSURE

FIGURE 420




15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – 15.3.3.2. POTENTIAL IMPACT

FIGURE 421



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – **15.3.3.3. VULNERABILITY**

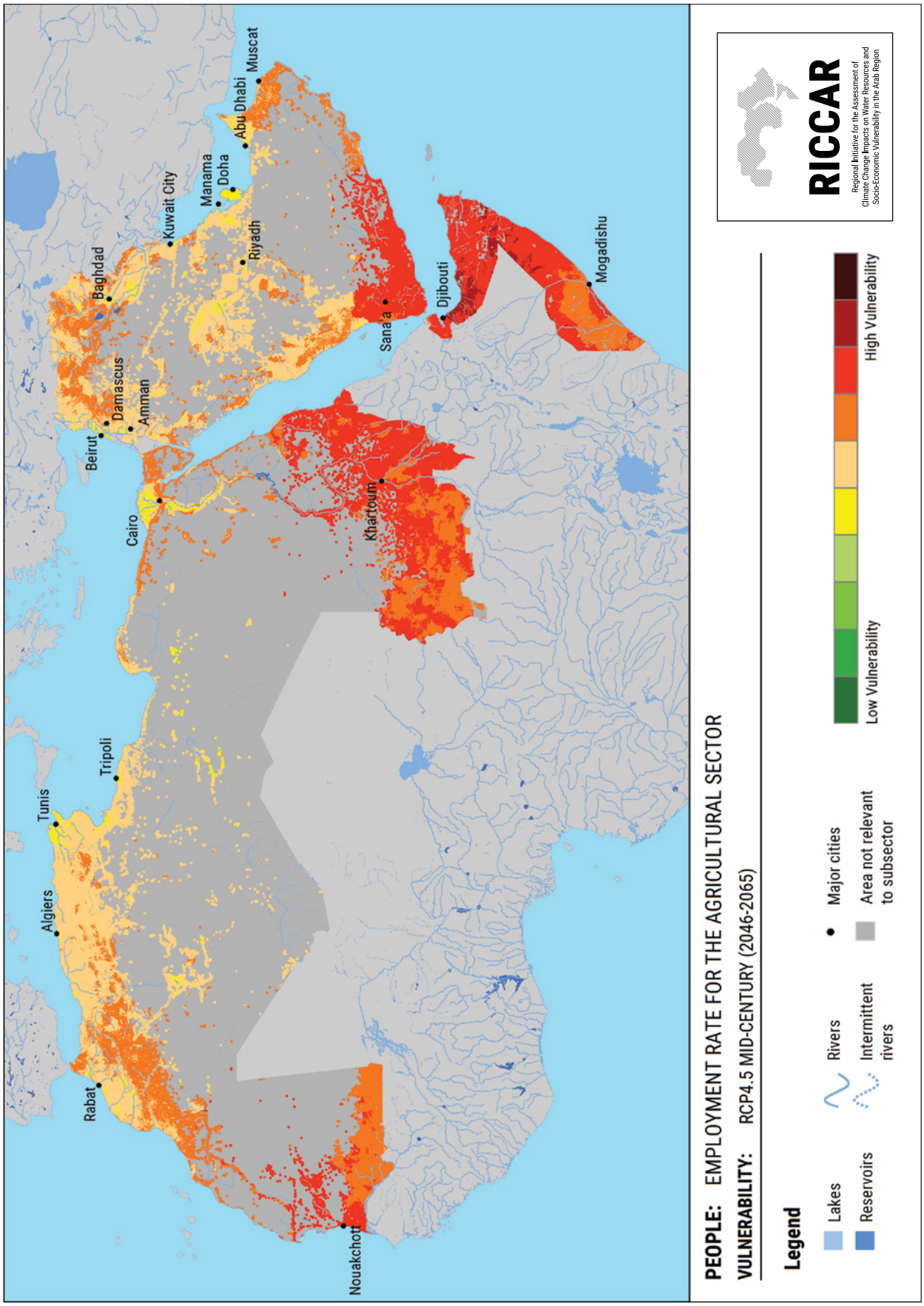
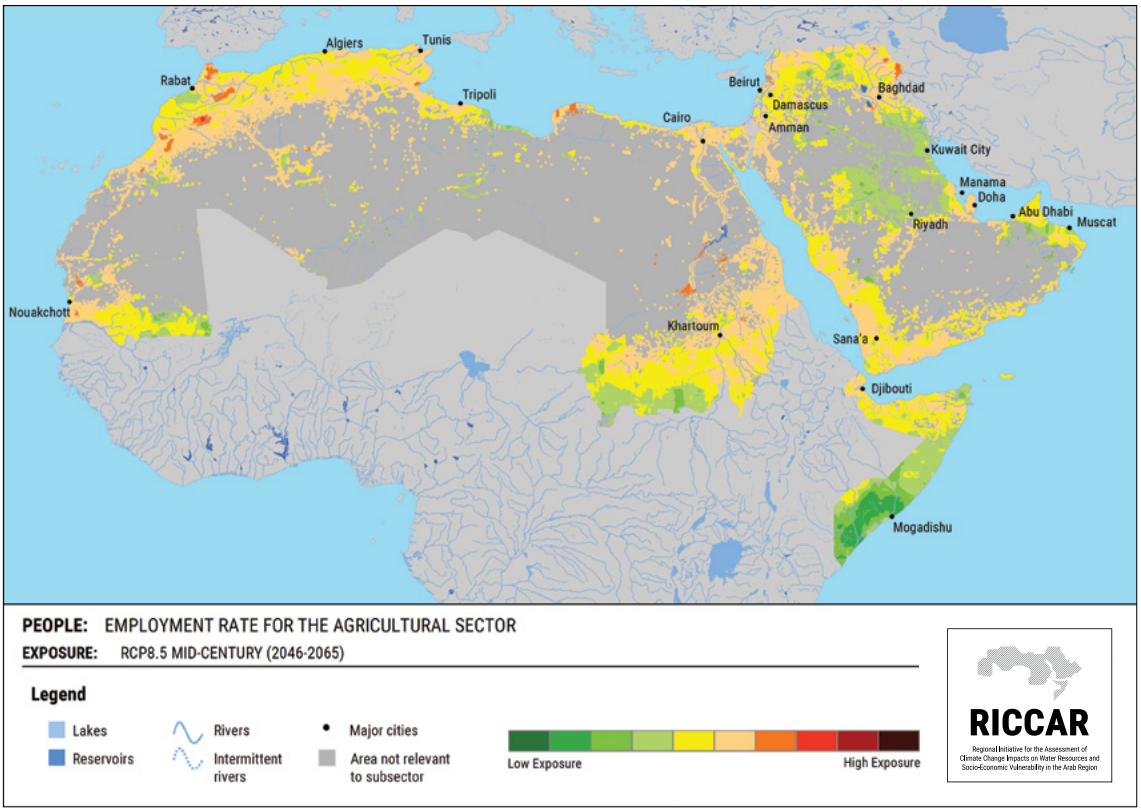



FIGURE 422

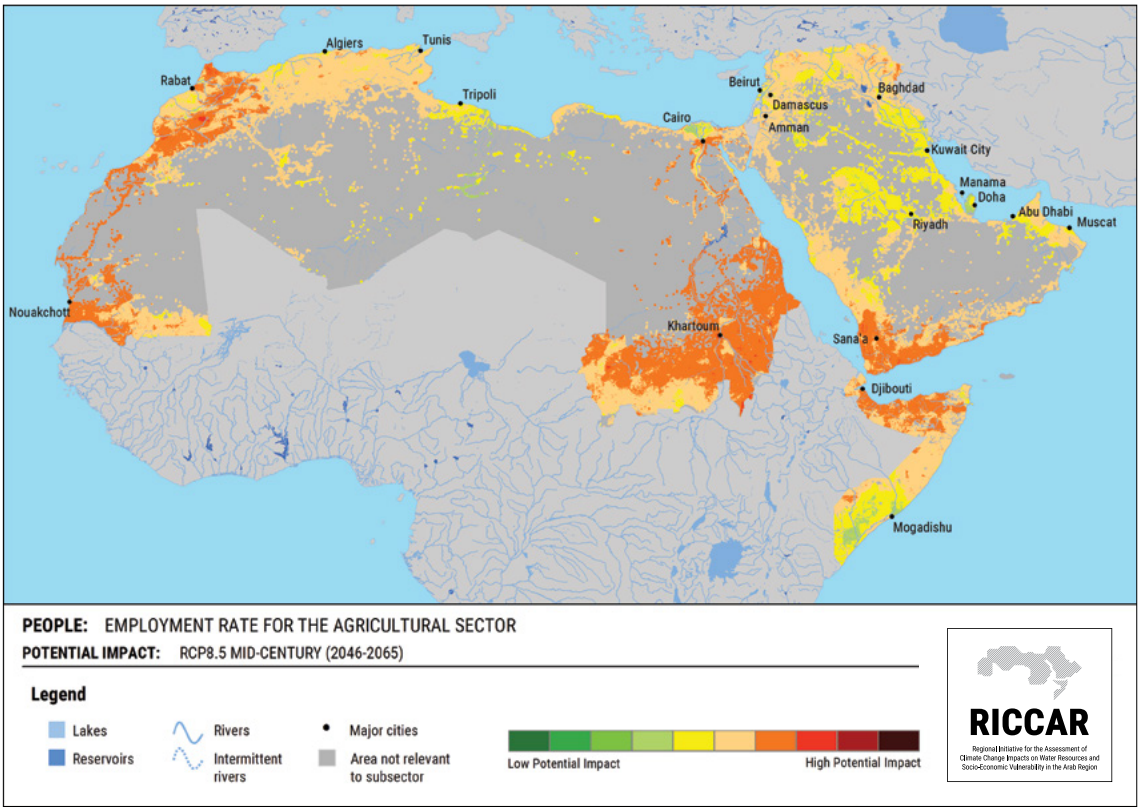
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – 15.3.4.1. EXPOSURE

FIGURE 423




15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – 15.3.4.2. POTENTIAL IMPACT

FIGURE 424



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – **15.3.4.3. VULNERABILITY**

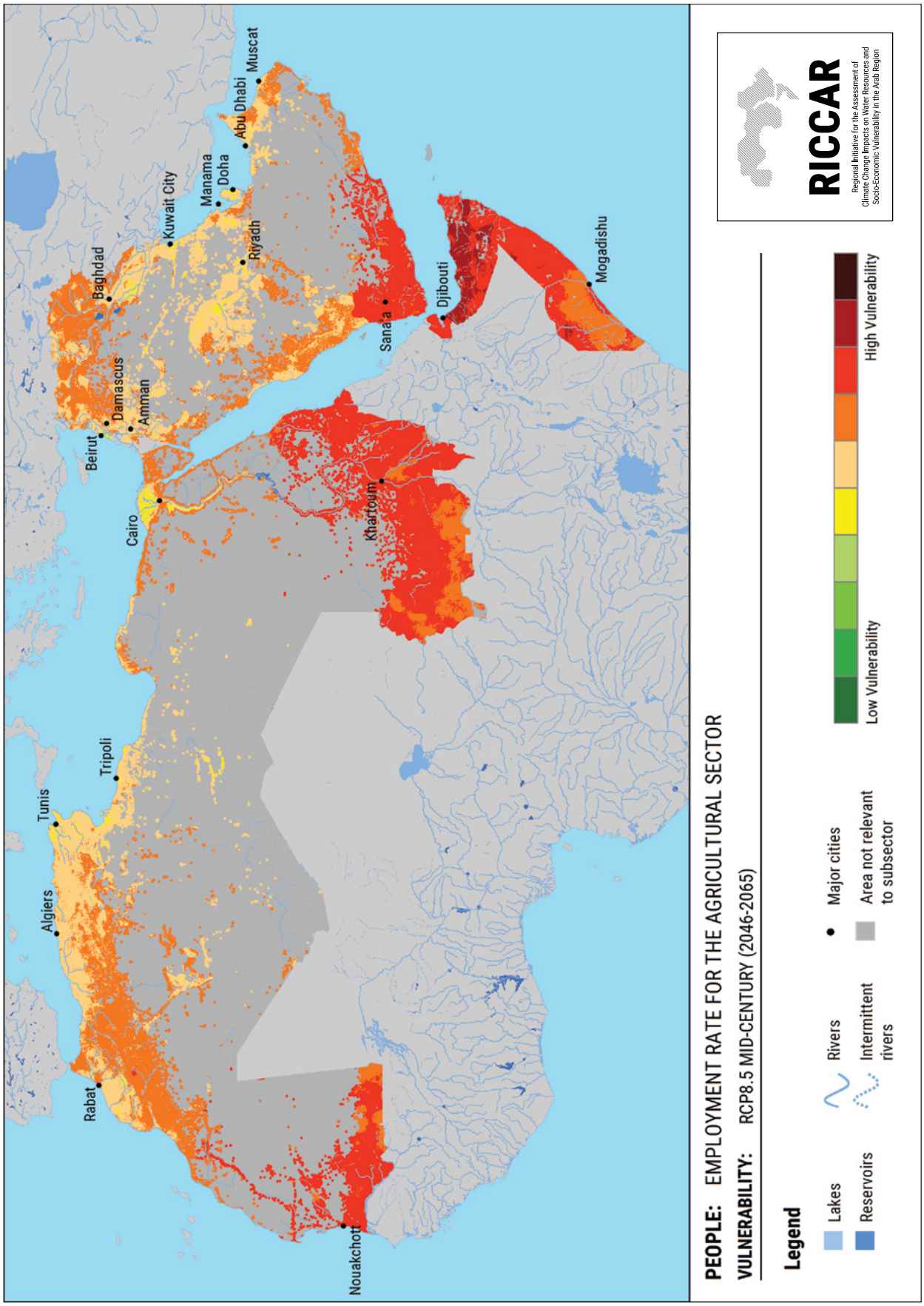
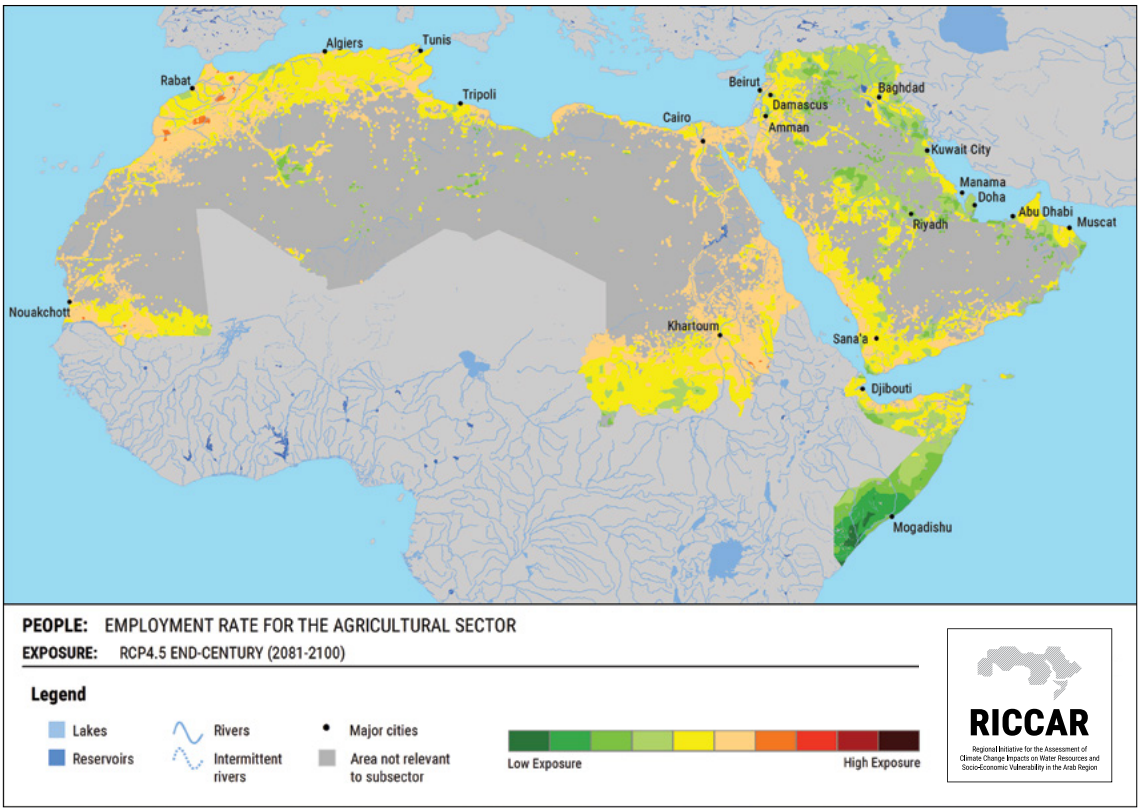



FIGURE 425

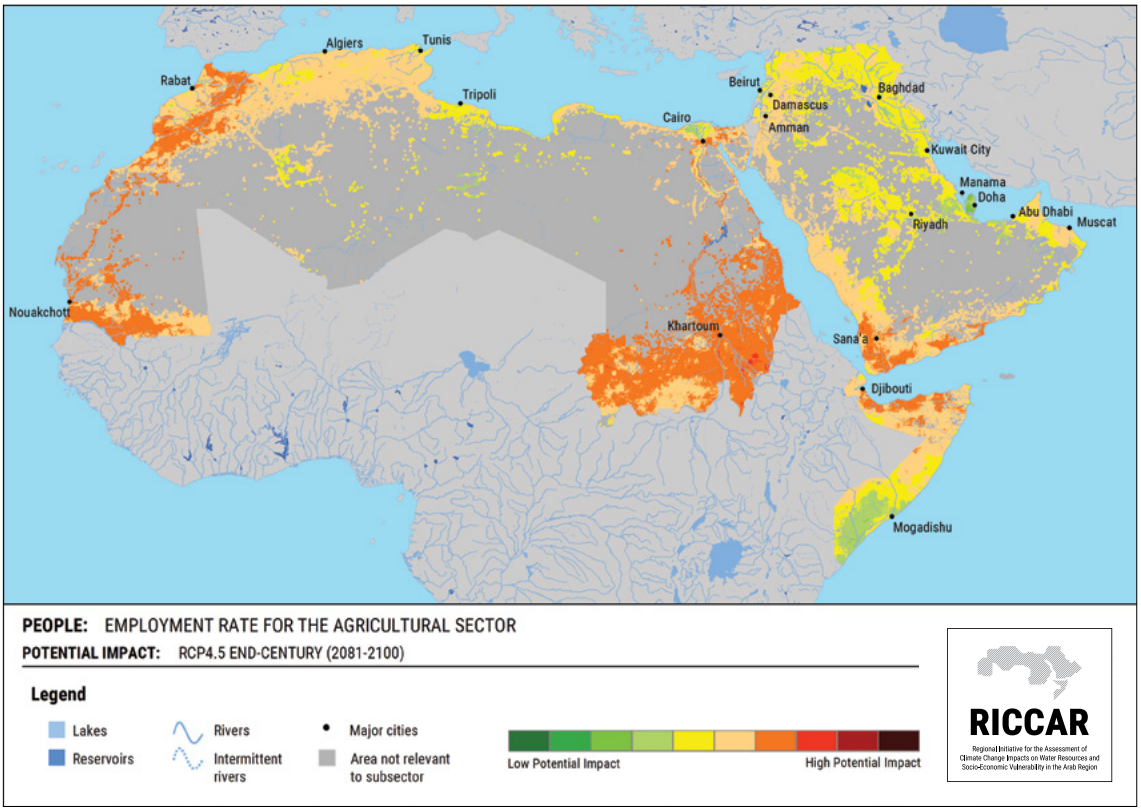
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – 15.3.5.1. EXPOSURE

FIGURE 426




15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – 15.3.5.2. POTENTIAL IMPACT

FIGURE 427



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – **15.3.5.3. VULNERABILITY**

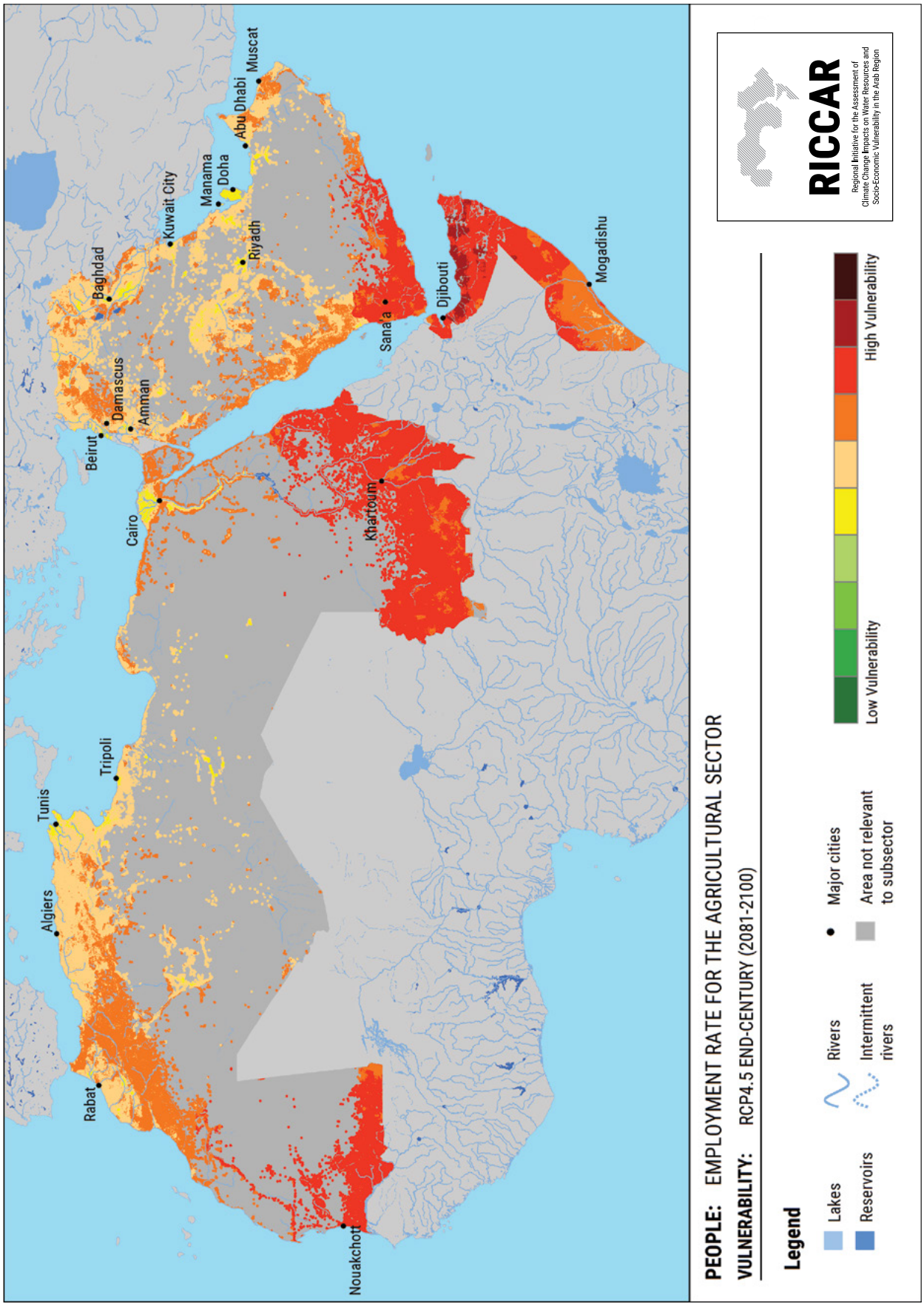
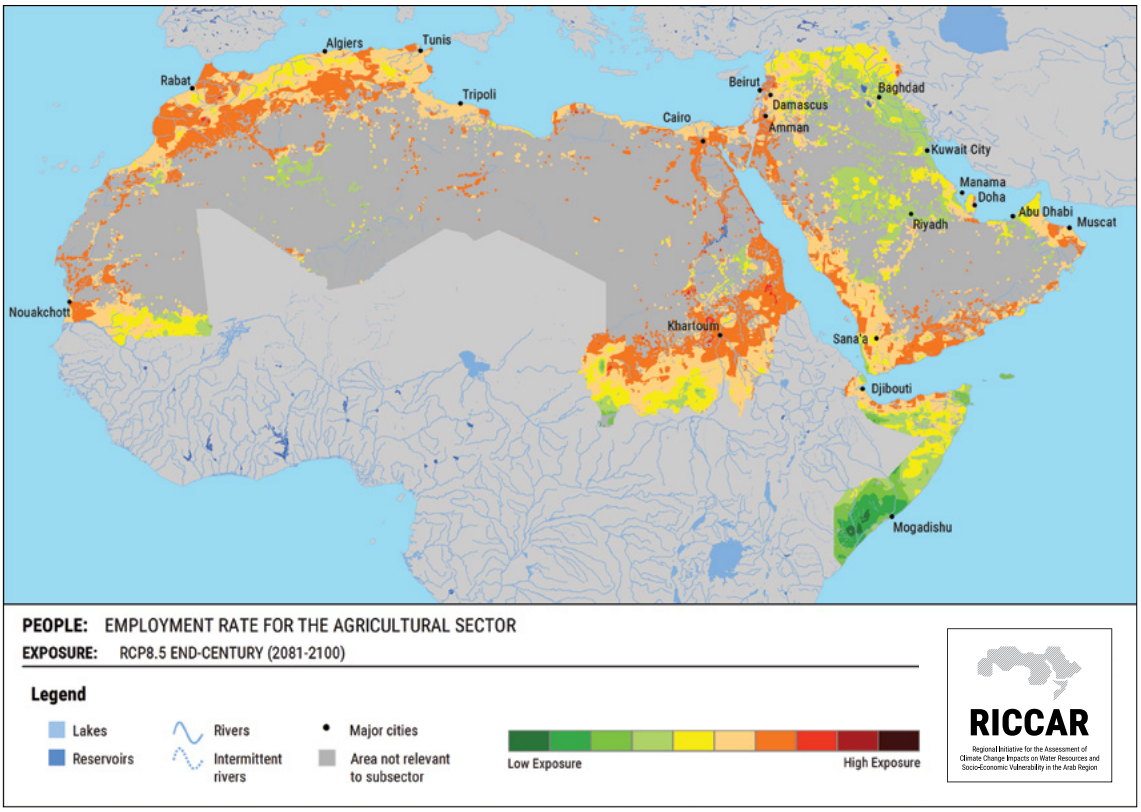



FIGURE 428

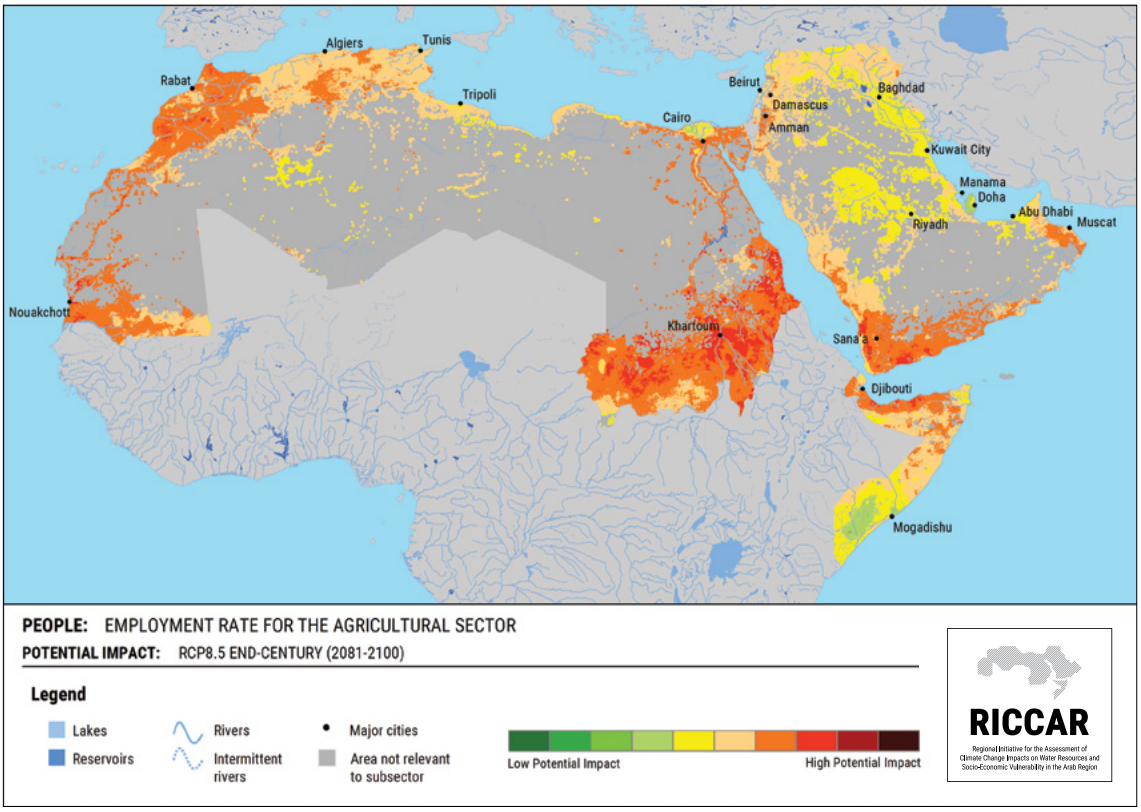
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.6. END-CENTURY RCP 8.5 – 15.3.6.1. EXPOSURE

FIGURE 429




15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.6. END-CENTURY RCP 8.5 – 15.3.6.2. POTENTIAL IMPACT

FIGURE 430



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.6. END-CENTURY RCP 8.5 – **15.3.6.3. VULNERABILITY**

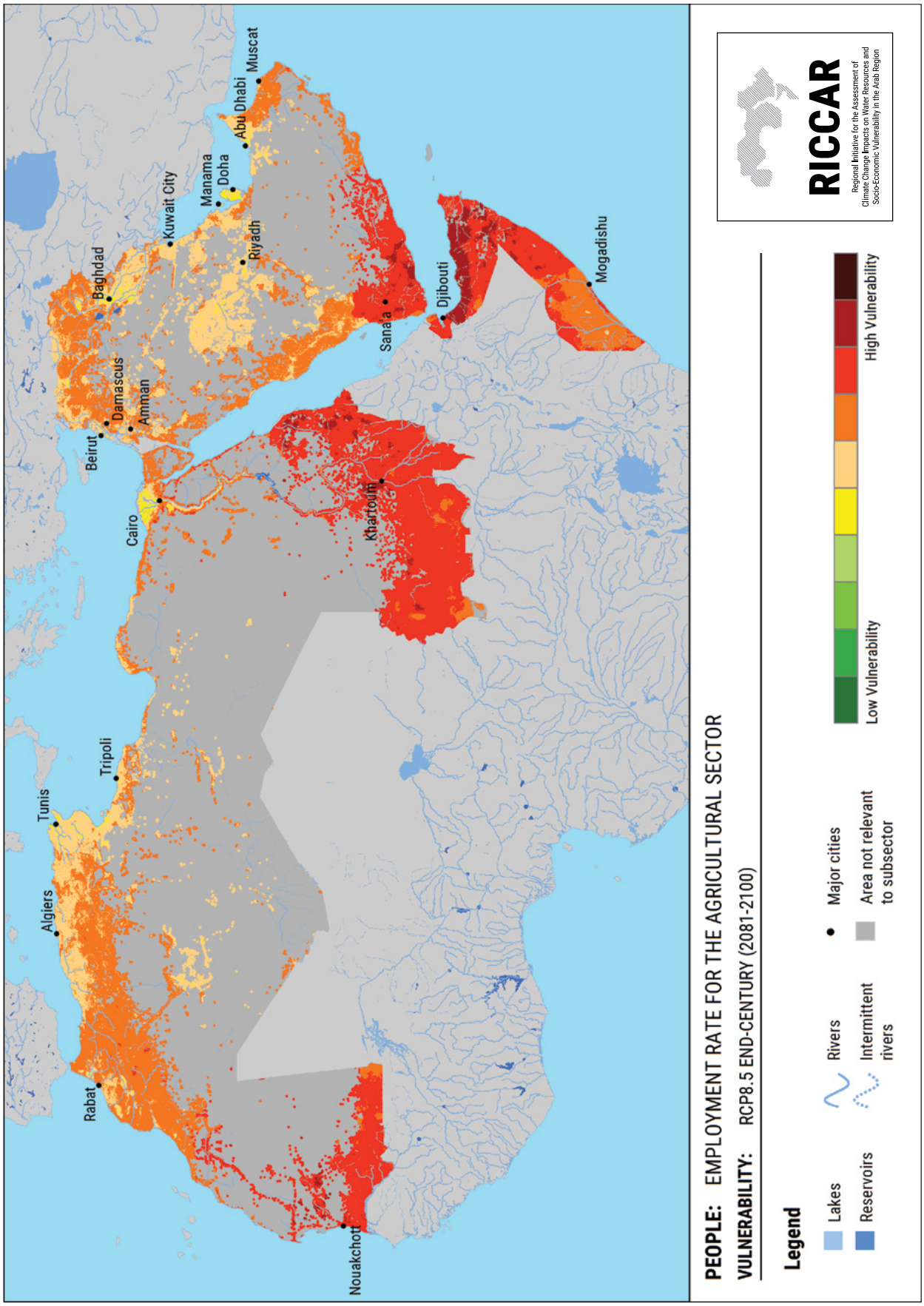



FIGURE 431

15.4. PEOPLE SECTOR: VULNERABILITY – 15.4.1. REFERENCE PERIOD

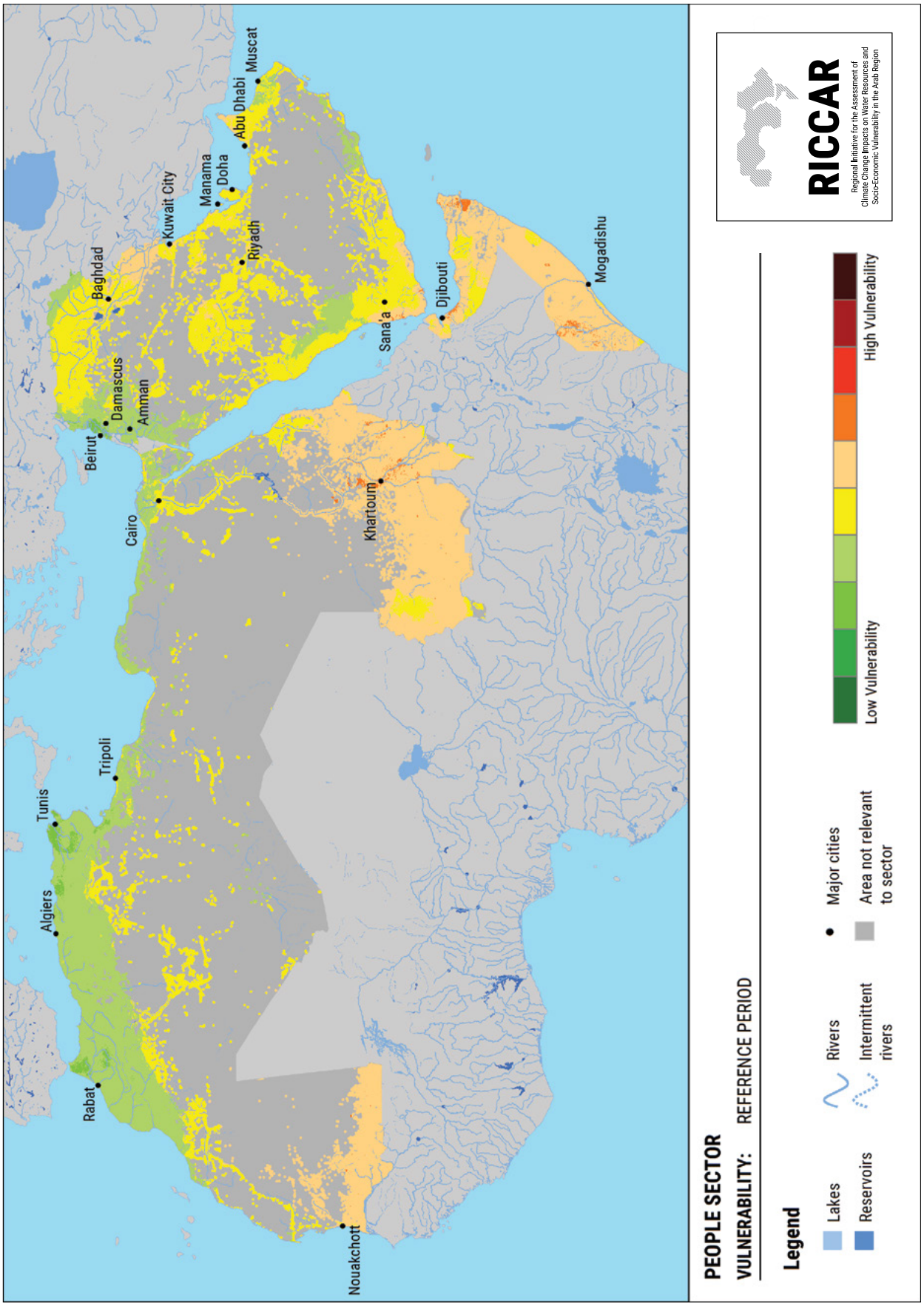



FIGURE 432

15.4. PEOPLE SECTOR: VULNERABILITY – **15.4.2. MID-CENTURY RCP 4.5**

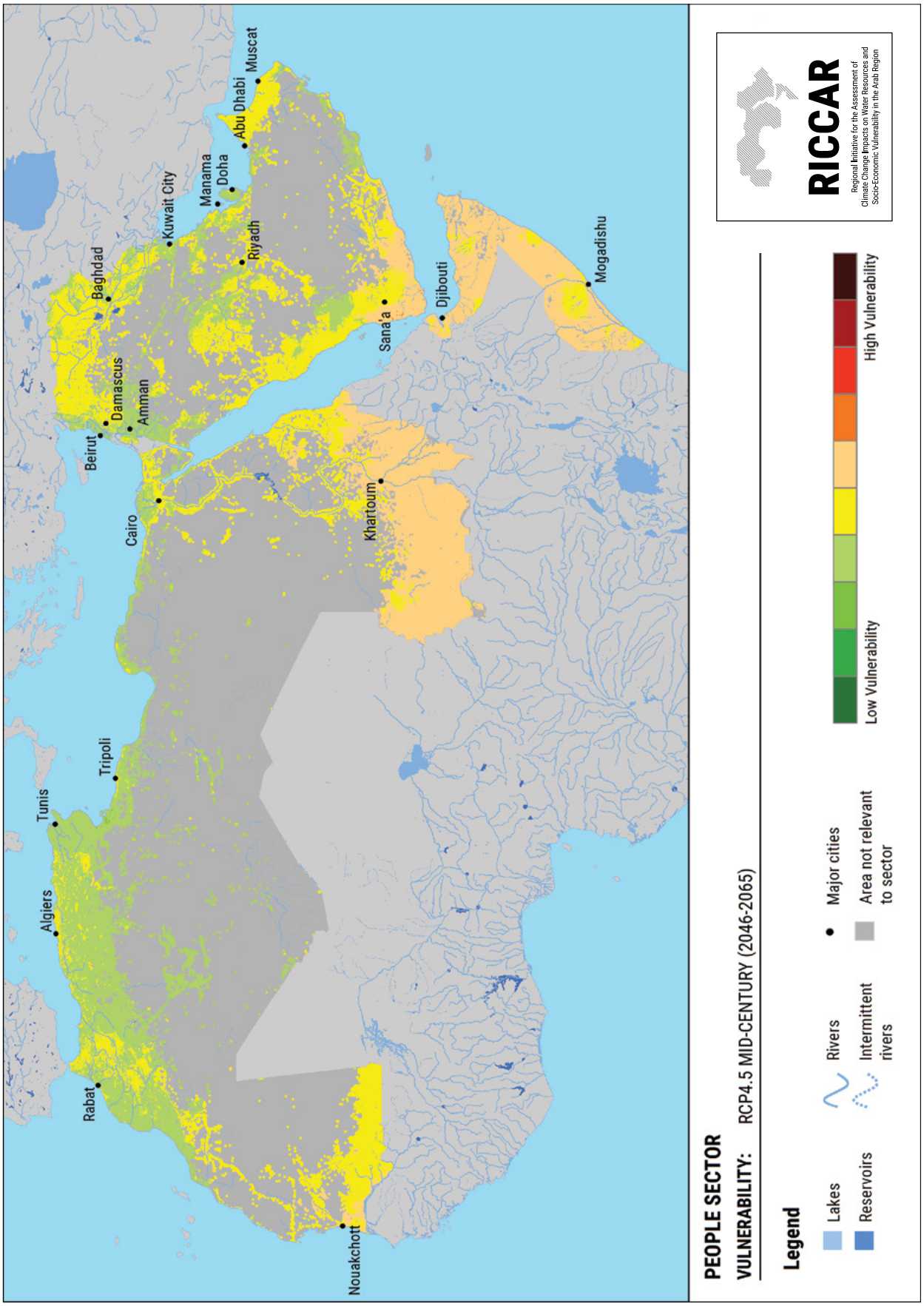



FIGURE 433

15.4. PEOPLE SECTOR: VULNERABILITY – 15.4.3. MID-CENTURY RCP 8.5

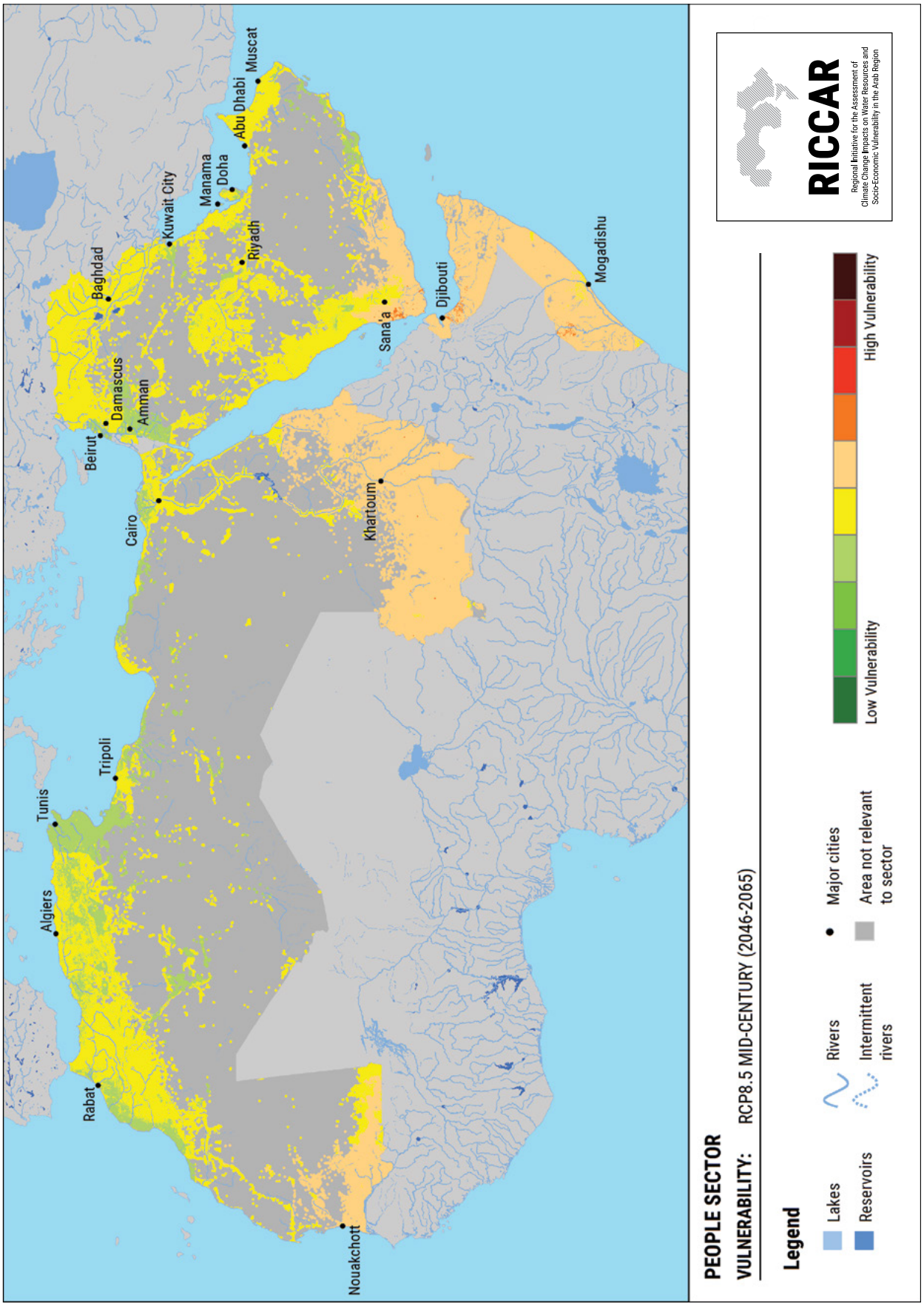



FIGURE 434

15.4. PEOPLE SECTOR: VULNERABILITY – **15.4.4. END-CENTURY RCP 4.5**

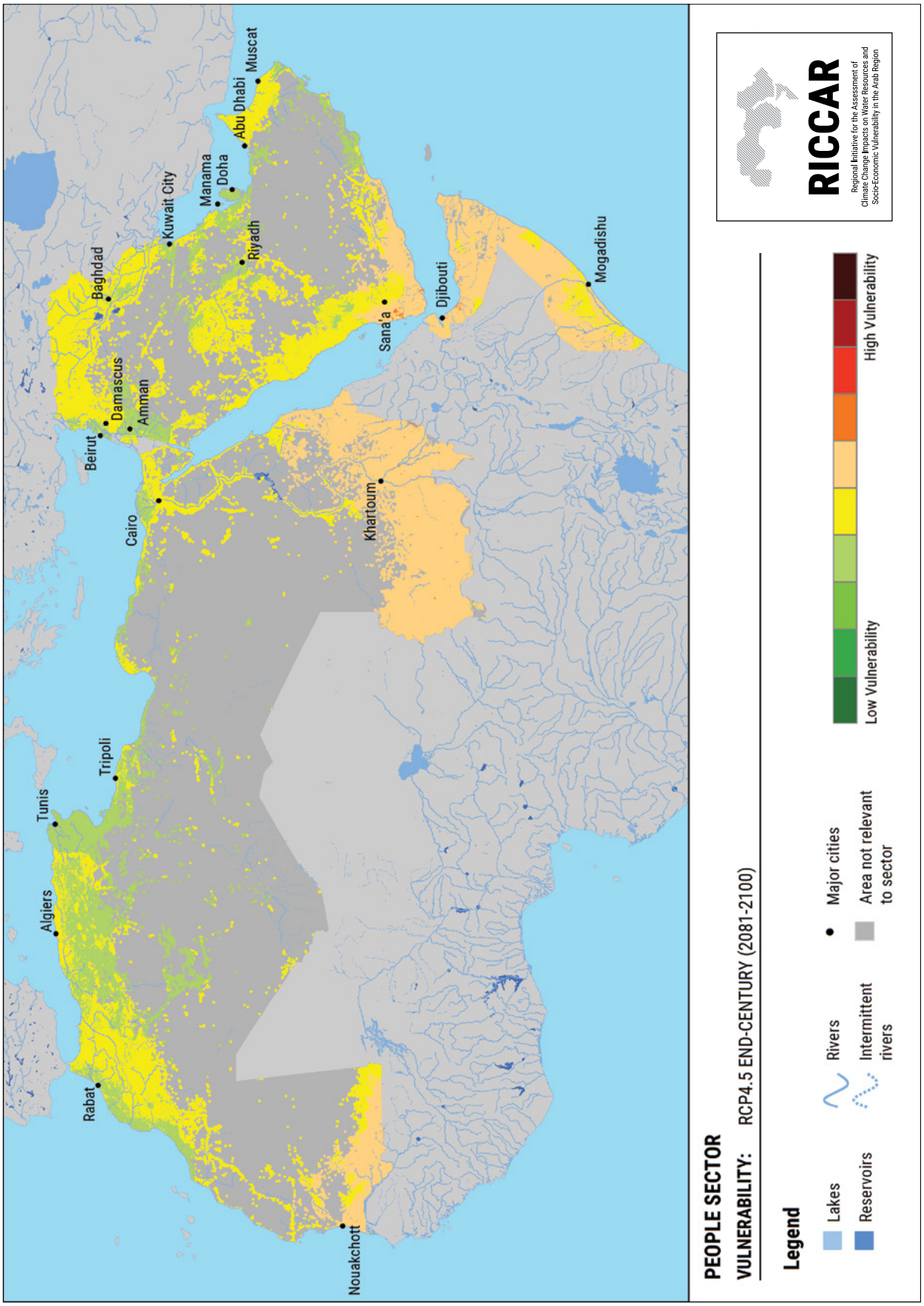



FIGURE 435

15.4. PEOPLE SECTOR: VULNERABILITY – 15.4.5. END-CENTURY RCP 8.5

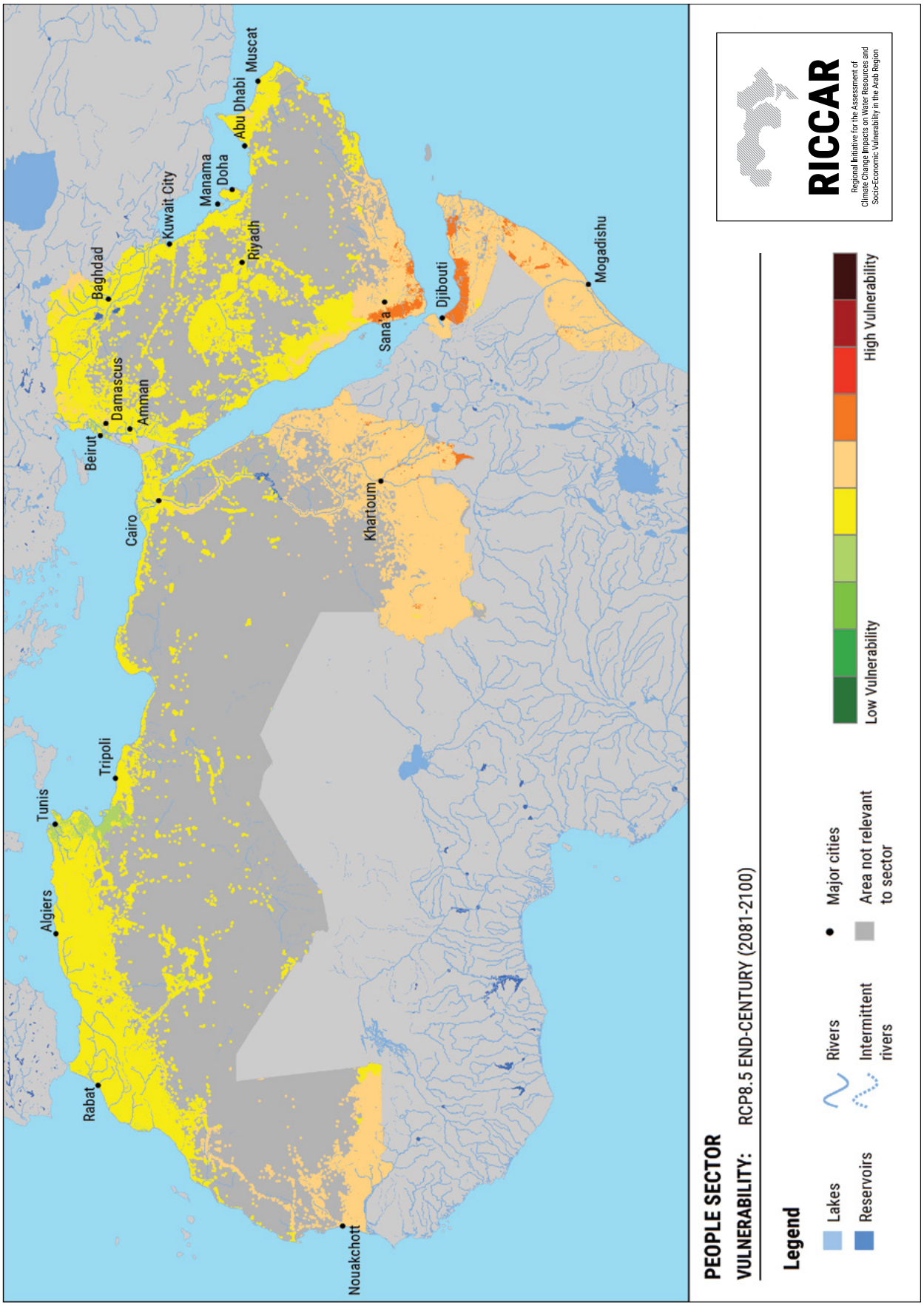



FIGURE 436

## NOTES

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WORLD METEOROLOGICAL ORGANIZATION

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNISDR The United Nations Office for Disaster Risk Reduction

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

UNITED NATIONS UNIVERSITY UNU-INWEH Institute for Water, Environment and Health

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