

ARAB CLIMATE CHANGE ASSESSMENT REPORT

TECHNICAL ANNEX



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



DONORS



Copyright © 2017

By the United Nations Economic and Social Commission for Western Asia (ESCWA).

All rights reserved under International Copyright Conventions. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without prior permission in writing from the publisher. Inquiries should be addressed to the Sustainable Development Policies Division, Economic and Social Commission for Western Asia, P.O. Box 11-8575, Beirut, Lebanon.

Email: publications-escwa@un.org

Website: www.escwa.un.org

Available through:

United Nations Publication

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

Reference as:

United Nations Economic and Social Commission for Western Asia (ESCWA) et al. 2017. Arab Climate Change Assessment Report – Technical Annex. Beirut, E/ESCWA/SDPD/2017/RICCAR/Report/Annex.

Authors:

United Nations Economic and Social Commission for Western Asia (ESCWA)

Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) of the League of Arab States

Food and Agriculture Organization of the United Nations (FAO)

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)

Disclaimer:

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The opinions expressed in this technical material are those of the authors and do not necessarily reflect the views of the United Nations Member States, the Government of Sweden, the Government of the Federal Republic of Germany, the League of Arab States or the United Nations Secretariat.

Cover photo © Kertu – Fotolia.com #131675281

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.

CONTENTS

PART I IMPACT ASSESSMENT

	EXPLANATORY NOTE	21
	CHAPTER 1 REGIONAL CLIMATE MODELLING: ARAB DOMAIN	23
	CHAPTER 2 REGIONAL HYDROLOGICAL MODELLING: ARAB REGION	39
	CHAPTER 3 MOROCCAN HIGHLANDS	53
	CHAPTER 4 MEDITERRANEAN COAST	59
	CHAPTER 5 NILE RIVER: BLUE NILE HEADWATERS	65
	CHAPTER 6 TIGRIS RIVER: UPPER TIGRIS	73
	CHAPTER 7 EUPHRATES RIVER: UPPER EUPHRATES	81
	CHAPTER 8 MEDJERDA RIVER	89
	CHAPTER 9 JORDAN RIVER	97
	CHAPTER 10 SENEGAL RIVER: SENEGAL HEADWATERS	105

PART II INTEGRATED VULNERABILITY ASSESSMENT

	EXPLANATORY NOTE	125
	CHAPTER 11 WATER SECTOR	127
	CHAPTER 12 BIODIVERSITY AND ECOSYSTEMS SECTOR	141
	CHAPTER 13 AGRICULTURE SECTOR	171
	CHAPTER 14 INFRASTRUCTURE AND HUMAN SETTLEMENTS SECTOR	201
	CHAPTER 15 PEOPLE SECTOR	215

ACRONYMS AND ABBREVIATIONS

abs.diff	absolute difference	RICCAR	Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region
Apr-Sept	April–September		
CDD	maximum length of dry spell	R10	Annual count of 10 mm precipitation days
CNRM-CM5	Centre National de Recherches Météorologiques-Climate Model 5	R20	Annual count of 20 mm precipitation days
CWD	maximum length of wet spell	SU	number of summer days
EC-EARTH	ECMWF-based Earth-system model	SU35	number of hot days
ESCWA	United Nations Economic and Social Commission for Western Asia	SU40	number of very hot days
GCM	Global Climate Model or General Circulation Model	TR	tropical nights
GDP	gross domestic product	VA	vulnerability assessment
GFDL-ESM2M	Geophysical Fluid Dynamics Laboratory- Earth System Model 2	VIC	Variable Infiltration Capacity (hydrological model)
HYPE	Hydrological Predictions for the Environment (hydrological model)	°C	degree Celsius
km	kilometres	%	per cent
mm	millimetres	&	and
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		

PART I



IMPACT ASSESSMENT

CONTENTS

Impact Assessment Explanatory Note

21

CHAPTER 1

REGIONAL CLIMATE MODELLING: ARAB DOMAIN

23

1.1	General Parameters	25
1.1.1	Temperature	25
1.1.2	Precipitation	26
1.2	Extreme Events	30
1.2.1	Changes in extreme temperature	30
1.2.2	Changes in extreme precipitation	34

CHAPTER 2

REGIONAL HYDROLOGICAL MODELLING: ARAB REGION

39

2.1	Hydrological Parameters	40
2.1.1	Runoff	40
2.1.2	Evapotranspiration	48

CHAPTER 3

MOROCCAN HIGHLANDS

53

3.1	General Parameters	54
3.1.1	Temperature	54
3.1.2	Precipitation	55
3.2	Extreme Events	56
3.2.1	Changes in extreme temperature	56
3.2.2	Changes in extreme precipitation	56
3.3	Hydrological Parameters	57
3.3.1	Runoff	57
3.3.2	Evapotranspiration	57
3.3.3	Comparison 50 km vs 25 km resolutions Runoff	58

CHAPTER 4

MEDITERRANEAN COAST

59

4.1	General Parameters	60
4.1.1	Temperature	60
4.1.2	Precipitation	61
4.2	Extreme Events	62
4.2.1	Changes in extreme temperature	62
4.2.2	Changes in extreme precipitation	62
4.3	Hydrological Parameters	63
4.3.1	Runoff	63
4.3.2	Evapotranspiration	63
4.3.3	Comparison 50 km vs 25 km resolutions Runoff	64

CHAPTER 5

NILE RIVER: BLUE NILE HEADWATERS

65

5.1	General Parameters	66
5.1.1	Temperature	66
5.1.2	Precipitation	67
5.2	Extreme Events	68
5.2.2	Changes in extreme temperature	68
5.2.3	Changes in extreme precipitation	68
5.3	Hydrological Parameters	69
5.3.1	Runoff	69
5.3.2	Discharge	70
5.3.3	Evapotranspiration	70
5.3.4	Comparison 50 km vs 25 km resolutions	71
5.3.4.1	Runoff	71
5.3.4.2	Discharge	72

CHAPTER 6

TIGRIS RIVER: UPPER TIGRIS

73

6.1	General Parameters	74
6.1.1	Temperature	74
6.1.2	Precipitation	75
6.2	Extreme Events	76
6.2.1	Changes in extreme temperature	76
6.2.2	Changes in extreme precipitation	76
6.3	Hydrological Parameters	77
6.3.1	Runoff	77
6.3.2	Discharge	78
6.3.3	Evapotranspiration	78
6.3.4	Comparison 50 km vs 25 km resolutions	79
6.3.4.1	Runoff	79
6.3.4.2	Discharge	80

CHAPTER 7

EUPHRATES RIVER: UPPER EUPHRATES

81

7.1	General Parameters	82
7.1.1	Temperature	82
7.1.2	Precipitation	83
7.2	Extreme Events	84
7.2.1	Changes in extreme temperature	84
7.2.2	Changes in extreme precipitation	84
7.3	Hydrological Parameters	85
7.3.1	Runoff	85
7.3.2	Discharge	86
7.3.3	Evapotranspiration	86
7.3.4	Comparison 50 km vs 25 km resolutions	87
7.3.4.1	Runoff	87
7.3.4.2	Discharge	88

CHAPTER 8		
MEDJERDA RIVER		89
8.1 General Parameters		90
8.1.1 Temperature		90
8.1.2 Precipitation		91
8.2 Extreme Events		92
8.2.1 Changes in extreme temperature		92
8.2.2 Changes in extreme precipitation		92
8.3 Hydrological Parameters		93
8.3.1 Runoff		93
8.3.2 Discharge		94
8.3.3 Evapotranspiration		94
8.3.4 Comparison 50 km vs 25 km resolutions		95
8.3.4.1 Runoff		95
8.3.4.2 Discharge		96
CHAPTER 9		
JORDAN RIVER		97
9.1 General Parameters		98
9.1.1 Temperature		98
9.1.2 Precipitation		99
9.2 Extreme Events		100
9.2.1 Changes in extreme temperature		100
9.2.2 Changes in extreme precipitation		100
9.3 Hydrological Parameters		101
9.3.1 Runoff		101
9.3.2 Discharge		102
9.3.3 Evapotranspiration		102
9.3.4 Comparison 50 km vs 25 km resolutions		103
9.3.4.1 Runoff		103
9.3.4.2 Discharge		104
CHAPTER 10		
SENEGAL RIVER: SENEGAL HEADWATERS		105
10.1 General Parameters		106
10.1.1 Temperature		106
10.1.2 Precipitation		107
10.2 Extreme Events		108
10.2.1 Changes in extreme temperature		108
10.2.2 Changes in extreme precipitation		108
10.3 Hydrological Parameters		109
10.3.1 Runoff		109
10.3.2 Discharge		110
10.3.3 Evapotranspiration		110
10.3.4 Comparison 50 km vs 25 km resolutions		111
10.3.4.1 Runoff		111
10.3.4.2 Discharge		112

FIGURES

CHAPTER 1

REGIONAL CLIMATE MODELLING: ARAB DOMAIN

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

_____ 25

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

_____ 26

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

_____ 27

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

_____ 28

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

_____ 28

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

_____ 29

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

_____ 29

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

_____ 30

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

_____ 31

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

_____ 32

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

_____ 33

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

_____ 34

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

_____ 35

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

_____ 36

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

_____ 37

CHAPTER 2

REGIONAL HYDROLOGICAL MODELLING: ARAB REGION

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

_____ 40

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

_____ 41

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

_____ 42

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

_____ 43

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

_____ 44

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

_____ 44

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

_____ 45

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

_____ 45

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

_____ 46

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

_____ 46

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

_____ 47

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	FIGURE 33 Mean change in seasonal temperature (April-September) 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 47 Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
47	54	55	56
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	FIGURE 34 Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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	FIGURE 48 Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
48	54	55	56
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 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 42 Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
49	54	56	57
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	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	FIGURE 43 Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
50	54	56	57
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	FIGURE 37 Mean change in annual precipitation 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	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
51	55	56	57
	FIGURE 38 Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	FIGURE 45 Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
	55	56	57
CHAPTER 3 MOROCCAN HIGHLANDS	FIGURE 39 Mean change in seasonal precipitation (October-March) 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 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
	55	56	58
FIGURE 32 Mean change in annual temperature over time for ensemble of three RCP 4.5 and RCP 8.5 projections			
54			

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

58

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

58

CHAPTER 4

MEDITERRANEAN COAST

FIGURE 56

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

60

FIGURE 57

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

60

FIGURE 58

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

60

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

60

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

60

FIGURE 61

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

61

FIGURE 62

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

61

FIGURE 63

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

61

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

61

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

61

FIGURE 66

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

62

FIGURE 67

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

62

FIGURE 68

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

62

FIGURE 69

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

62

FIGURE 70

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

62

FIGURE 71

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

62

FIGURE 72

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

62

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

63

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

63

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

63

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

63

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

64

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

64

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

64

CHAPTER 5NILE RIVER:
BLUE NILE HEADWATERS

FIGURE 80 Mean change in annual temperature 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 94 Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 66	_____ 67	_____ 68	_____ 70
FIGURE 81 Mean change in seasonal temperature (April-September) 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 95 Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 66	_____ 67	_____ 68	_____ 70
FIGURE 82 Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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	FIGURE 96 Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 66	_____ 67	_____ 68	_____ 70
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 90 Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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 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
_____ 66	_____ 68	_____ 69	_____ 71
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	FIGURE 91 Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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 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
_____ 66	_____ 68	_____ 69	_____ 71
FIGURE 85 Mean change in annual precipitation 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	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	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
_____ 67	_____ 68	_____ 69	_____ 71
FIGURE 86 Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	FIGURE 93 Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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 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
_____ 67	_____ 68	_____ 70	_____ 72

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

72

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

72

CHAPTER 6

TIGRIS RIVER: UPPER TIGRIS

FIGURE 110

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

74

FIGURE 111

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

74

FIGURE 112

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

74

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

74

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

74

FIGURE 115

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

75

FIGURE 116

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

75

FIGURE 117

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

75

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

75

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

75

FIGURE 120

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

76

FIGURE 121

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

76

FIGURE 122

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

76

FIGURE 123

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

76

FIGURE 124

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

76

FIGURE 125

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

76

FIGURE 126

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

76

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

77

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

77

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

77

FIGURE 130

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

78

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

78

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

78

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

78

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

79

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 141 Mean change in seasonal temperature (April-September) 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 155 Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 79	_____ 82	_____ 83	_____ 84
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 142 Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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	FIGURE 156 Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 79	_____ 82	_____ 83	_____ 84
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 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 150 Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 80	_____ 82	_____ 84	_____ 85
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 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	FIGURE 151 Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 80	_____ 82	_____ 84	_____ 85
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	FIGURE 145 Mean change in annual precipitation 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	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
_____ 80	_____ 83	_____ 84	_____ 85
CHAPTER 7 EUPHRATES RIVER: UPPER EUPHRATES	FIGURE 146 Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	FIGURE 153 Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections	FIGURE 160 Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model
	_____ 83	_____ 84	_____ 86
FIGURE 140 Mean change in annual temperature 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 154 Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 82	_____ 83	_____ 84	_____ 86

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

86

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

86

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

87

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

87

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

87

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

88

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

88

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

88

CHAPTER 8

MEDJERDA RIVER

FIGURE 170

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

90

FIGURE 171

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

90

FIGURE 172

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

90

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

90

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

90

FIGURE 175

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

91

FIGURE 176

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

91

FIGURE 177

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

91

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

91

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

91

FIGURE 180

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

92

FIGURE 181

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

92

FIGURE 182

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

92

FIGURE 183

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

92

FIGURE 184

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

92

FIGURE 185

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

92

FIGURE 186

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

92

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

93

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

93

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	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	FIGURE 202 Mean change in seasonal temperature (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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
_____ 93	_____ 95	_____ 98	_____ 99
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 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 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 210 Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 94	_____ 96	_____ 98	_____ 100
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 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 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	FIGURE 211 Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 94	_____ 96	_____ 98	_____ 100
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	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	FIGURE 205 Mean change in annual precipitation 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
_____ 94	_____ 96	_____ 99	_____ 100
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	CHAPTER 9 JORDAN RIVER		FIGURE 213 Mean change in CDD over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 94			_____ 100
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 200 Mean change in annual temperature 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 214 Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 95	_____ 98	_____ 99	_____ 100
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 201 Mean change in seasonal temperature (April-September) 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 215 Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 95	_____ 98	_____ 99	_____ 100

FIGURE 216 Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections	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		FIGURE 236 Mean change in seasonal precipitation (April-September) over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 100	_____ 102		_____ 107
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 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 237 Mean change in seasonal precipitation (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 101	_____ 103		_____ 107
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 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 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
_____ 101	_____ 103		_____ 107
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	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		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
_____ 101	_____ 103		_____ 107
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 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 240 Mean change in SU35 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 102	_____ 104		_____ 108
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 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 241 Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 102	_____ 104		_____ 108
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	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		FIGURE 242 Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections
_____ 102	_____ 104		_____ 108

CHAPTER 10

SENEGAL RIVER: SENEGAL HEADWATERS

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
_____ 106	_____ 106	_____ 106	_____ 106
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	FIGURE 235 Mean change in annual precipitation over time for ensemble of three RCP 4.5 and RCP 8.5 projections		
_____ 106	_____ 107		

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

_____ 108

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

_____ 108

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

_____ 108

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

_____ 108

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

_____ 109

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

_____ 109

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

_____ 109

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

_____ 110

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

_____ 110

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

_____ 110

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

_____ 110

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

_____ 111

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

_____ 111

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

_____ 111

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

_____ 112

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

_____ 112

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

_____ 112

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 RHM 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.

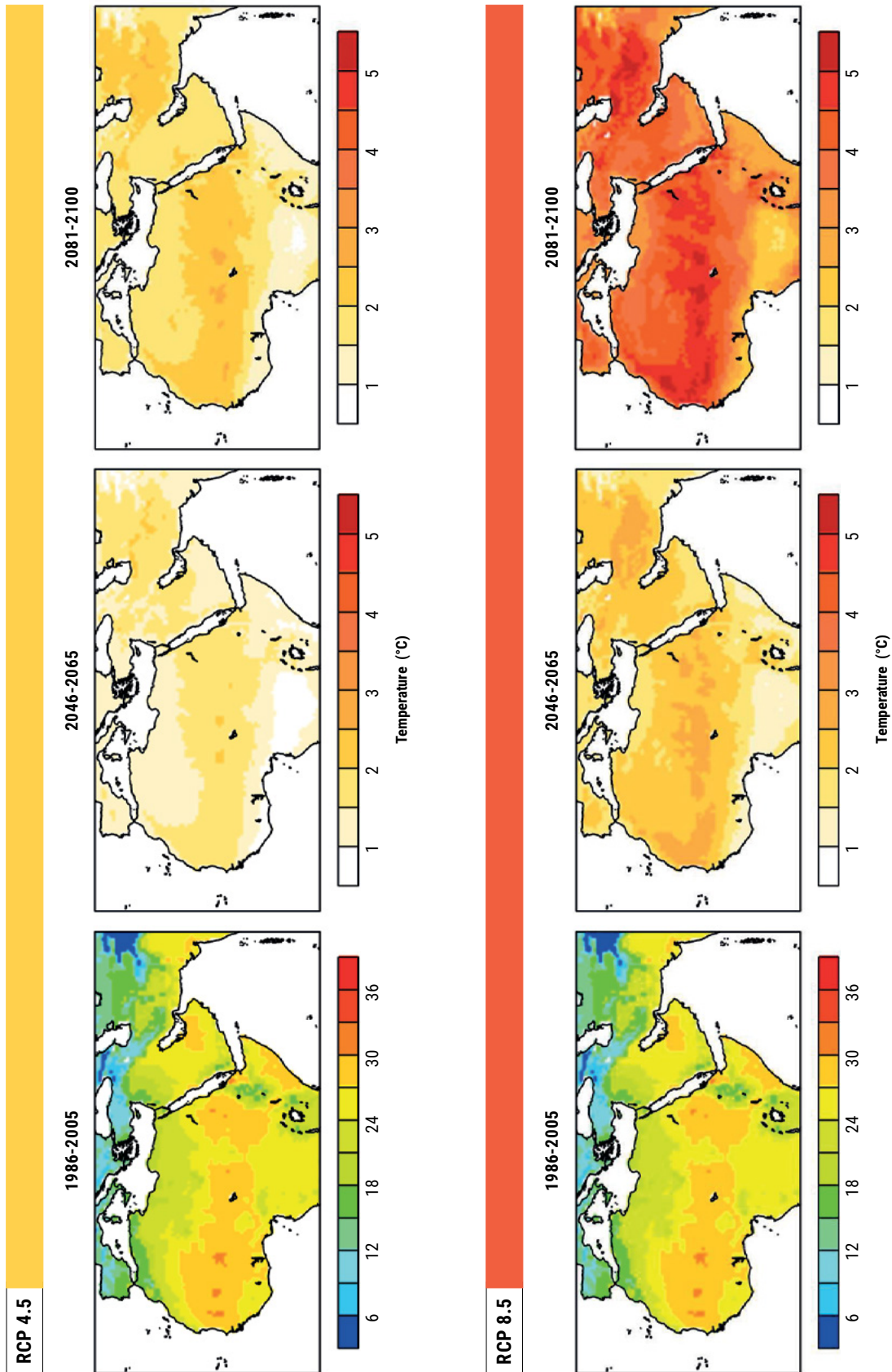
CHAPTER 1



REGIONAL CLIMATE MODELLING: ARAB DOMAIN

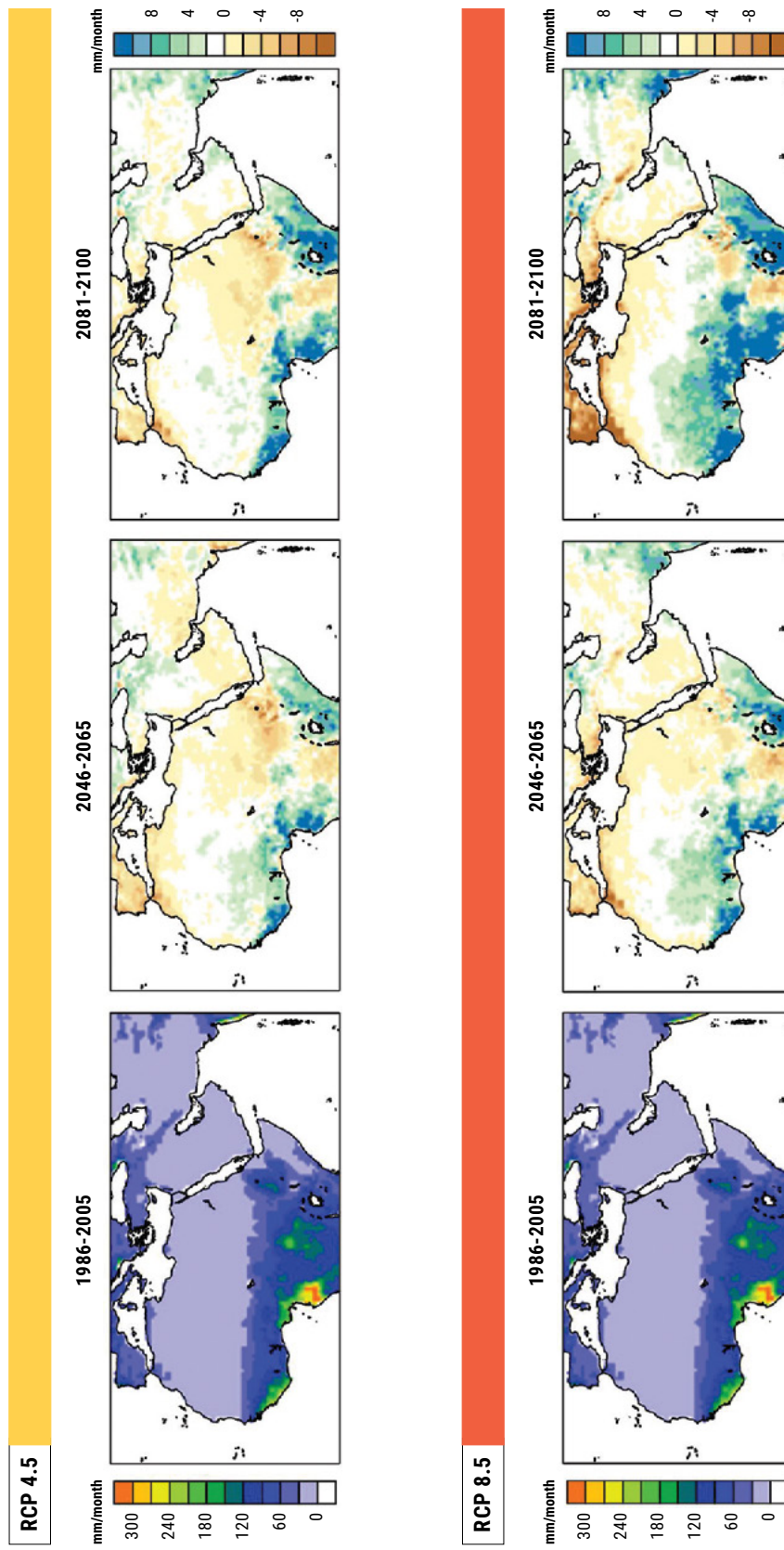
1.1. GENERAL PARAMETERS - 1.1.1. TEMPERATURE

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



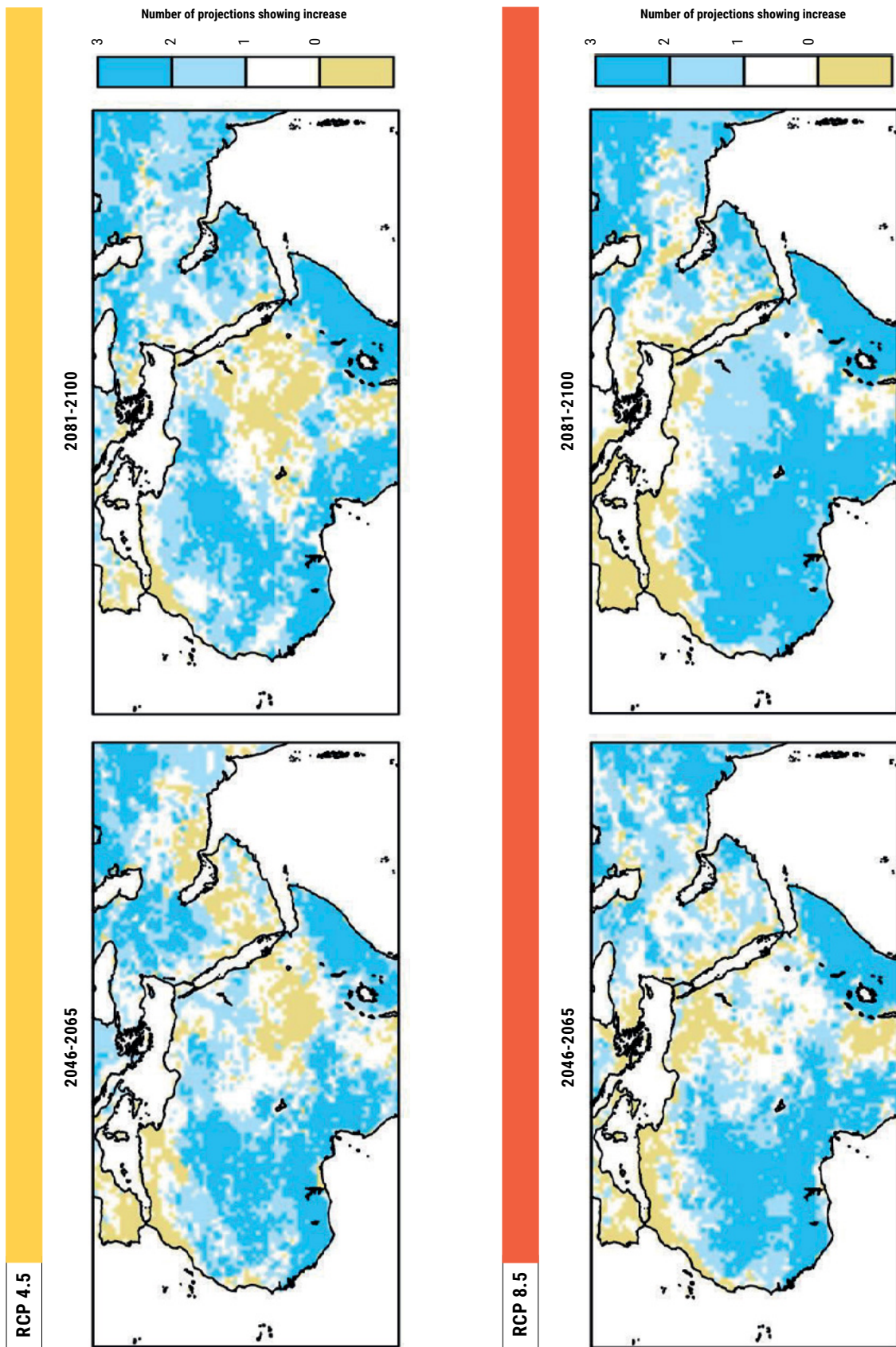
1.1. GENERAL PARAMETERS - 1.1.2. PRECIPITATION

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

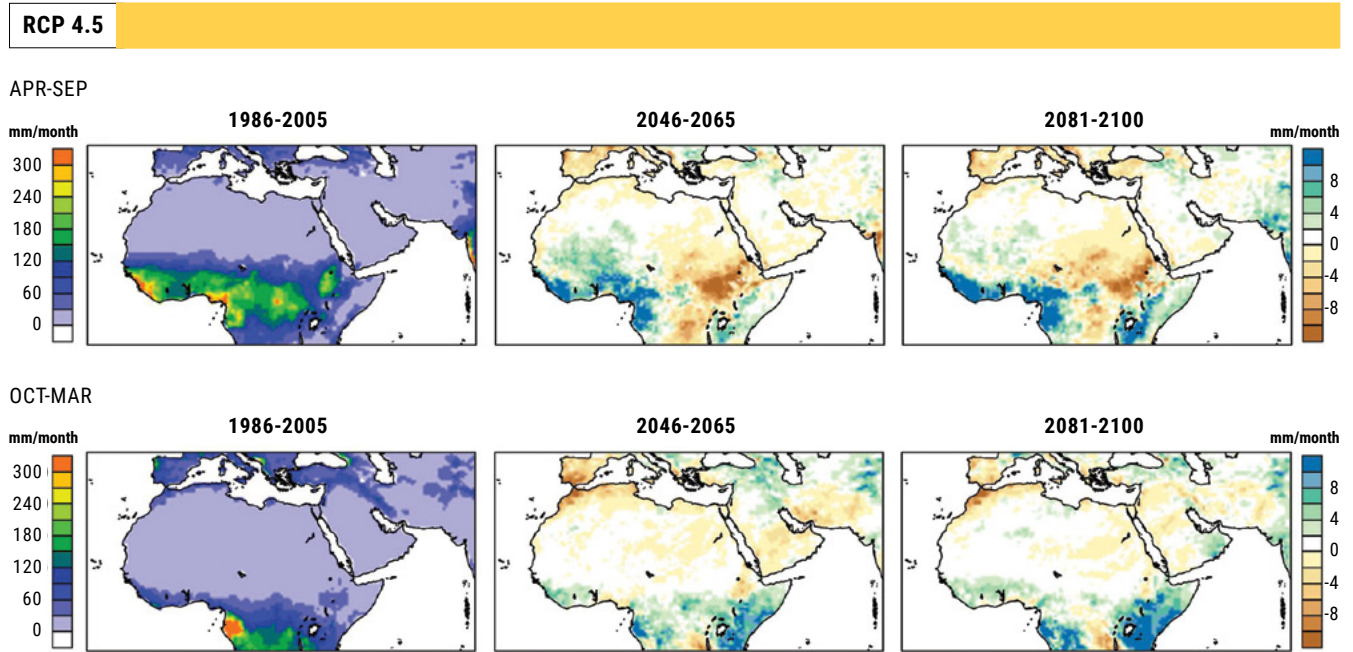
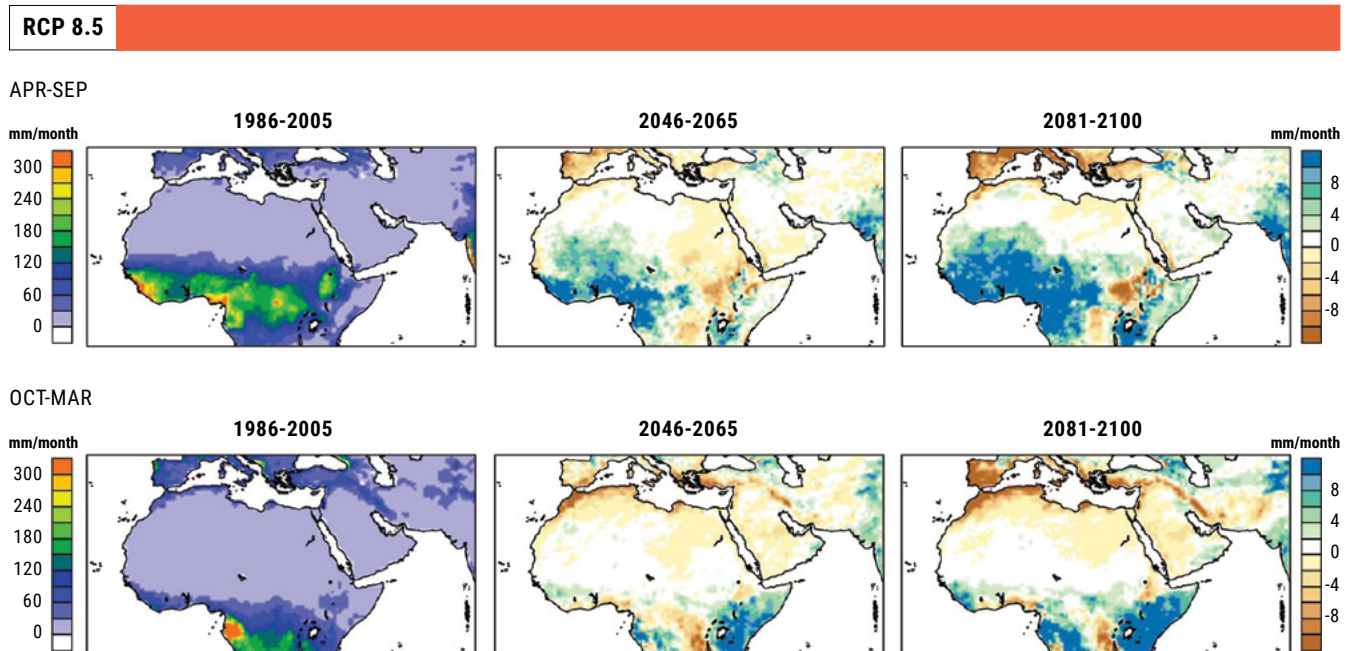


FIGURE 5

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



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

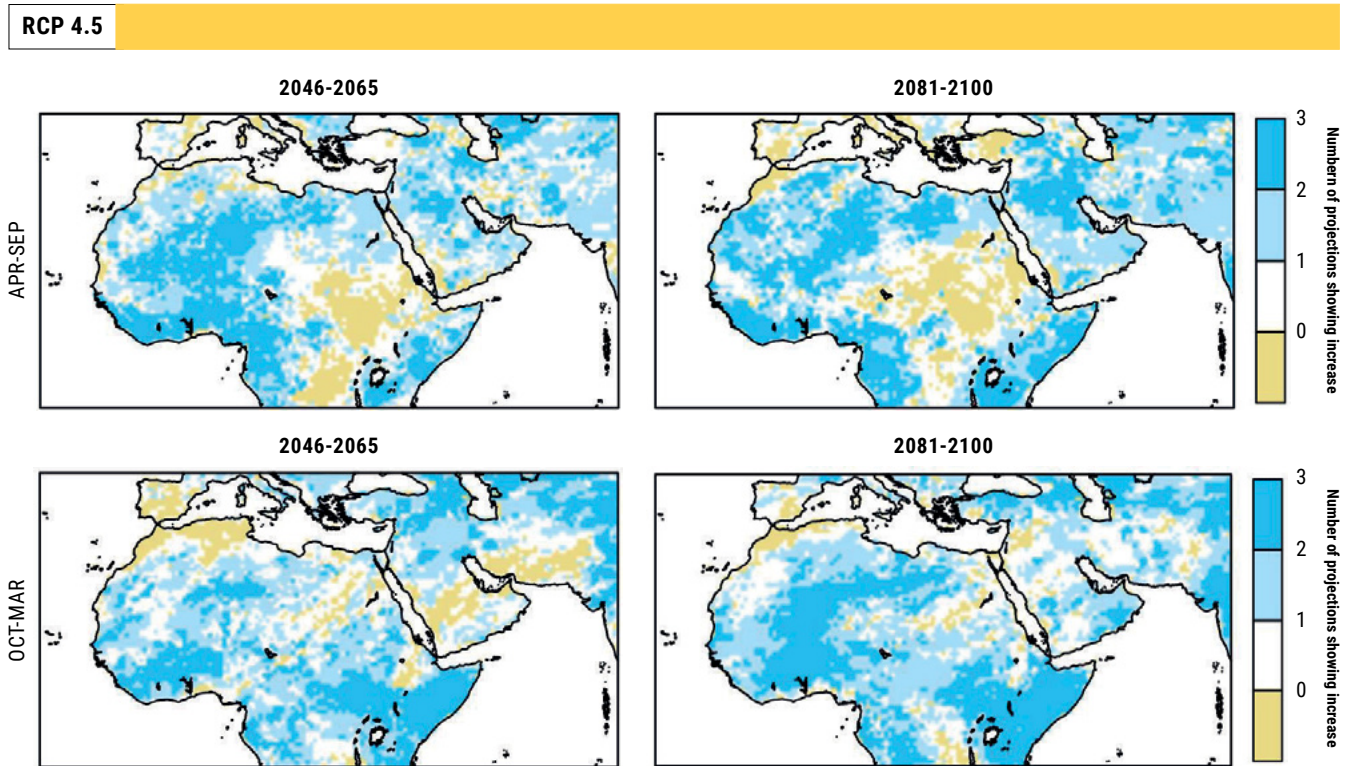
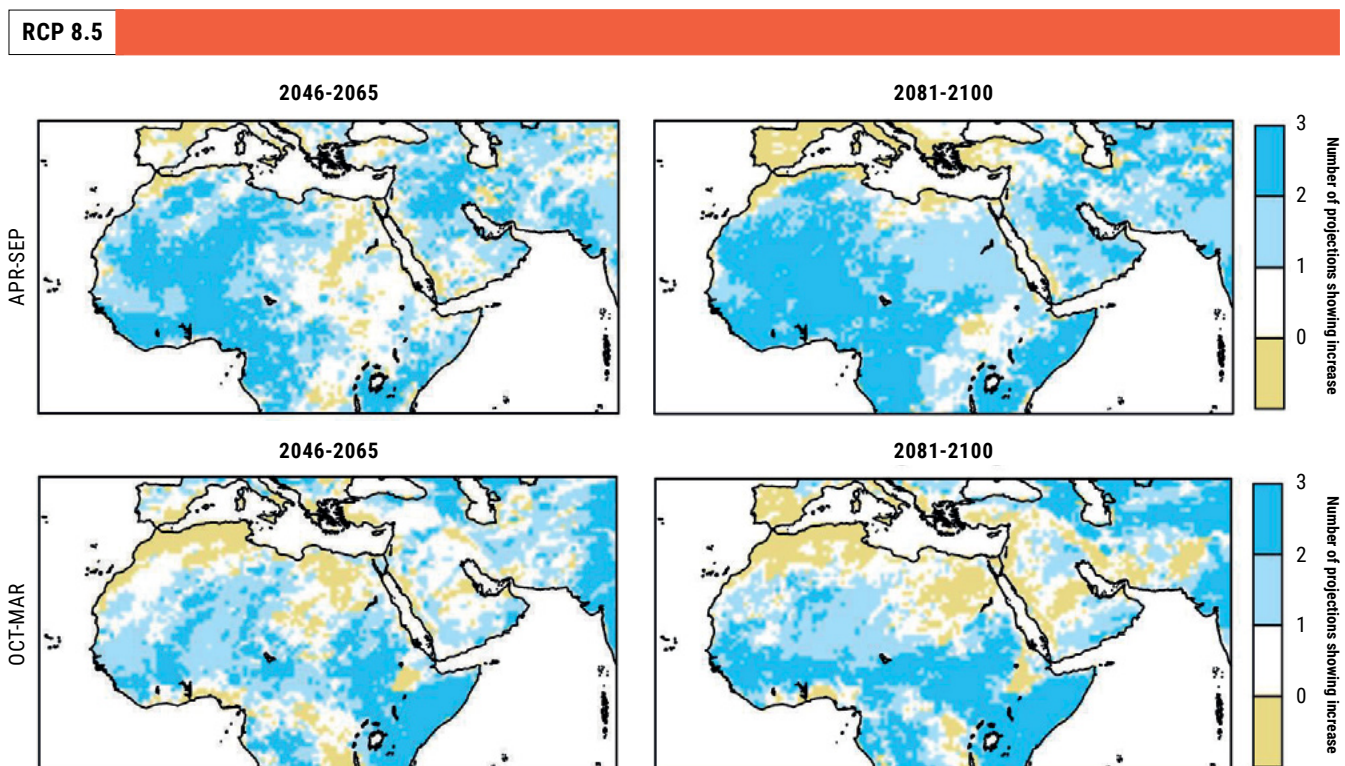


FIGURE 7

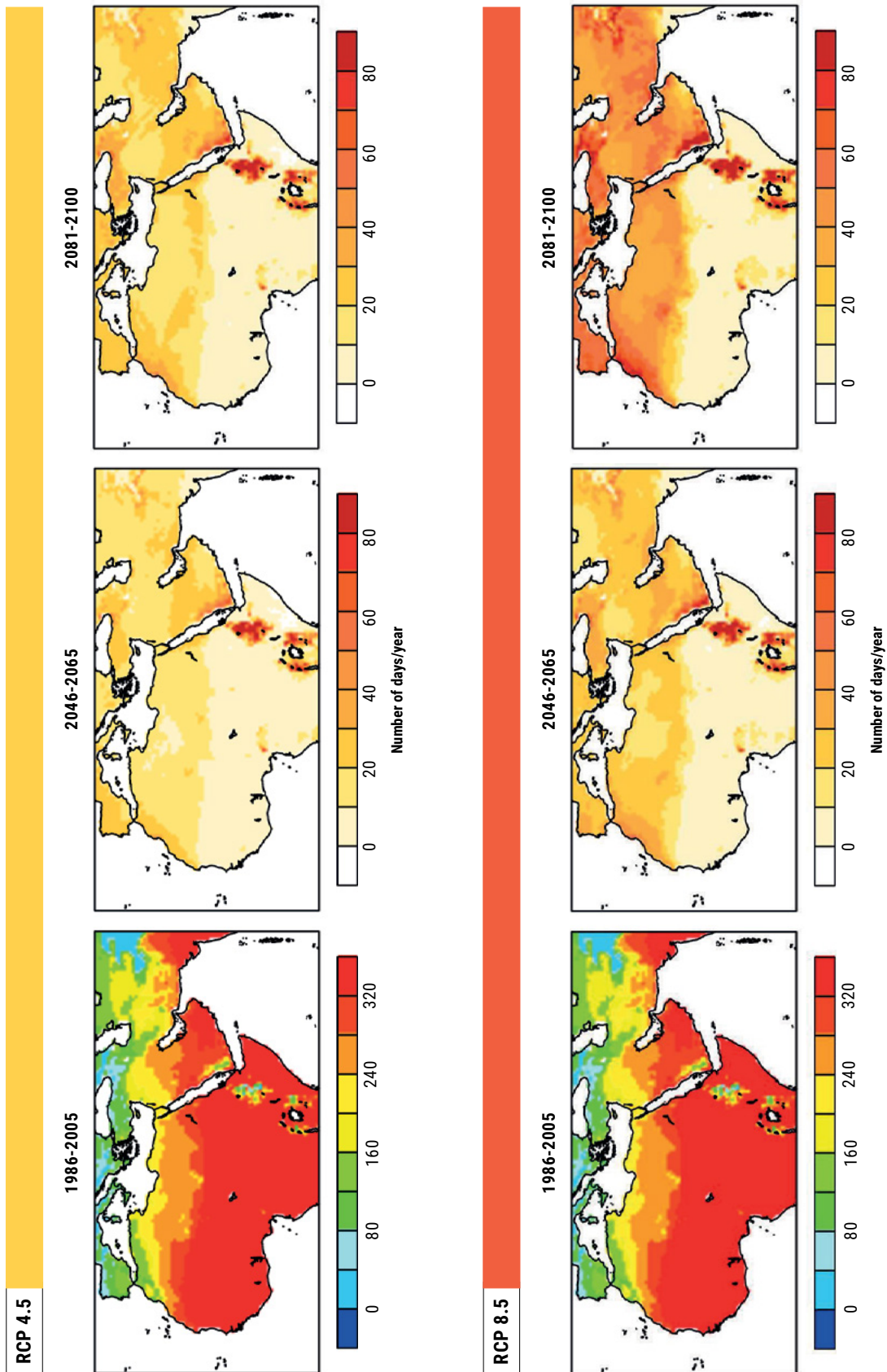
Agreement on mean change in seasonal precipitation from the reference period between the ensemble of three RCP 8.5 projections for mid-century and end-century



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.

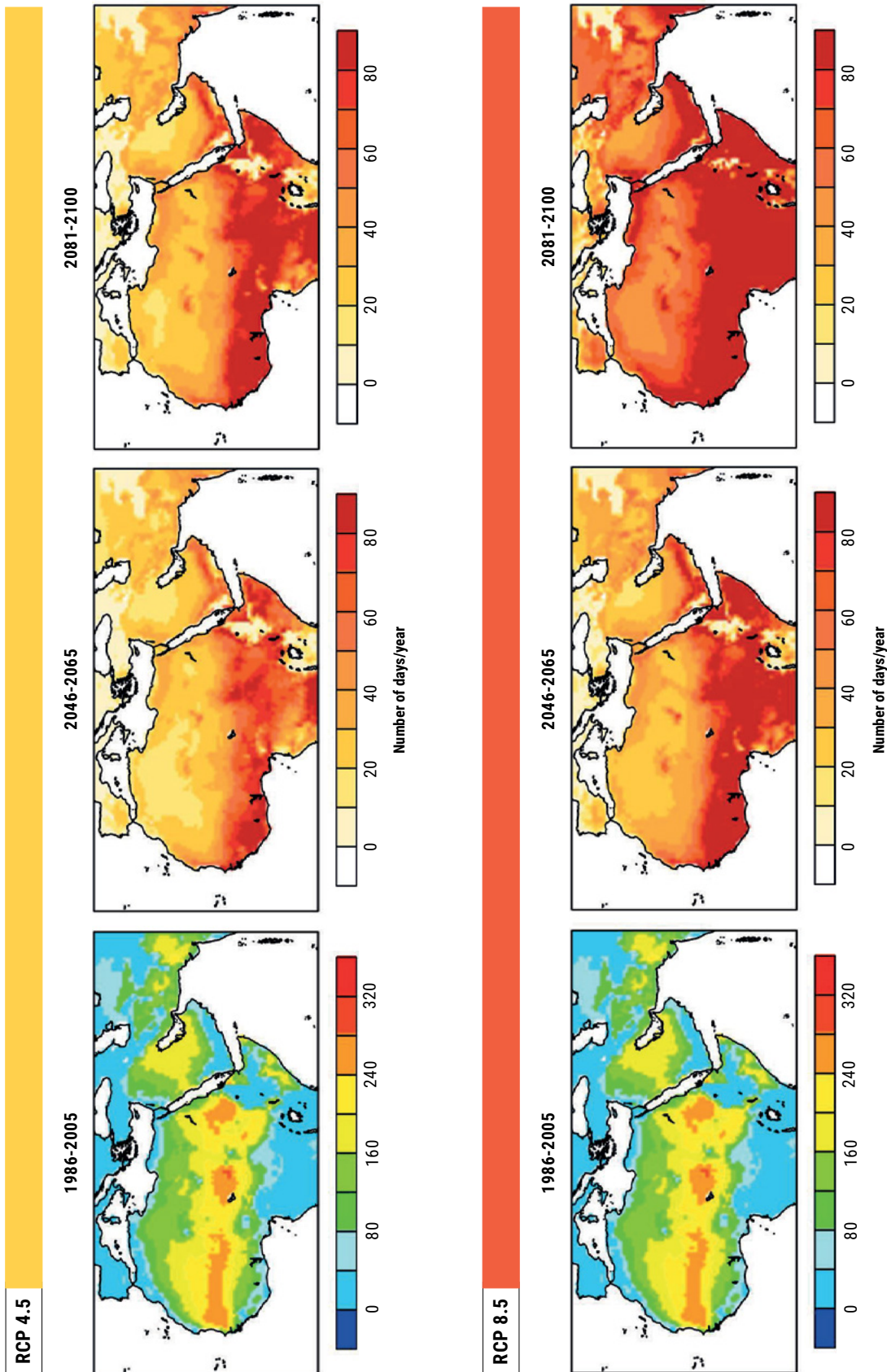
1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

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



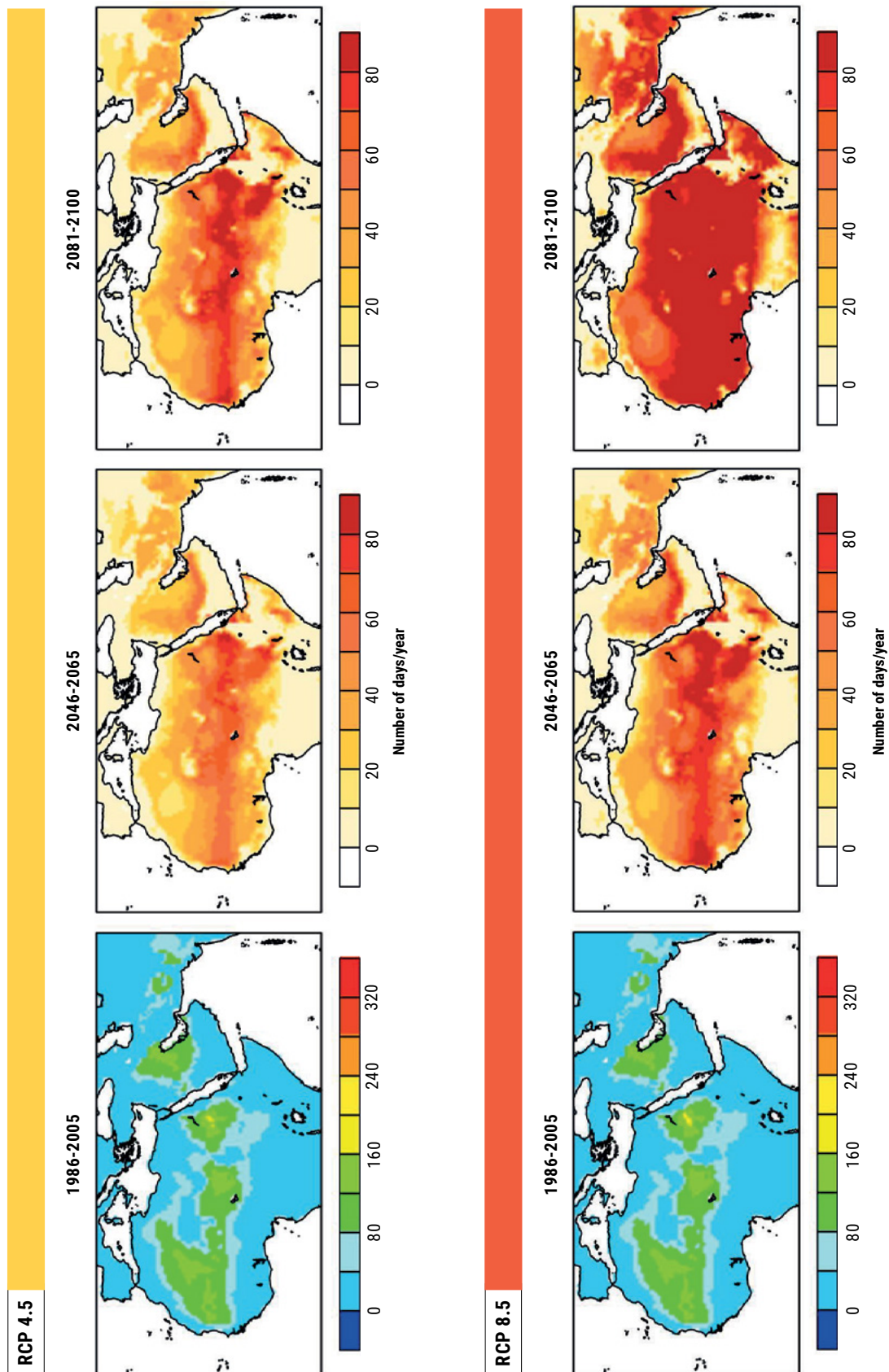
1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

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



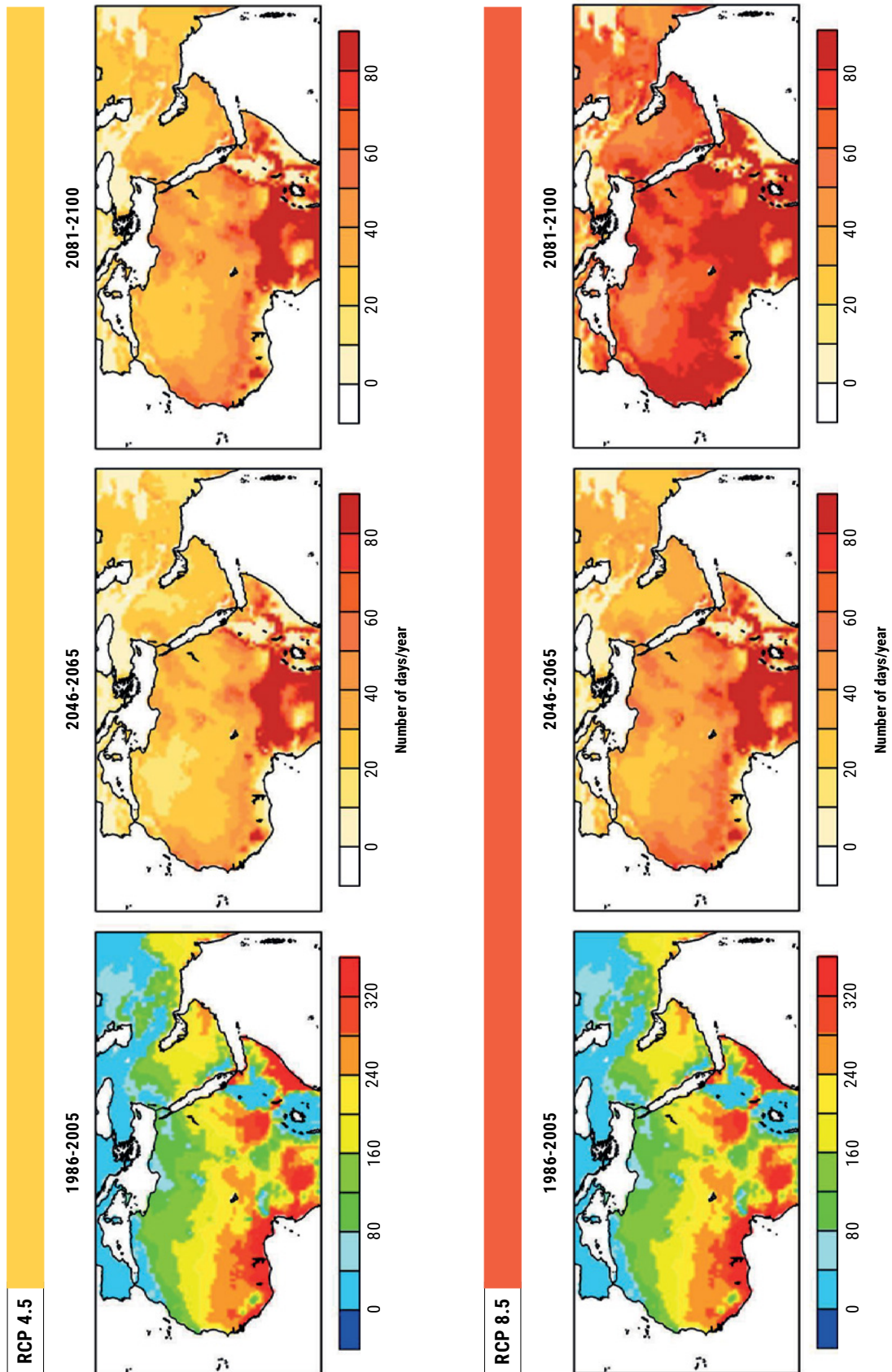
1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

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



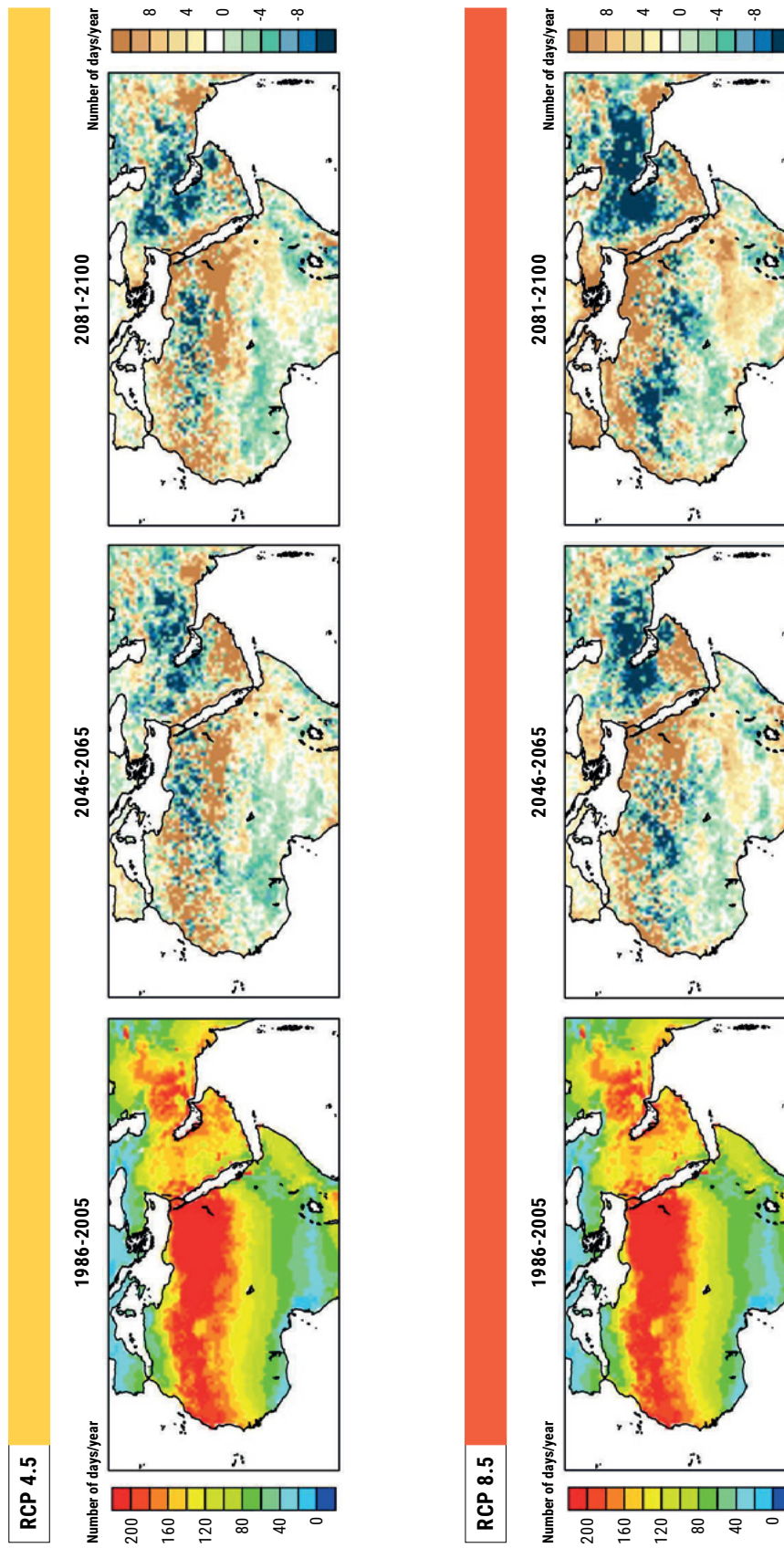
1.2. EXTREME EVENTS – 1.2.1. CHANGES IN EXTREME TEMPERATURE

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



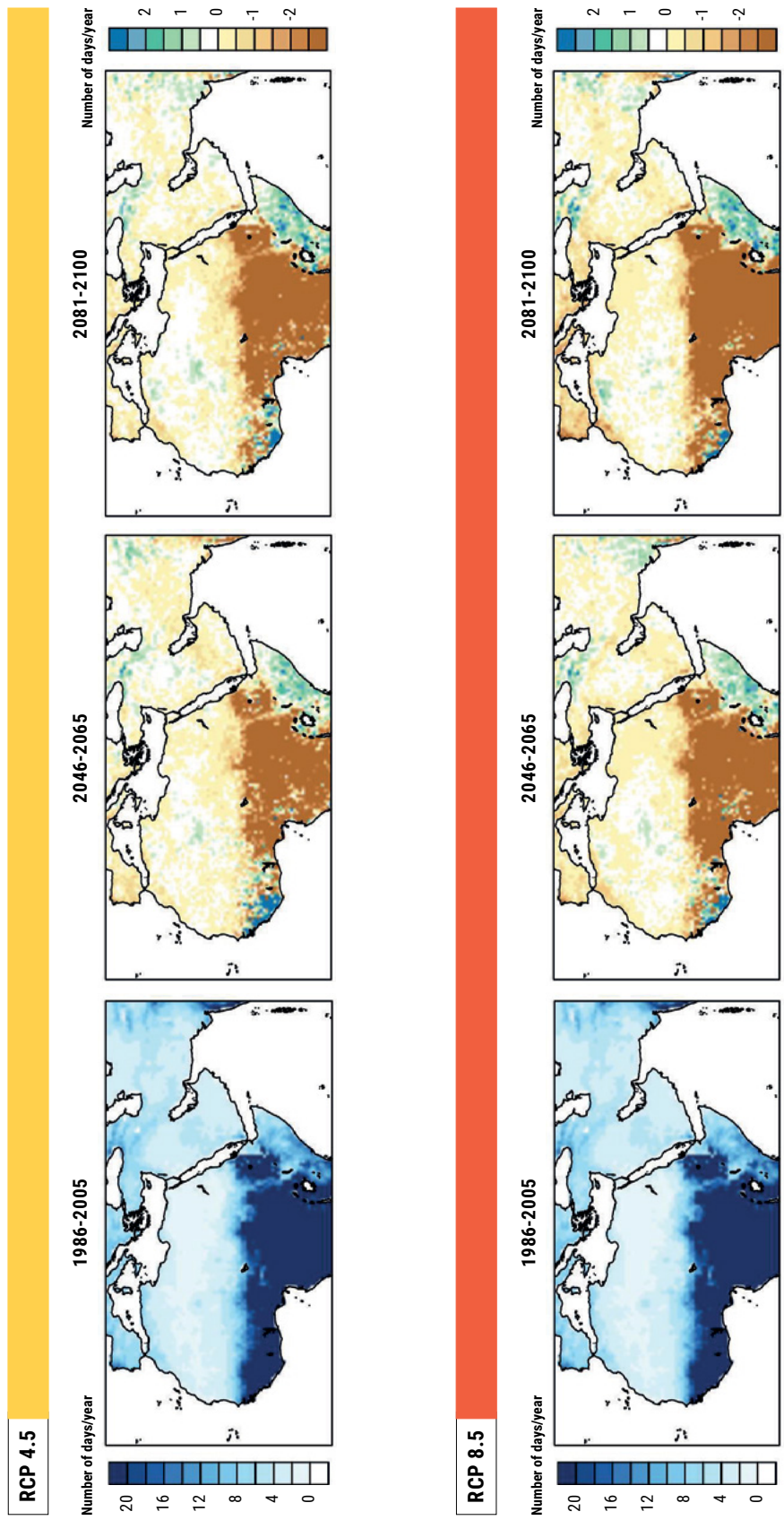
1.2. EXTREME EVENTS – 1.2.2. CHANGES IN EXTREME PRECIPITATION

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



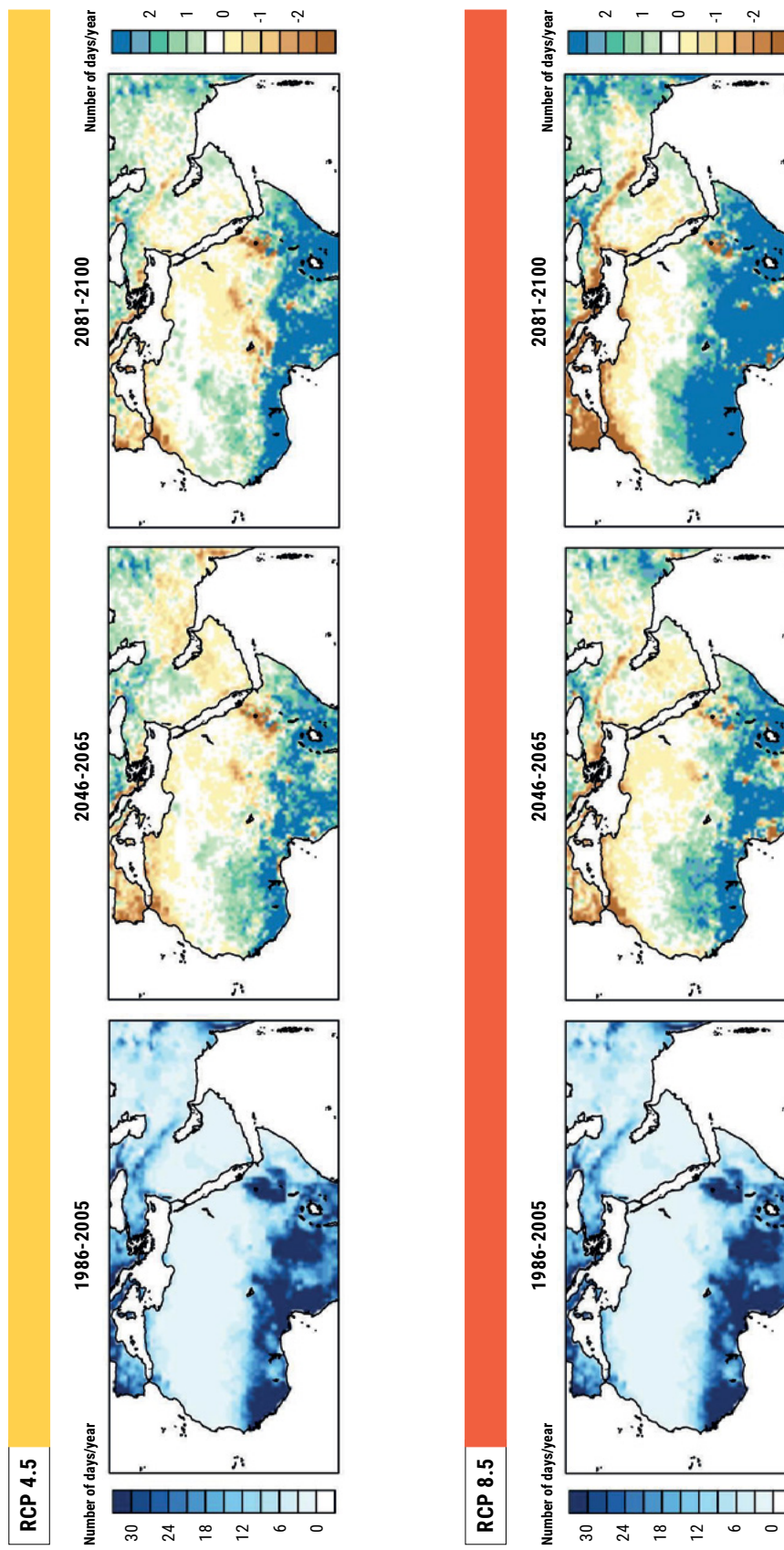
1.2. EXTREME EVENTS – 1.2.2. CHANGES IN EXTREME PRECIPITATION

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



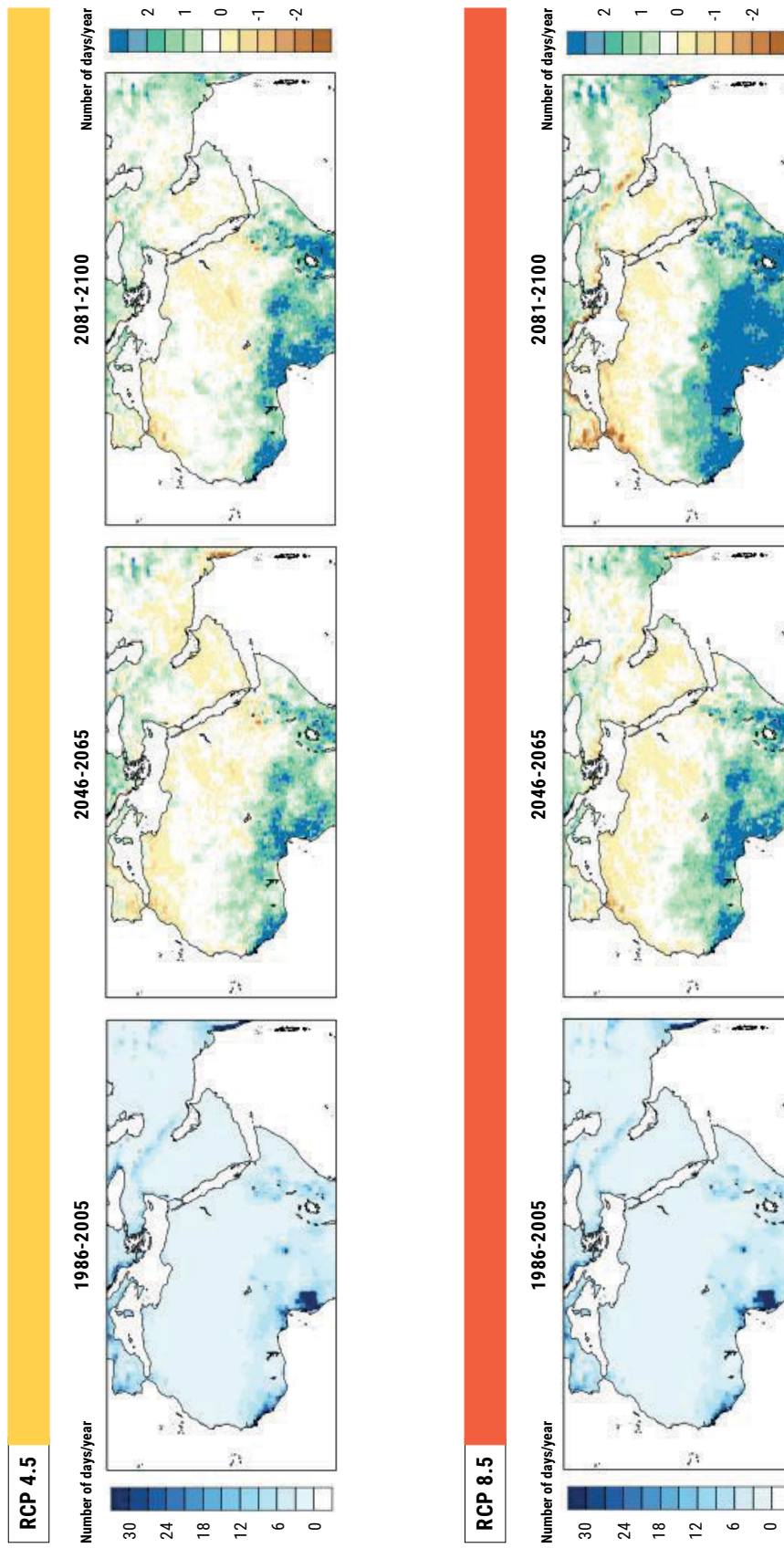
1.2. EXTREME EVENTS – 1.2.2. CHANGES IN EXTREME PRECIPITATION

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



1.2. EXTREME EVENTS – 1.2.2. CHANGES IN EXTREME PRECIPITATION

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

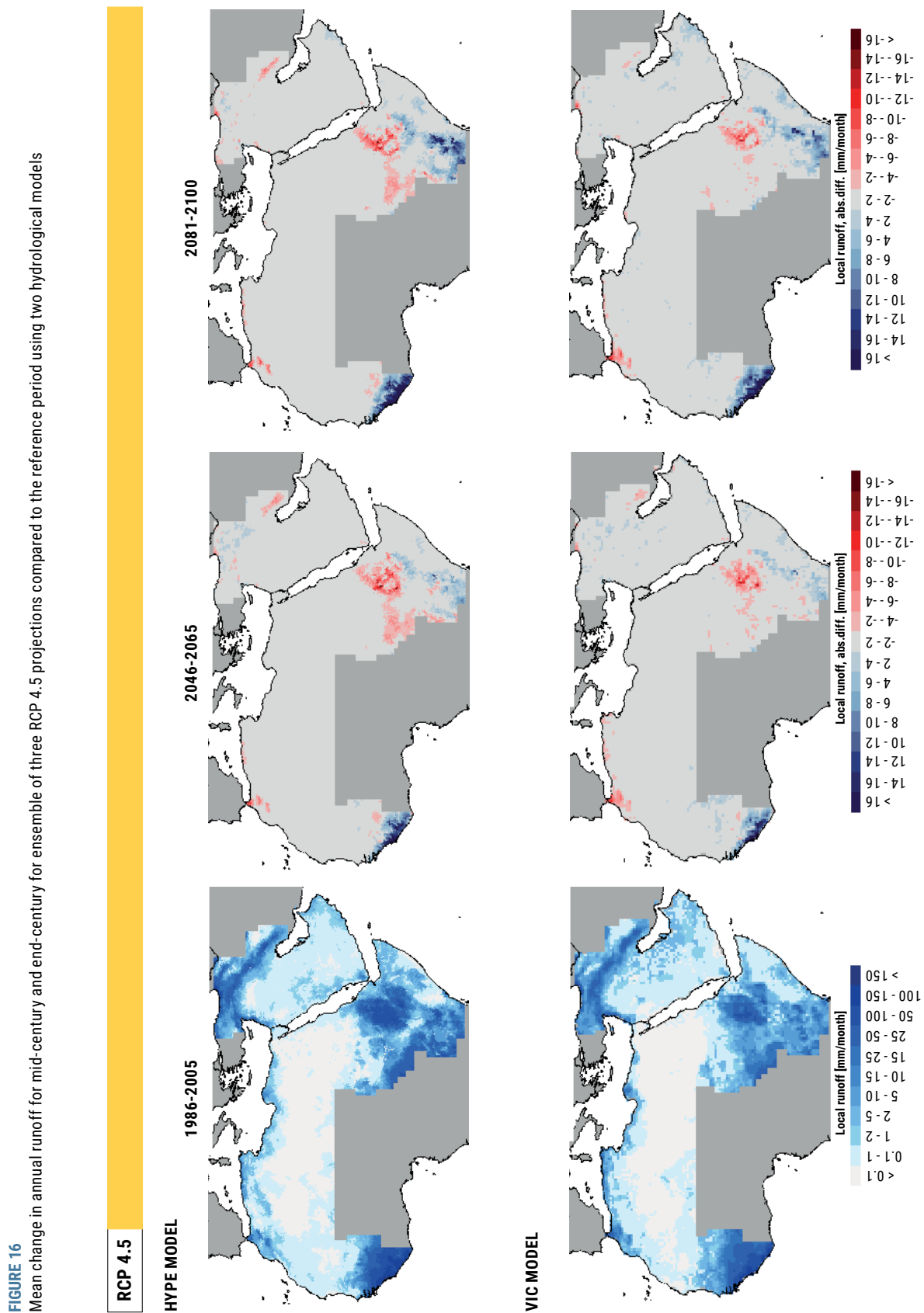


CHAPTER 2



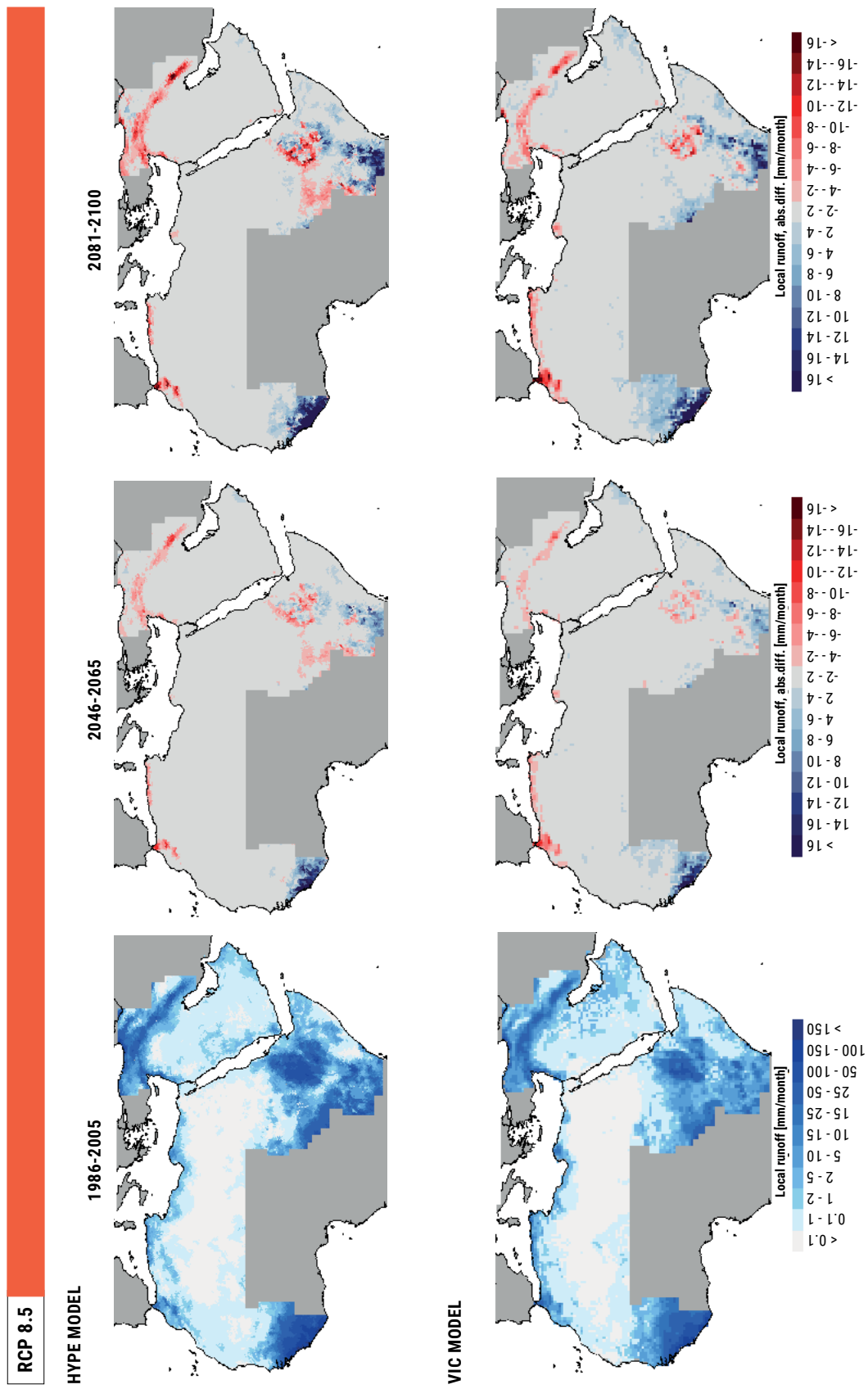
REGIONAL HYDROLOGICAL MODELLING: ARAB REGION

2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF

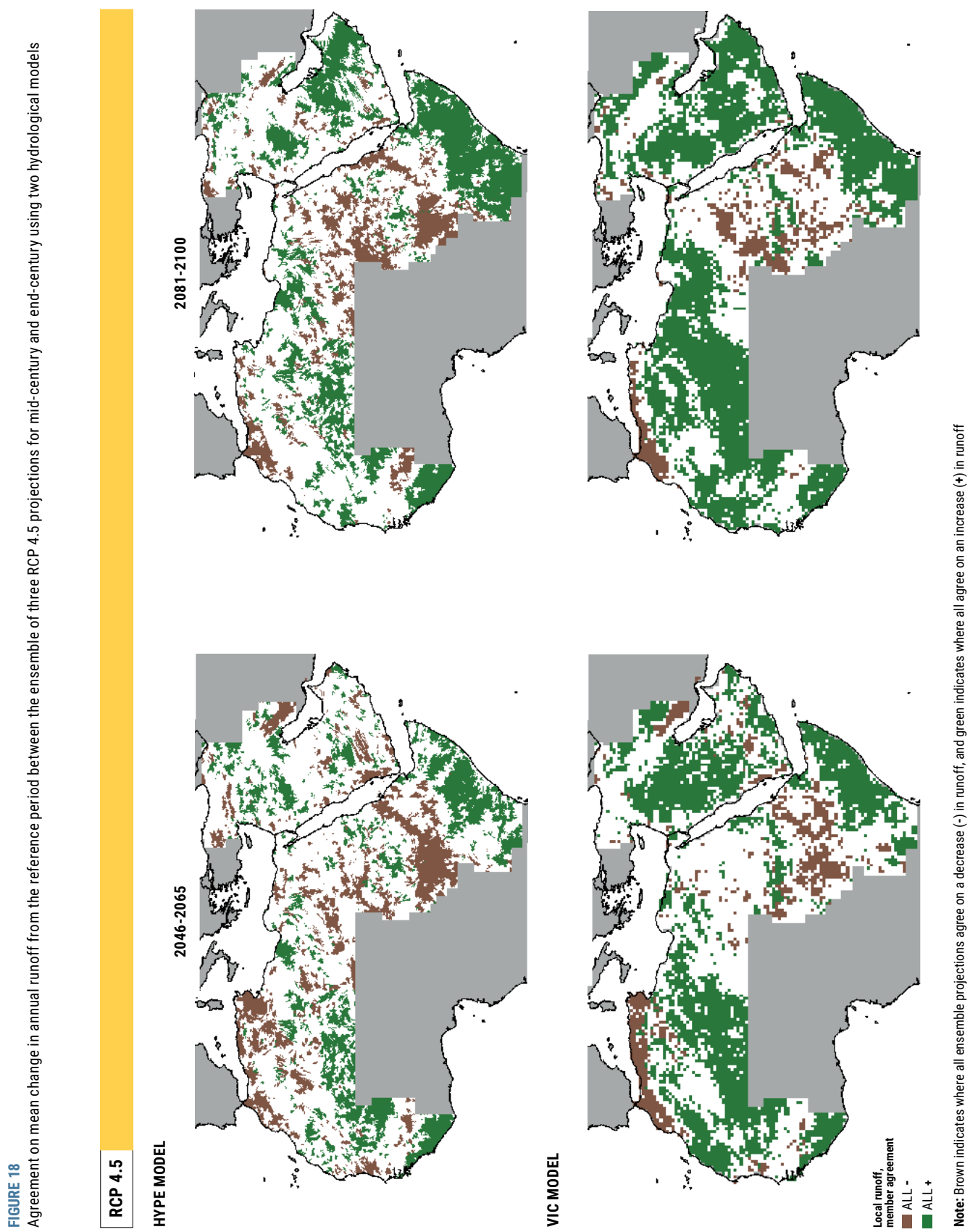


2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF

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

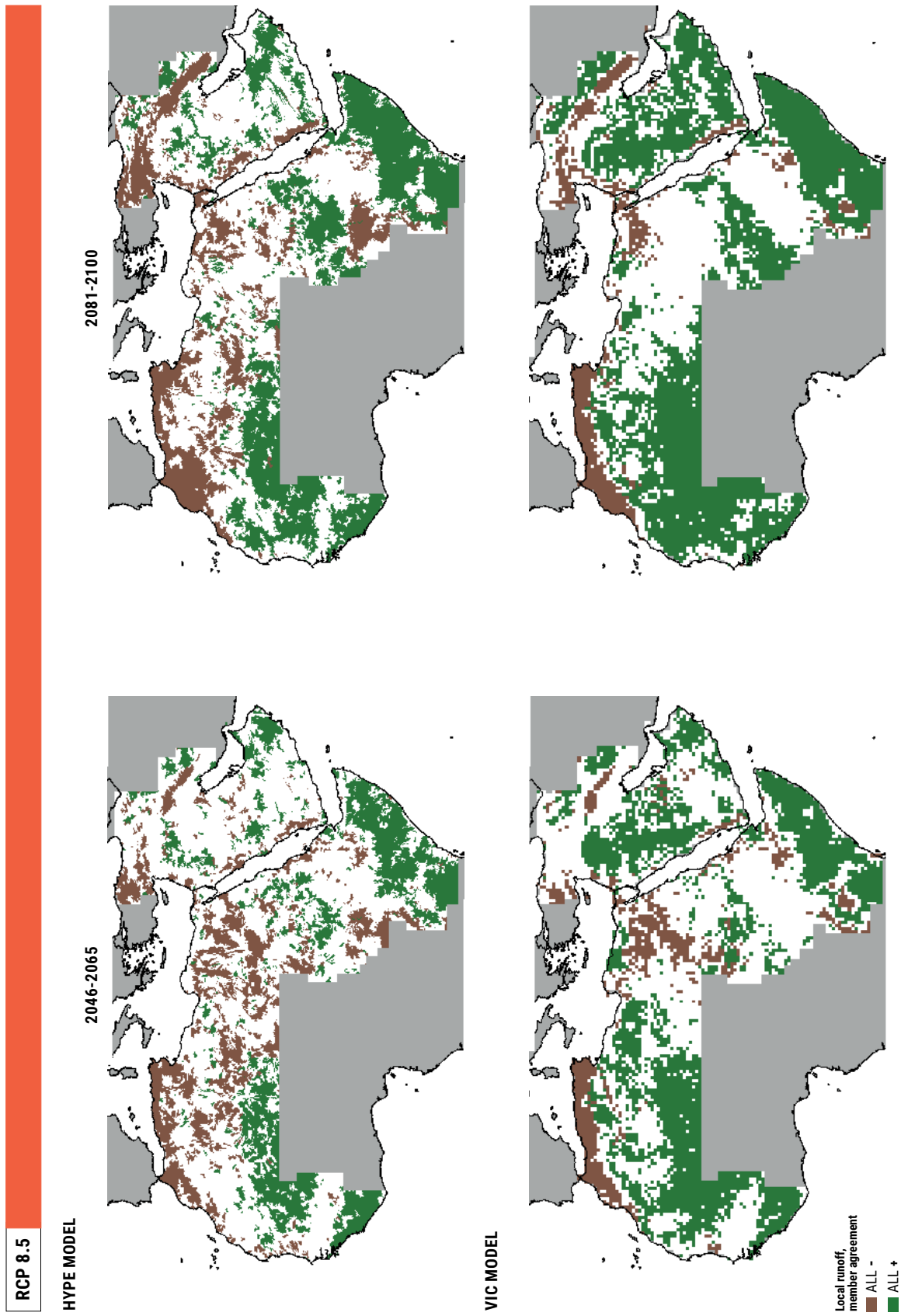


2.1. HYDROLOGICAL PARAMETERS – 2.1.1. RUNOFF



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



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

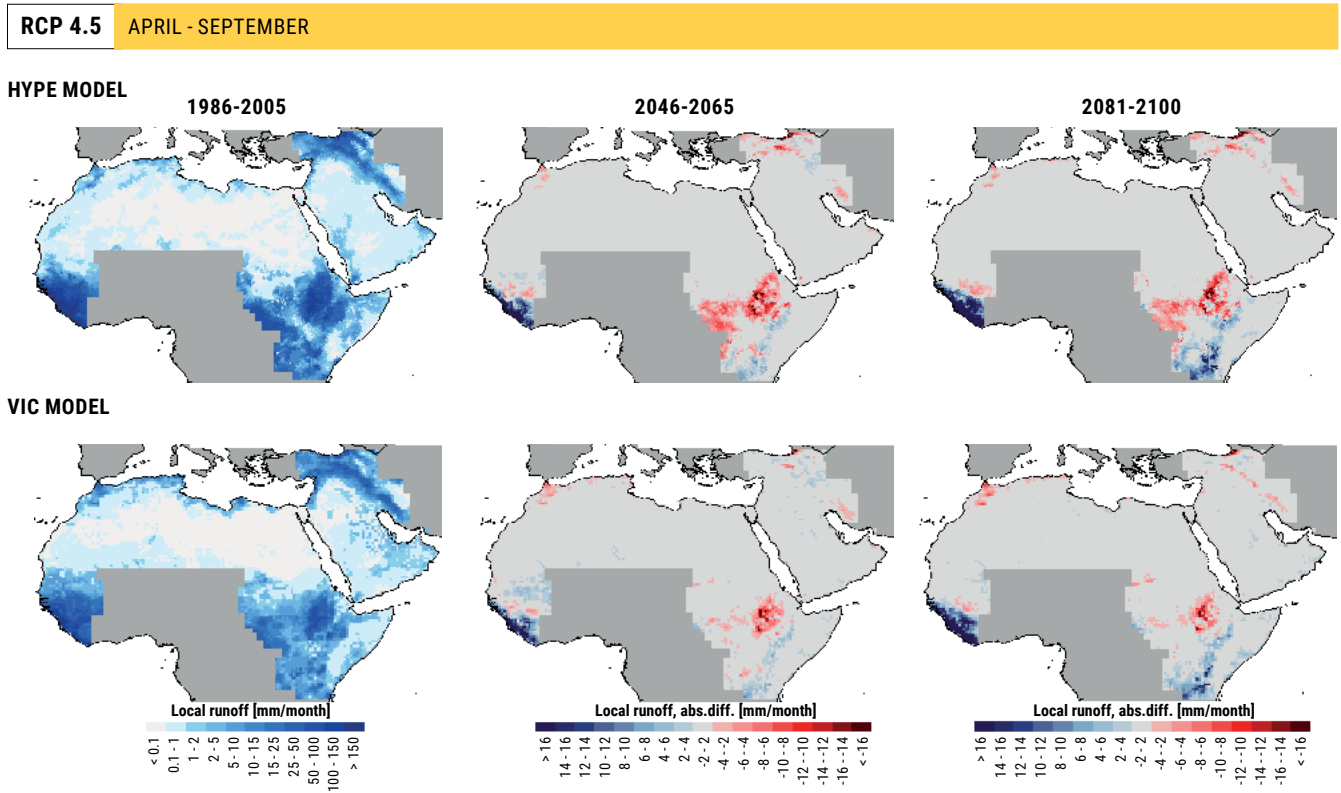
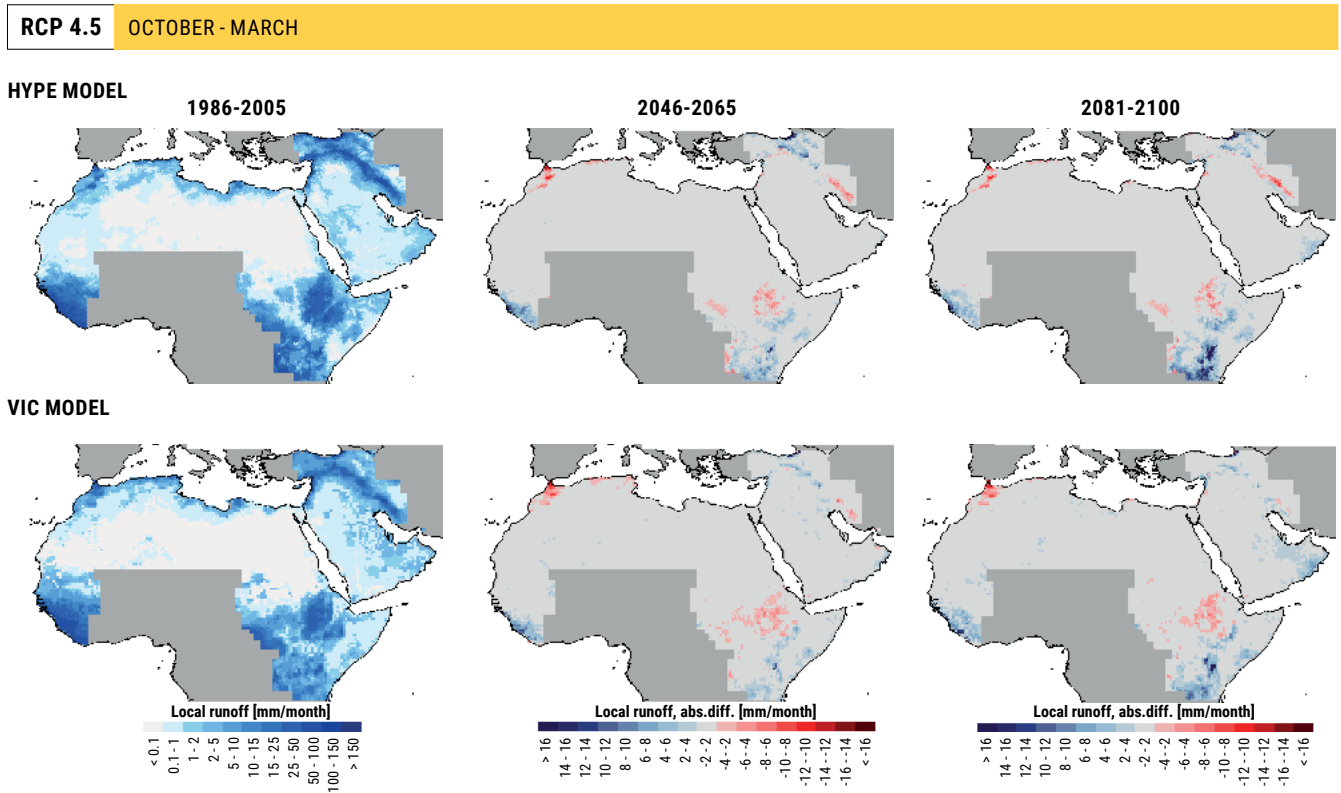


FIGURE 21

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



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

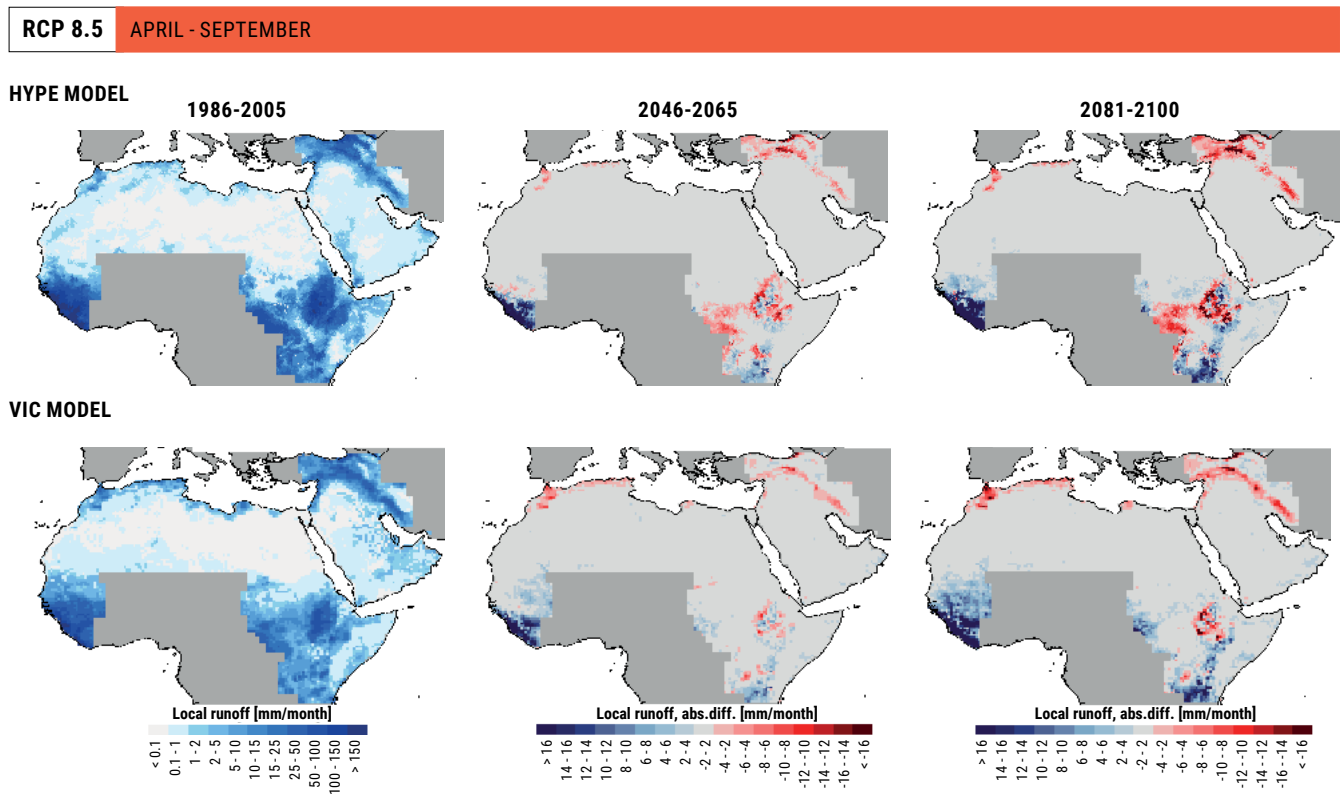
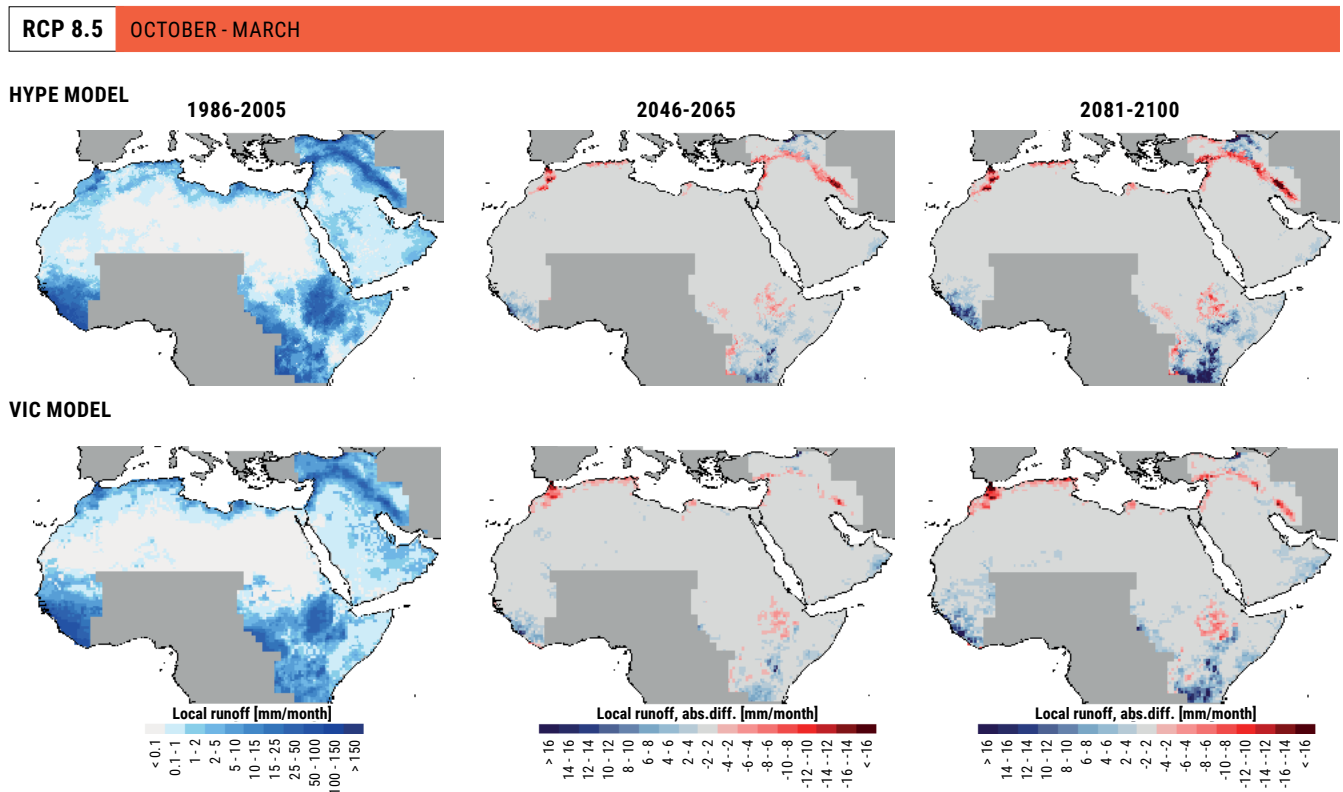


FIGURE 23

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



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

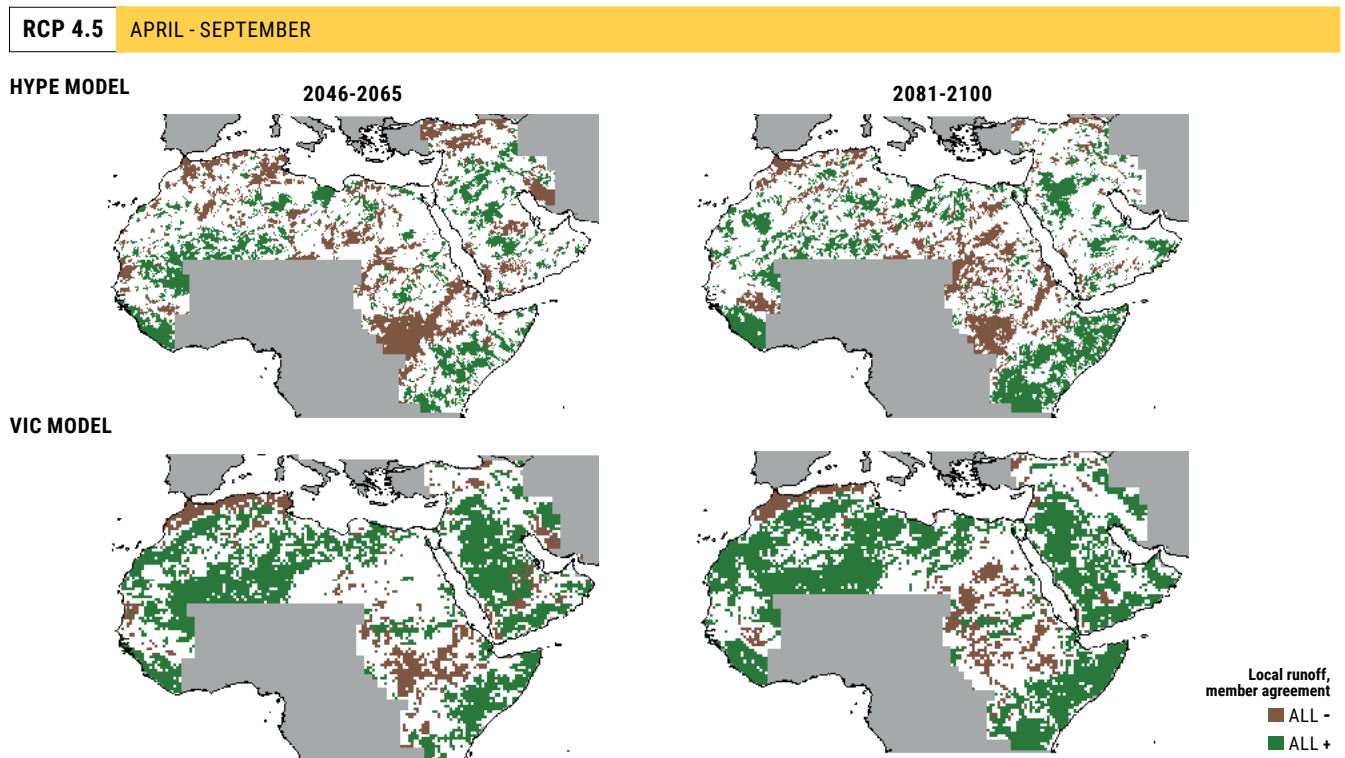
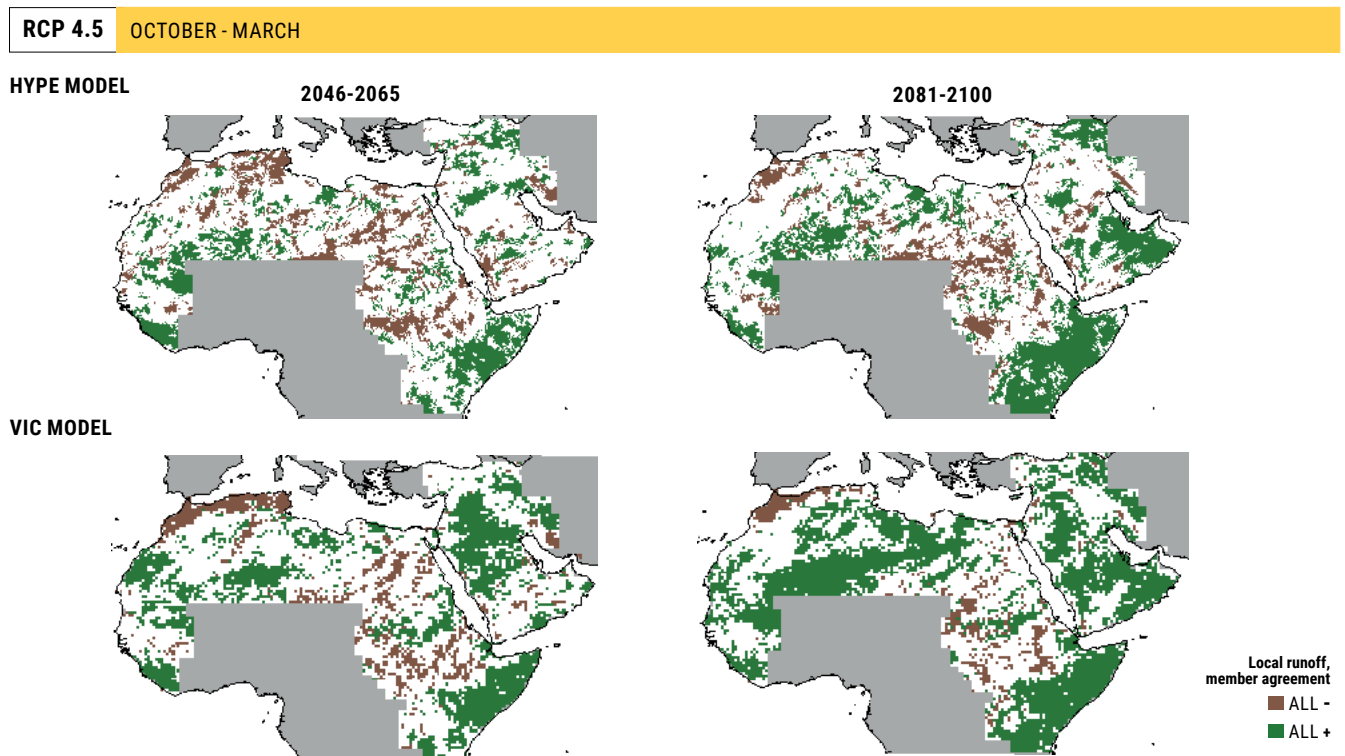


FIGURE 25

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

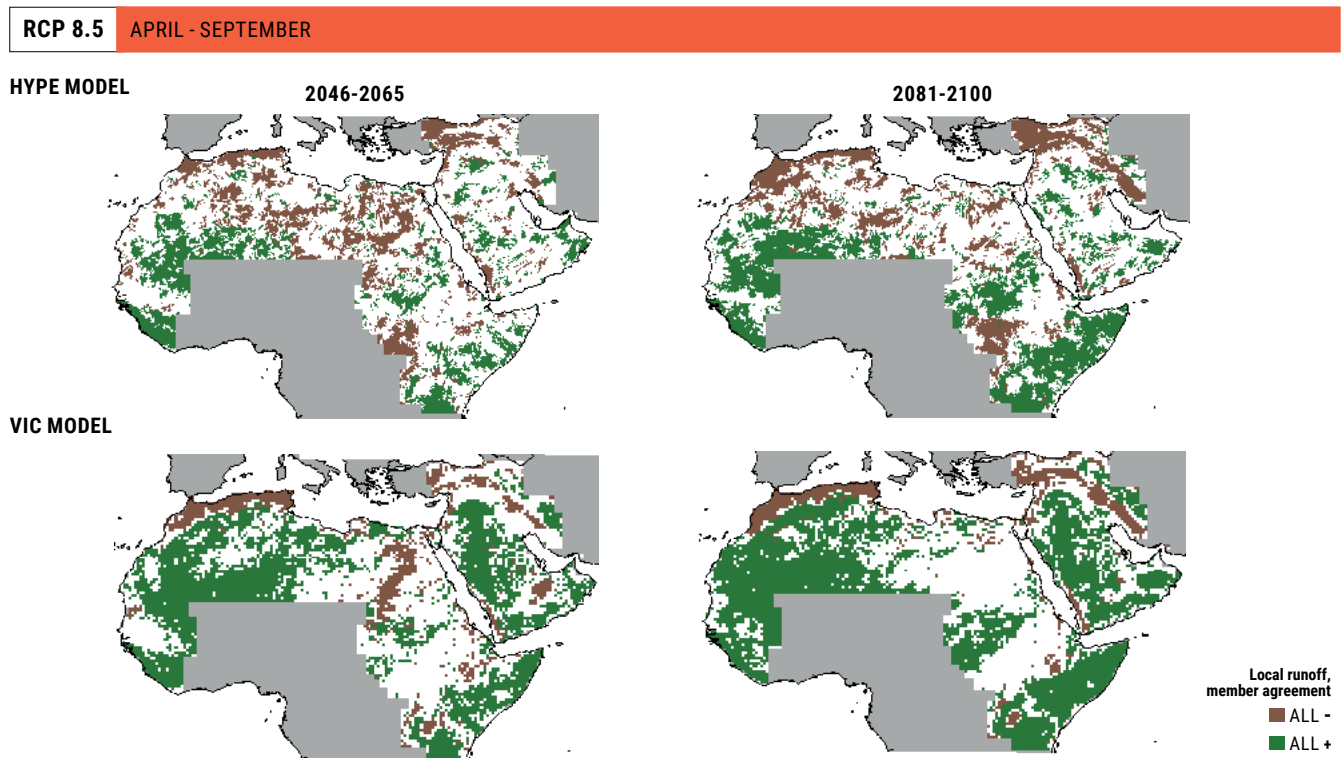
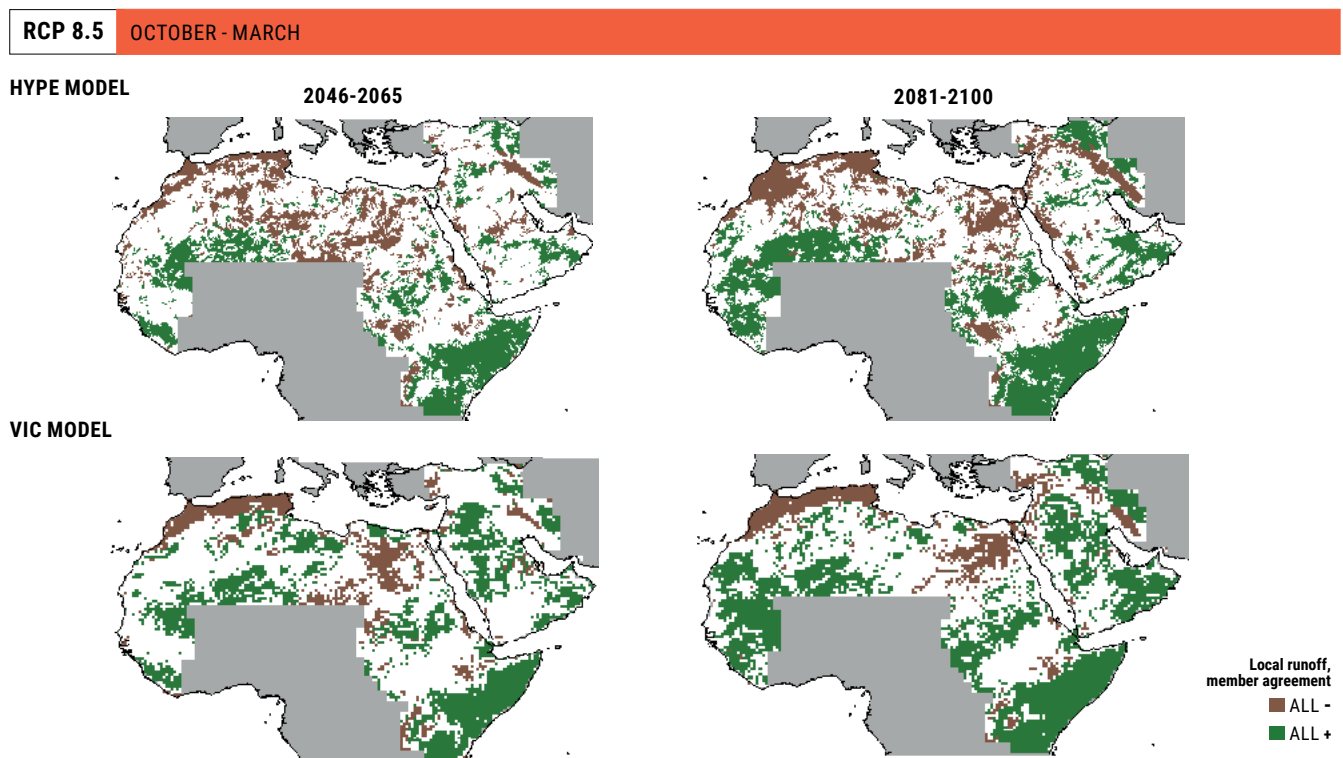


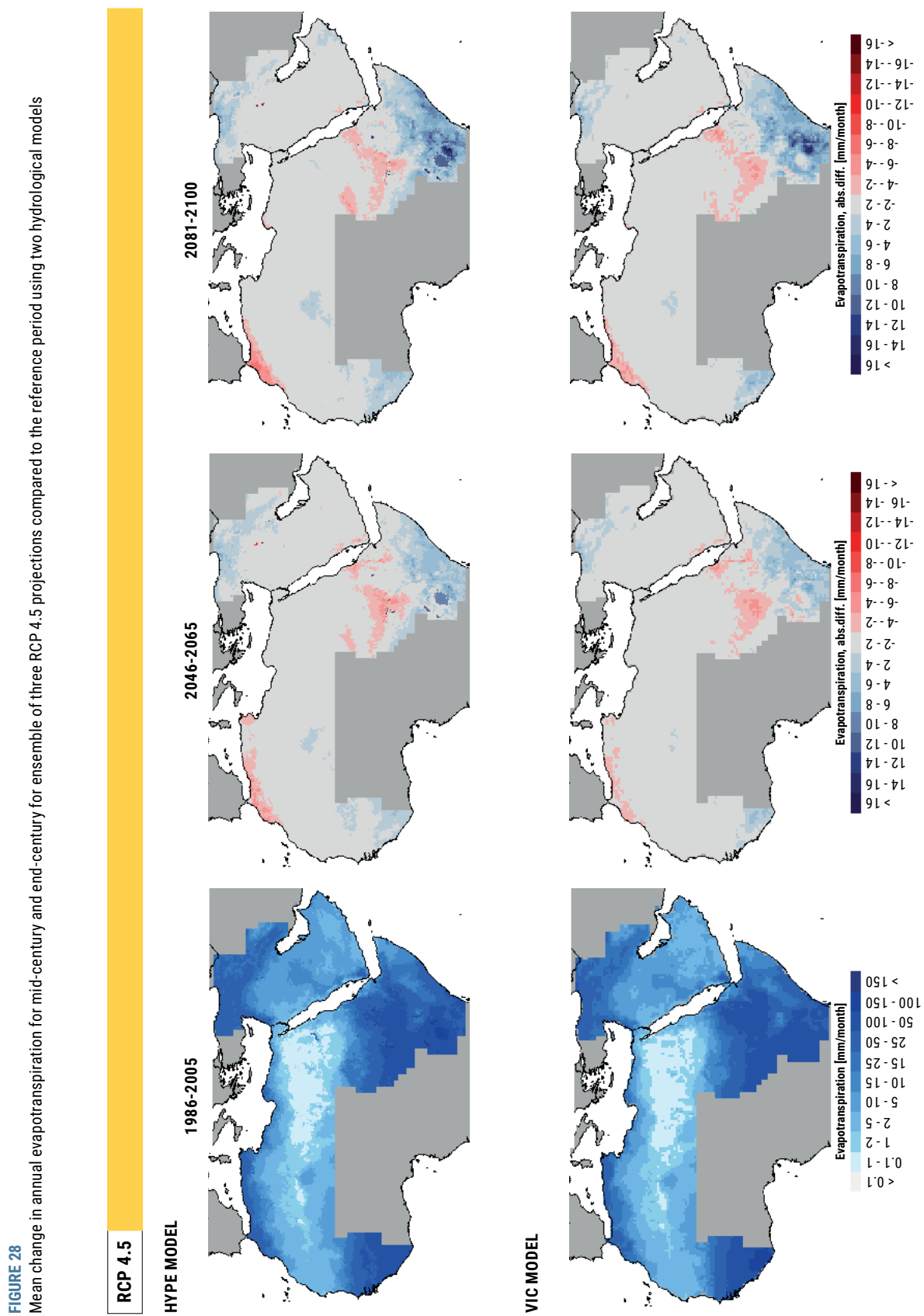
FIGURE 27

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



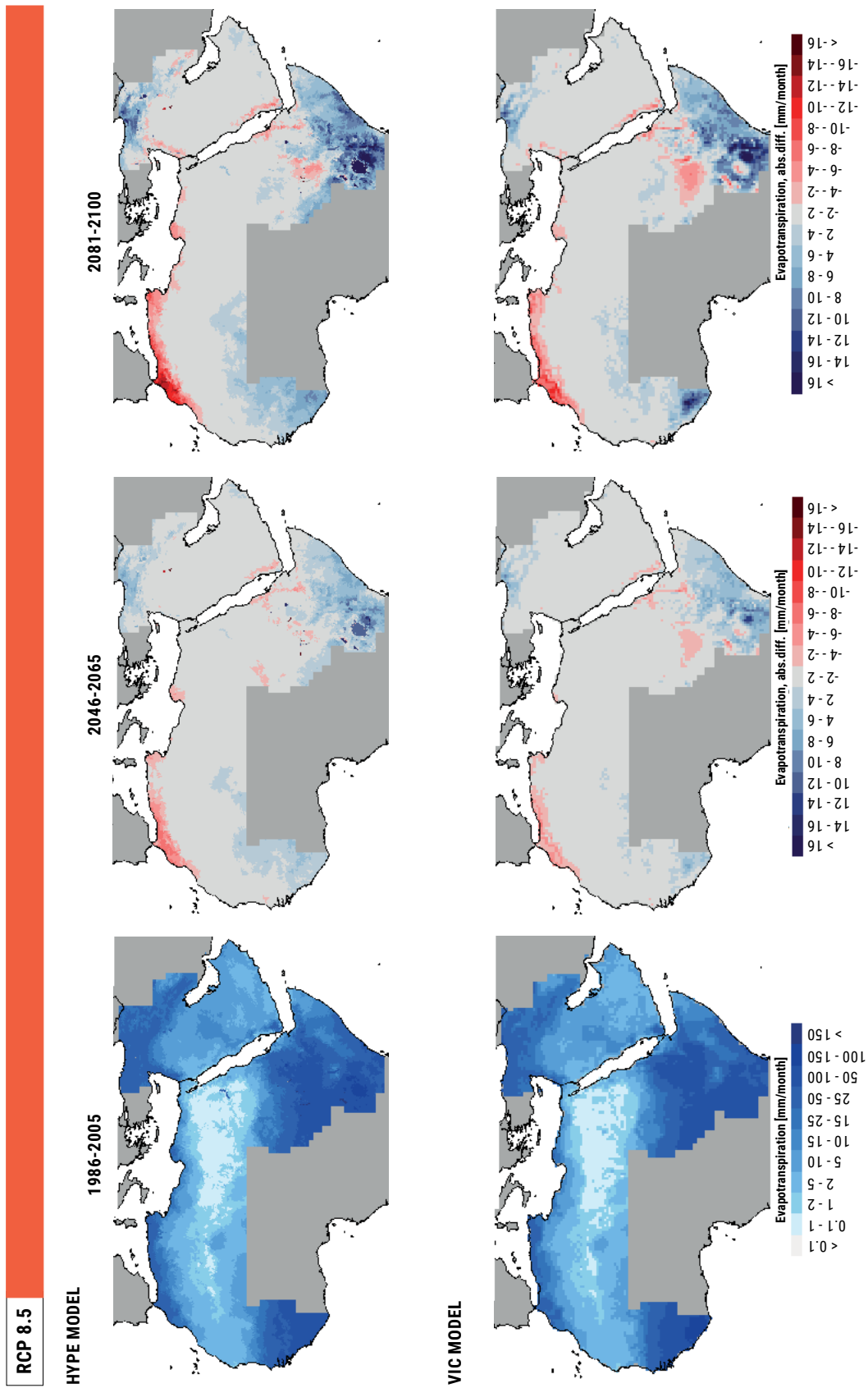
Note: Brown indicates where all ensemble projections agree on a decrease (-) in runoff, and green indicates where all agree on an increase (+) in runoff

2.1. HYDROLOGICAL PARAMETERS – 2.1.2. EVAPOTRANSPIRATION



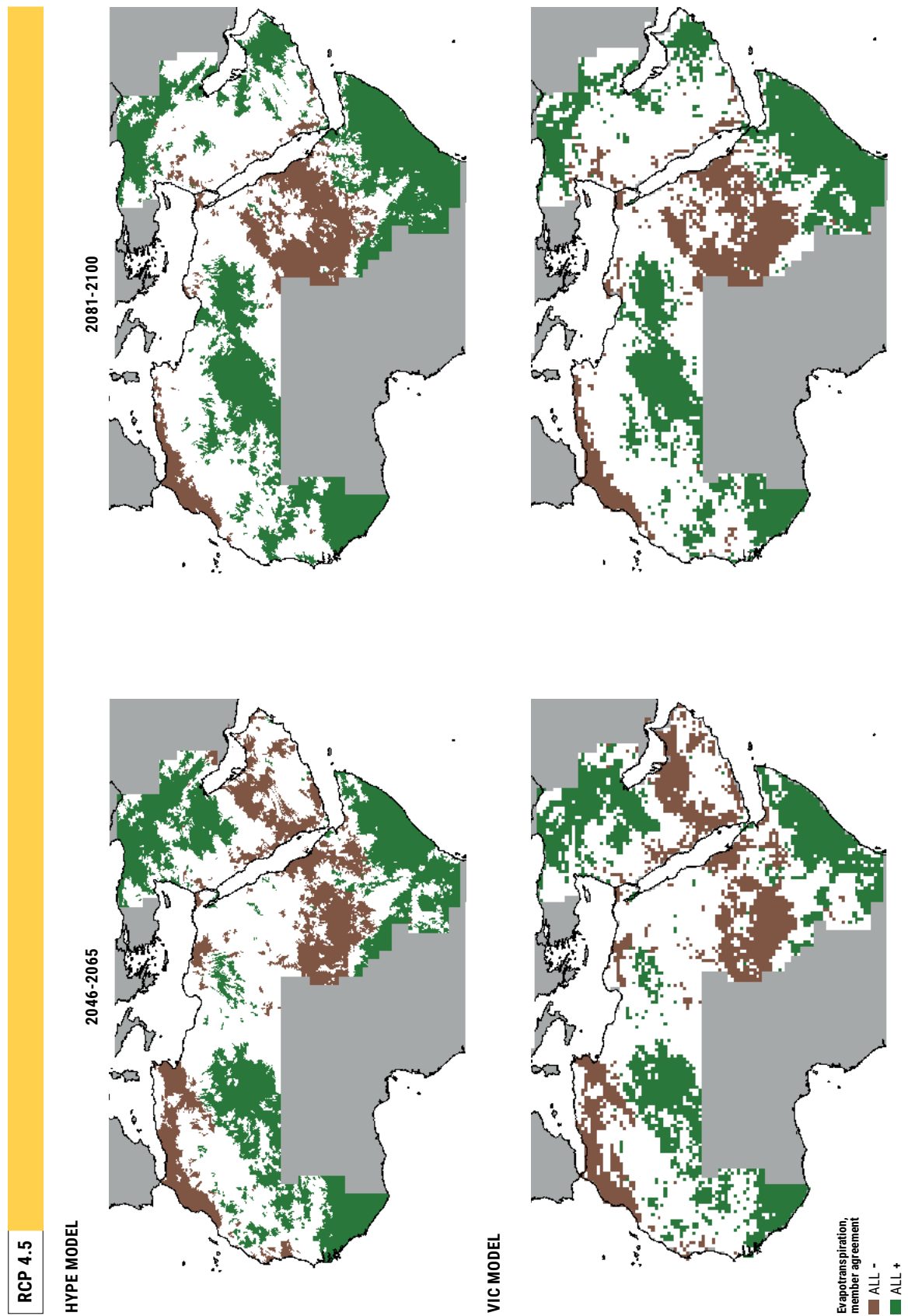
2.1. HYDROLOGICAL PARAMETERS – 2.1.2. EVAPOTRANSPIRATION

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



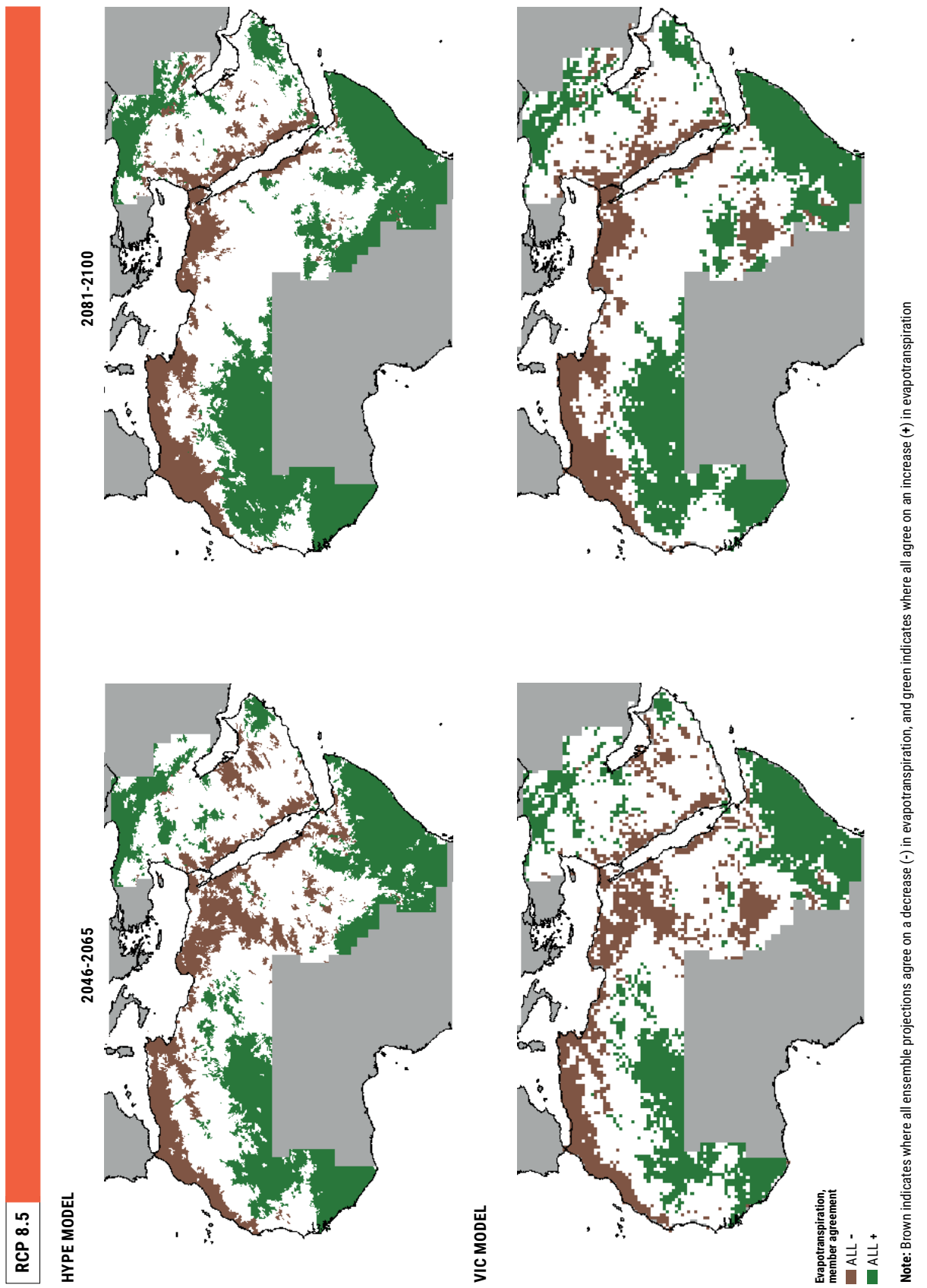
2.1. HYDROLOGICAL PARAMETERS – 2.1.2. EVAPOTRANSPIRATION

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



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



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

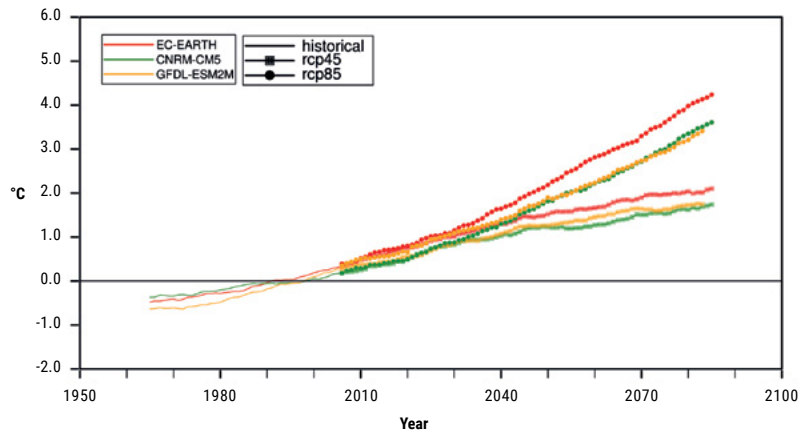


FIGURE 33

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

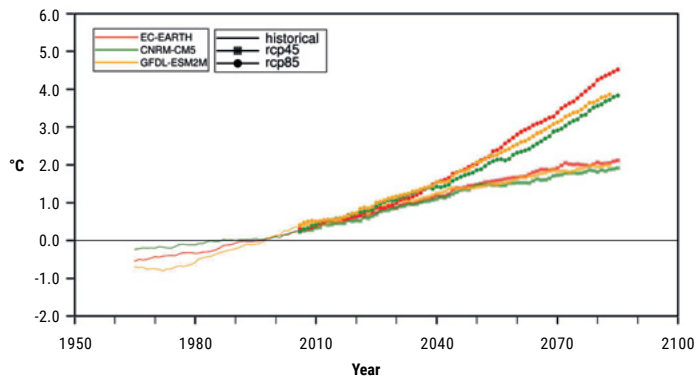


FIGURE 34

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

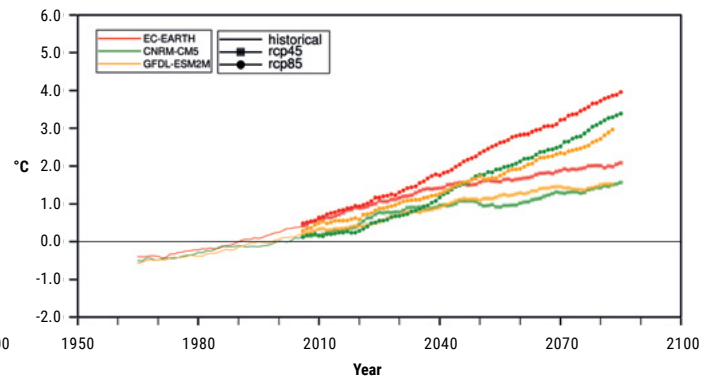


FIGURE 35

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

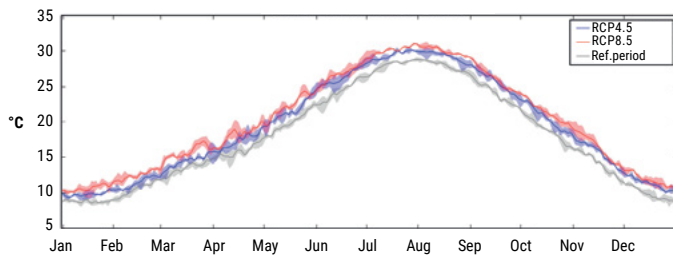
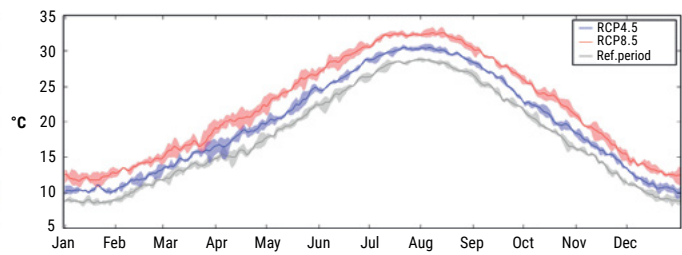


FIGURE 36

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

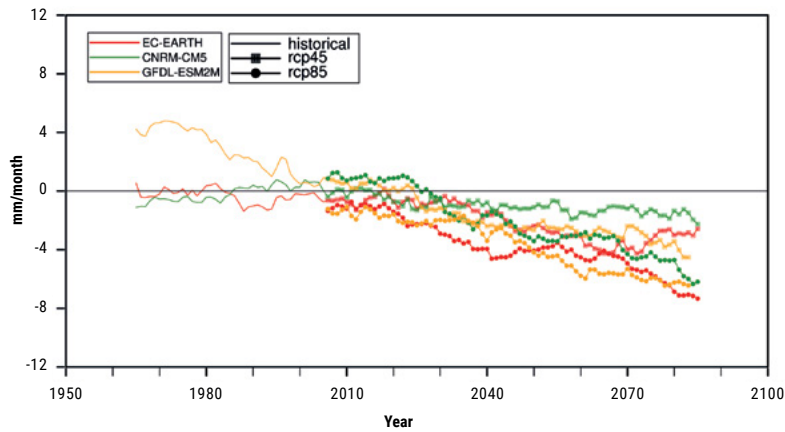


FIGURE 38

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

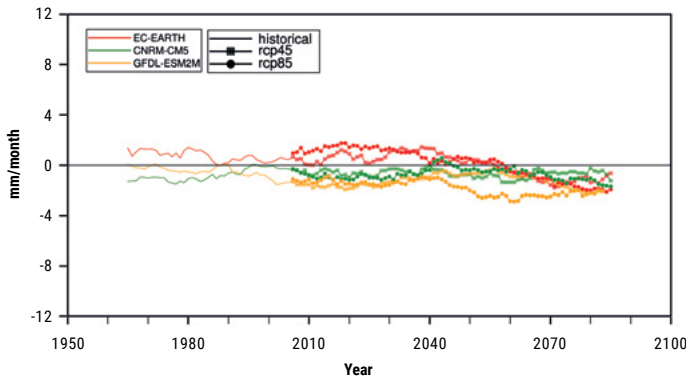


FIGURE 39

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

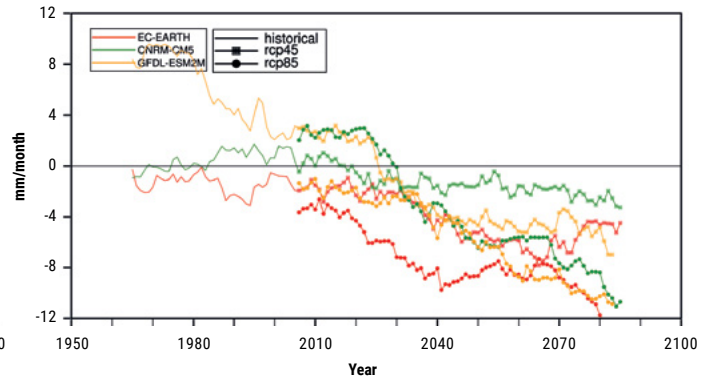


FIGURE 40

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

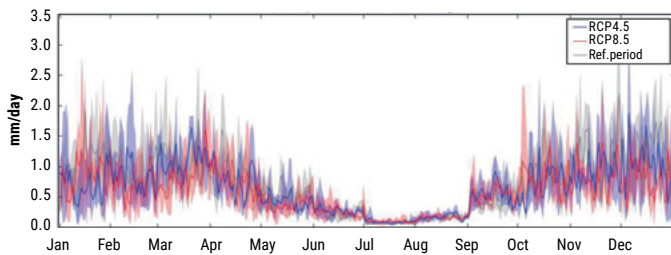
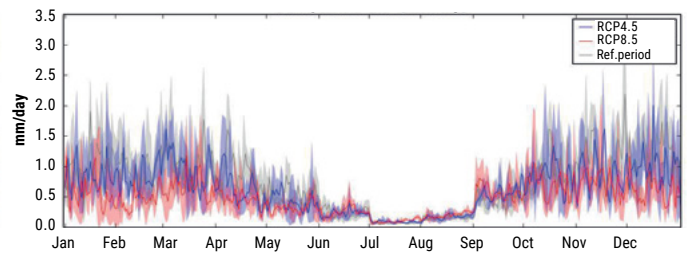


FIGURE 41

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

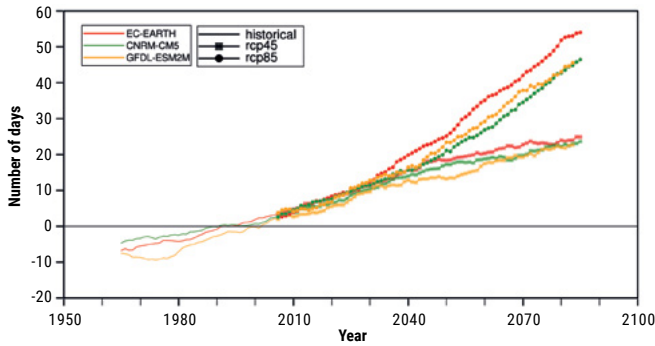


FIGURE 43

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

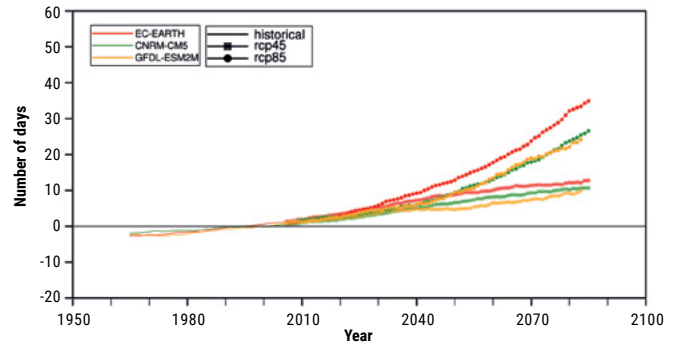
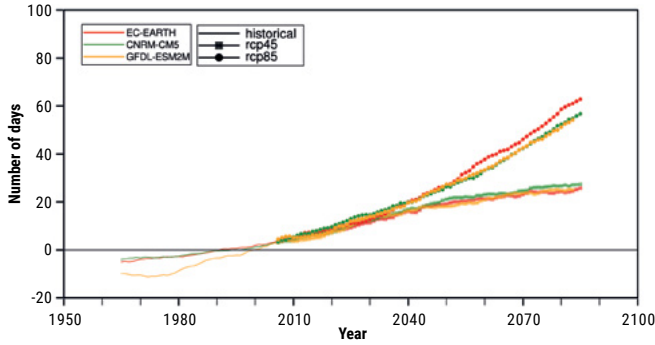


FIGURE 44

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

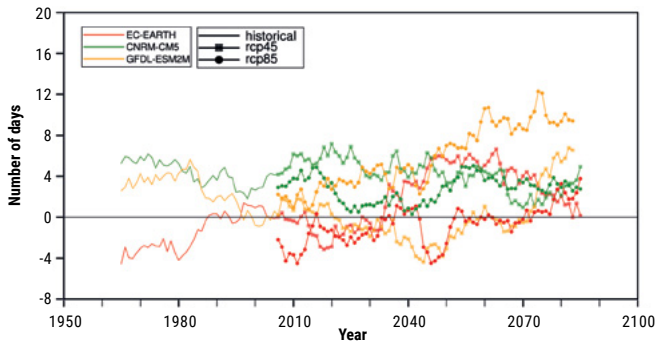


FIGURE 46

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

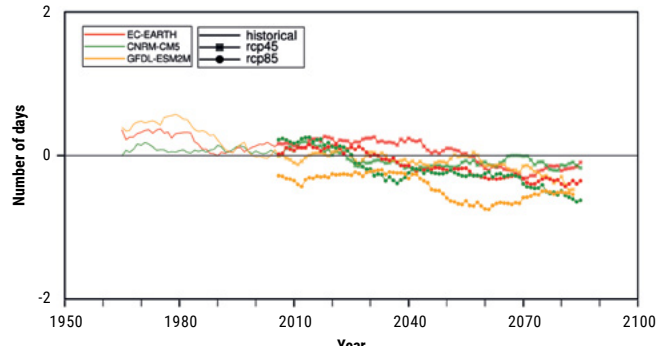


FIGURE 47

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

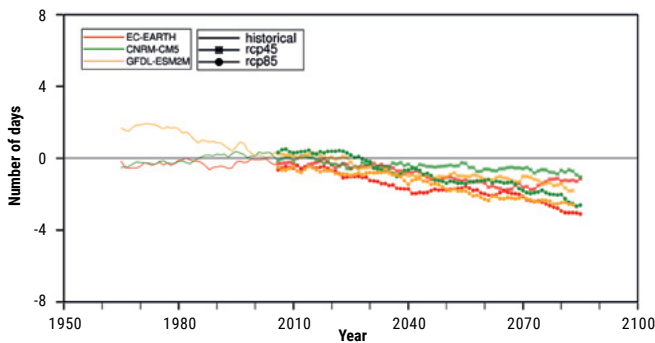
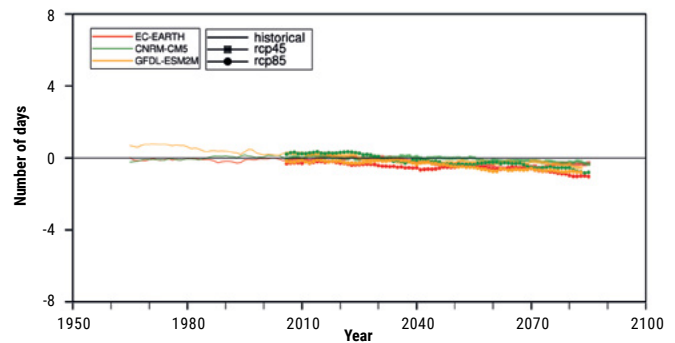


FIGURE 48

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

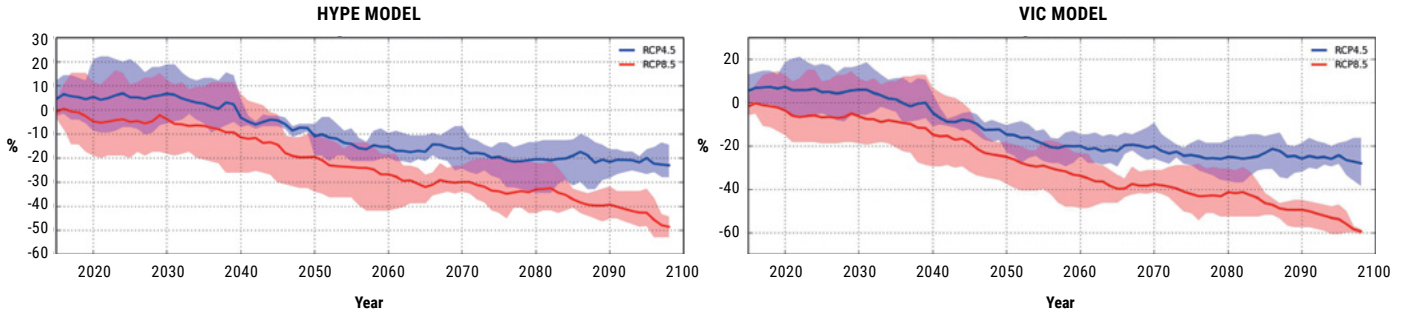


FIGURE 50

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

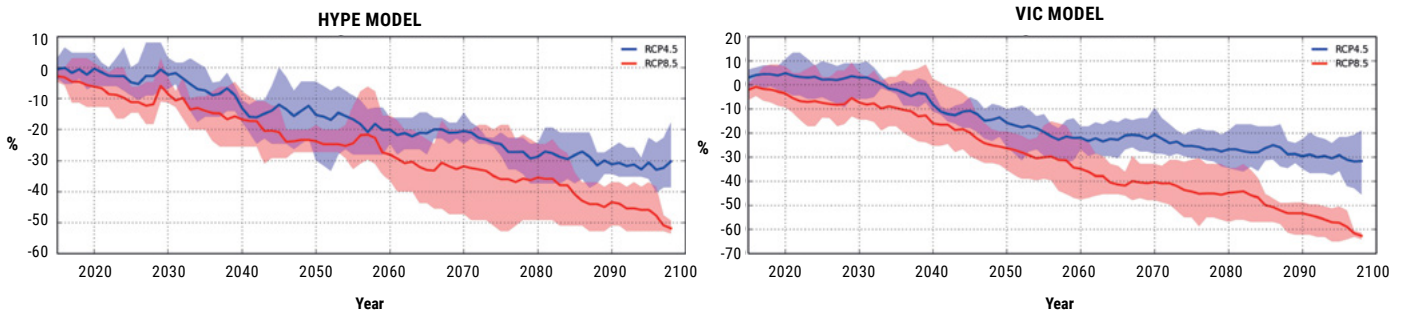
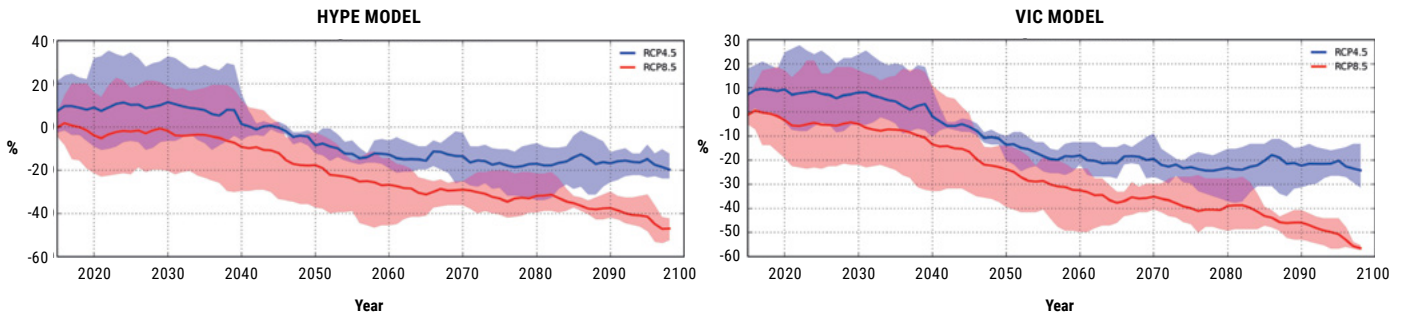


FIGURE 51

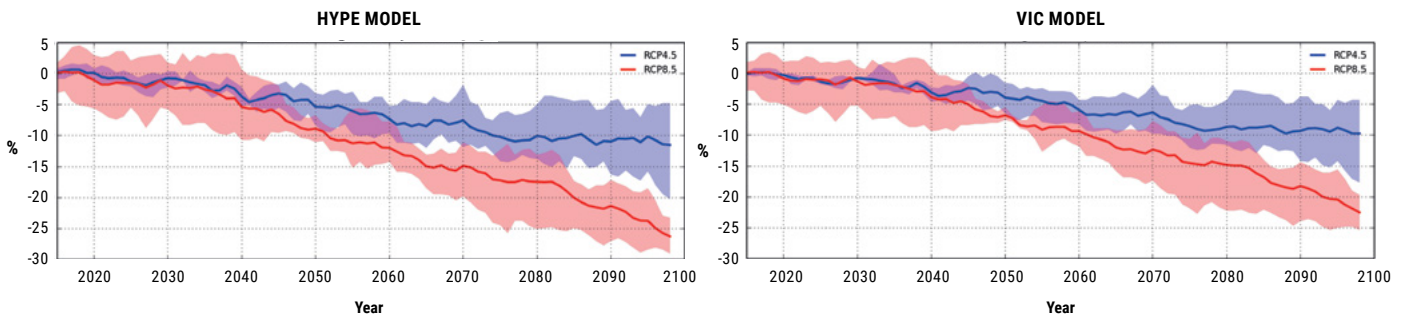
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



3.3. HYDROLOGICAL PARAMETERS – 3.3.2. EVAPOTRANSPIRATION

FIGURE 52

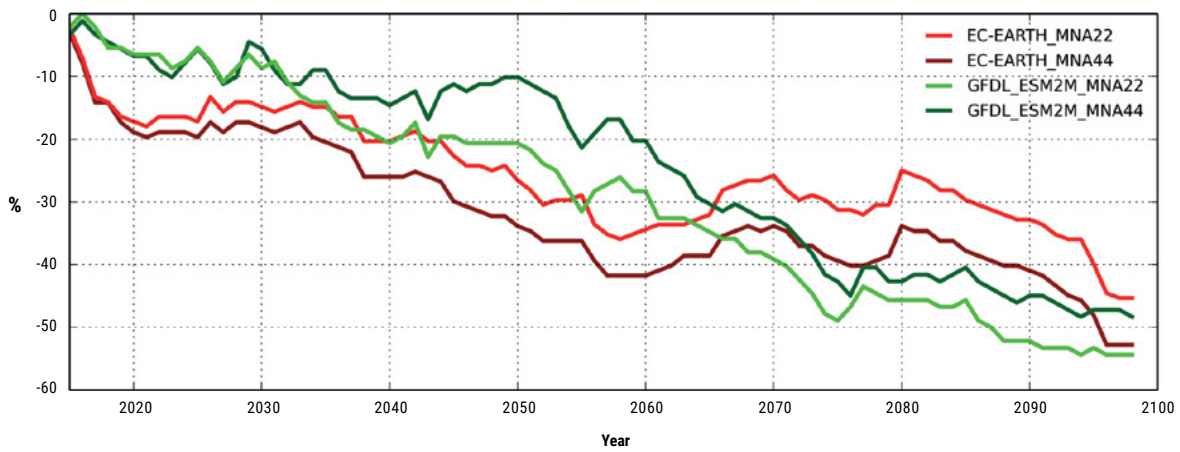
Mean change in annual evapotranspiration over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



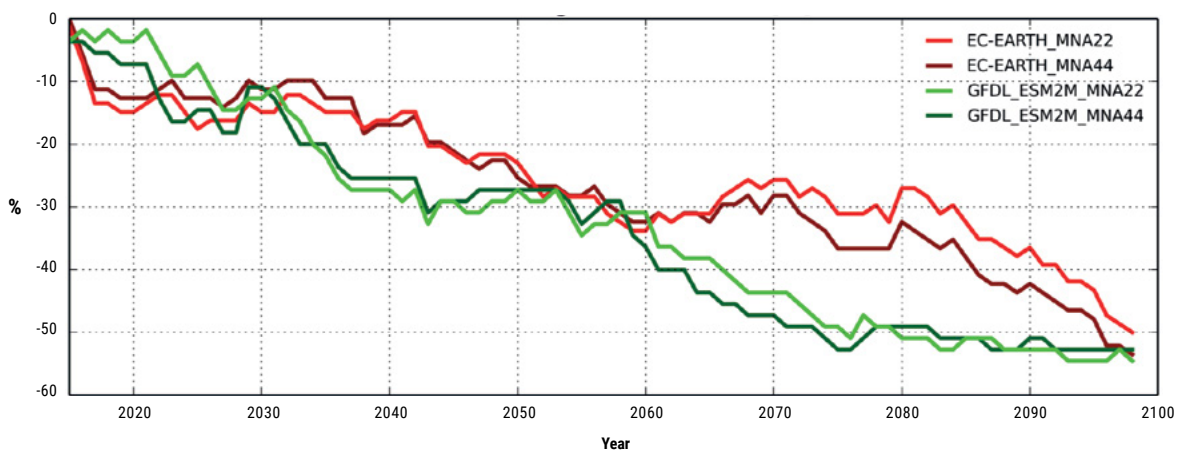
3.3. HYDROLOGICAL PARAMETERS – 3.3.3. COMPARISON 50 KM VS 25 KM RESOLUTIONS - RUNOFF

FIGURE 53

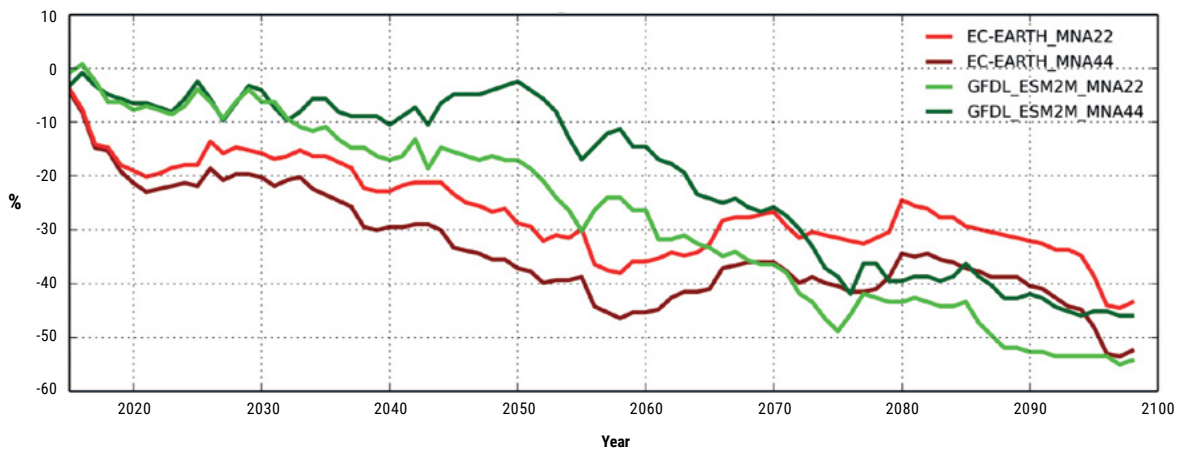
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual runoff over time for two RCP 8.5 projections using HYPE model

**FIGURE 54**

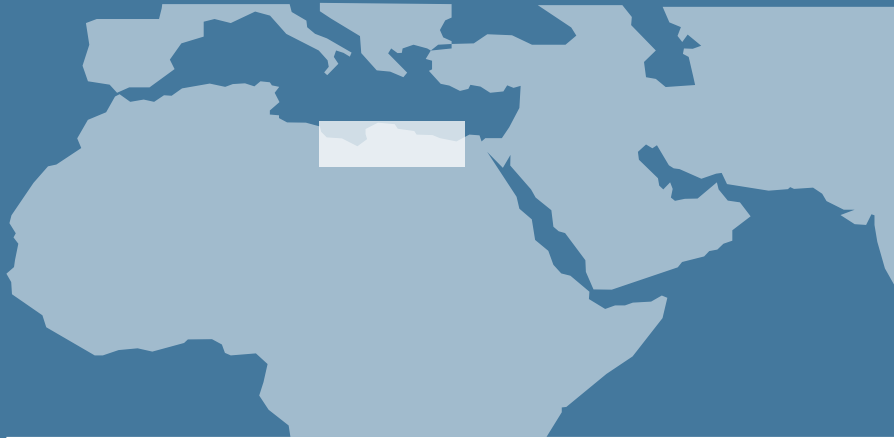
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (April-September) over time for two RCP 8.5 projections using HYPE model

**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

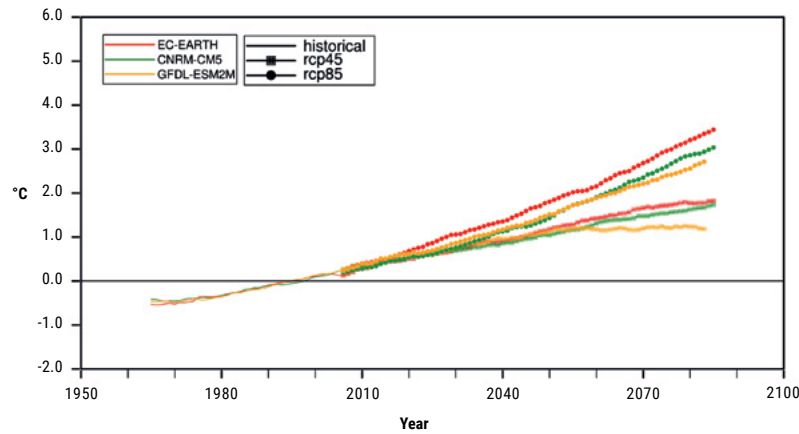


FIGURE 57

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

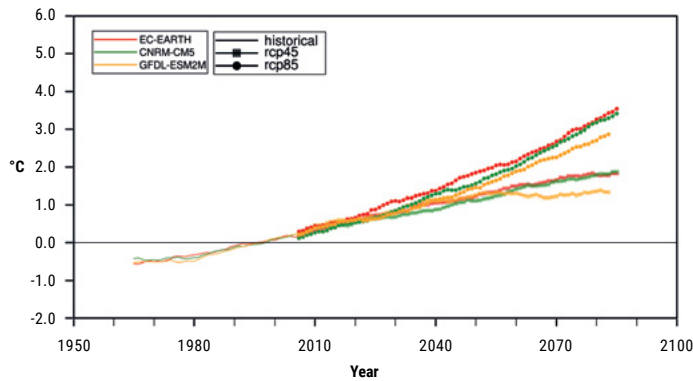


FIGURE 58

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

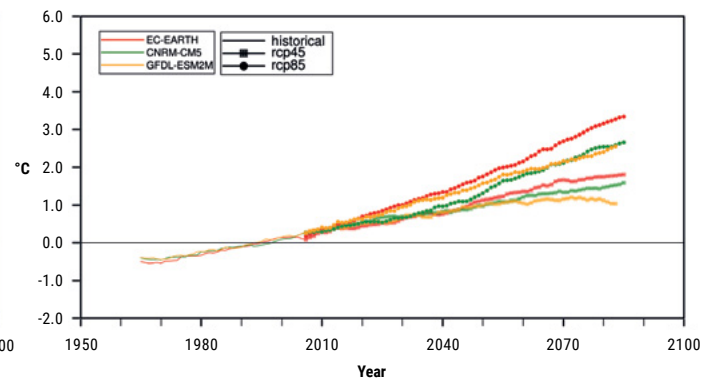


FIGURE 59

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

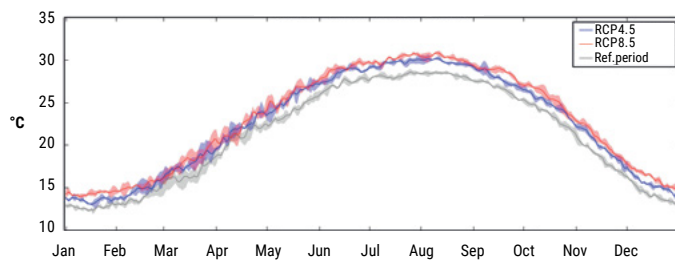
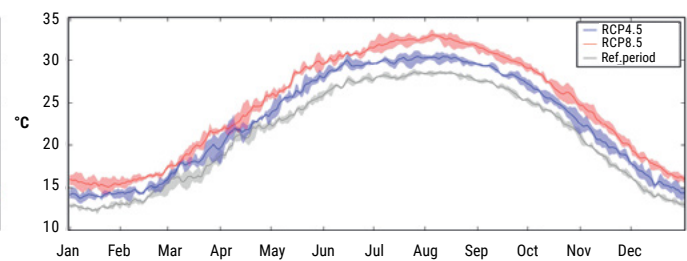


FIGURE 60

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

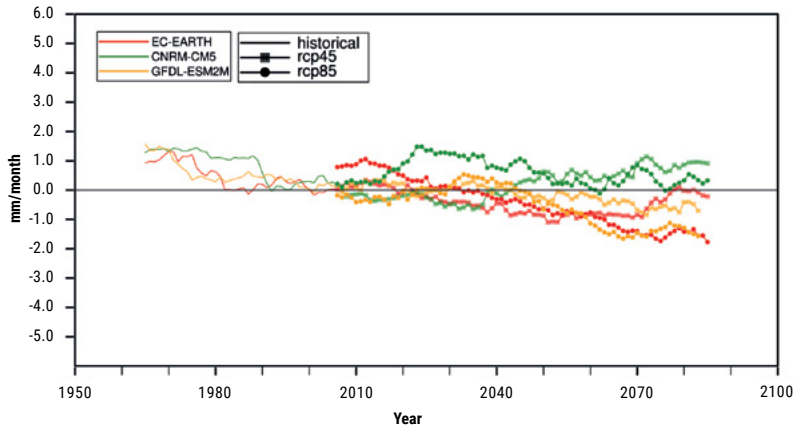


FIGURE 62

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

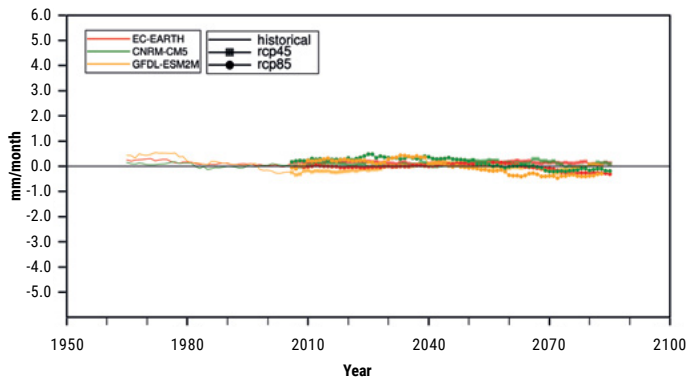


FIGURE 63

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

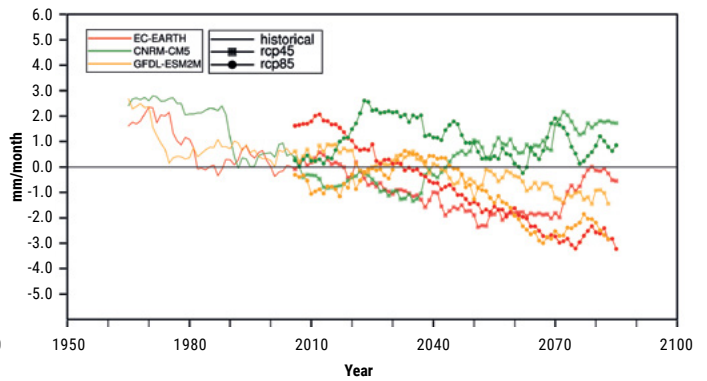


FIGURE 64

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

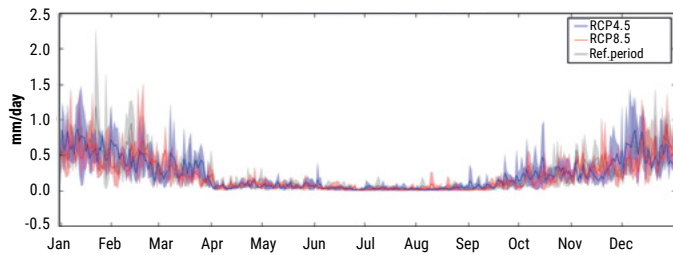
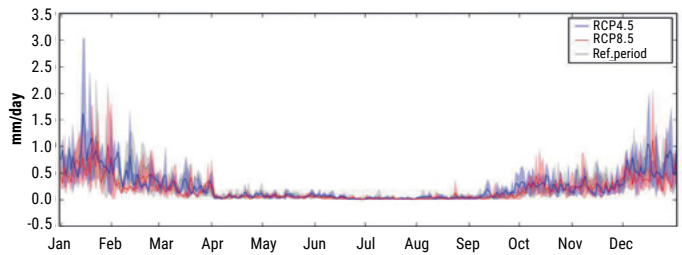


FIGURE 65

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

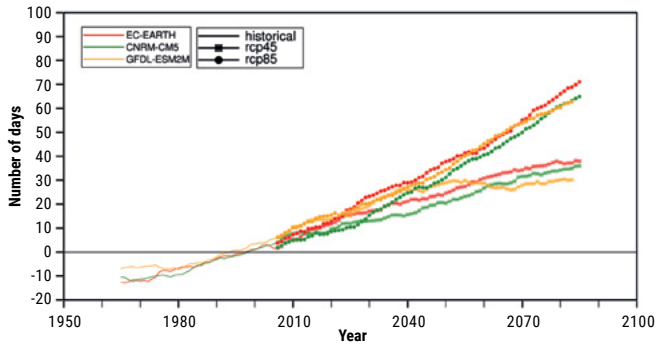


FIGURE 67

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

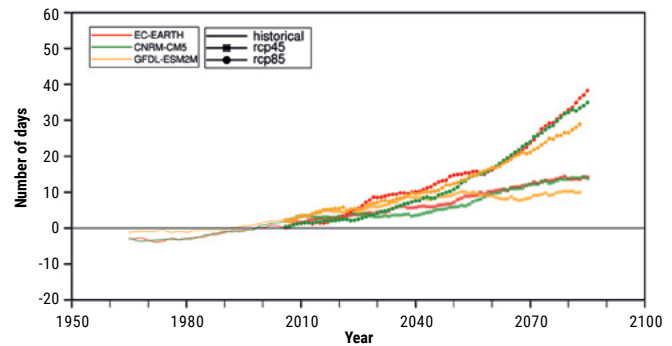
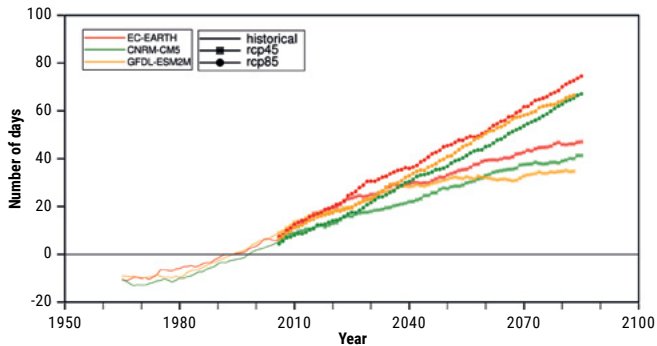


FIGURE 68

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

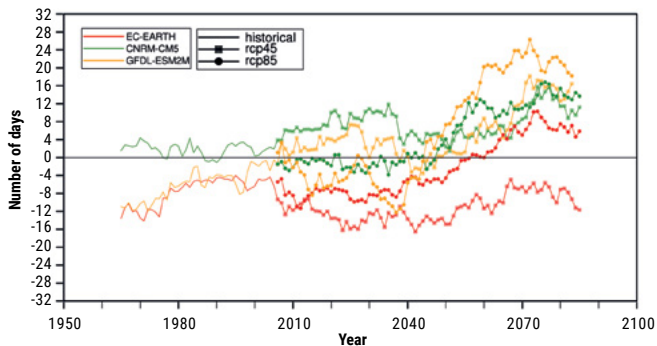


FIGURE 70

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

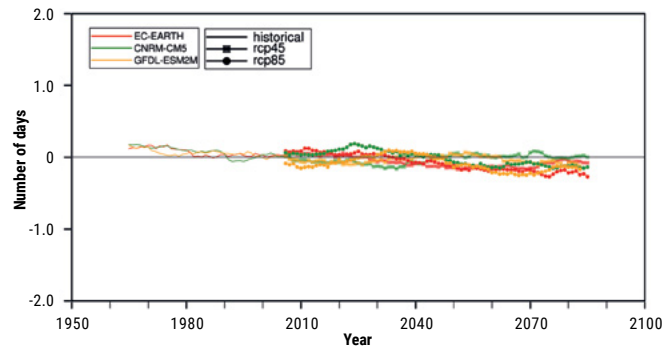


FIGURE 71

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

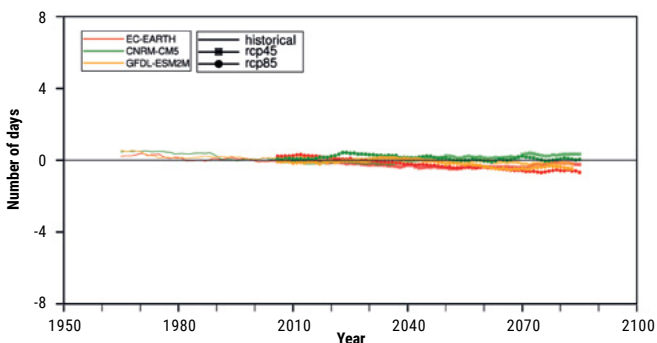
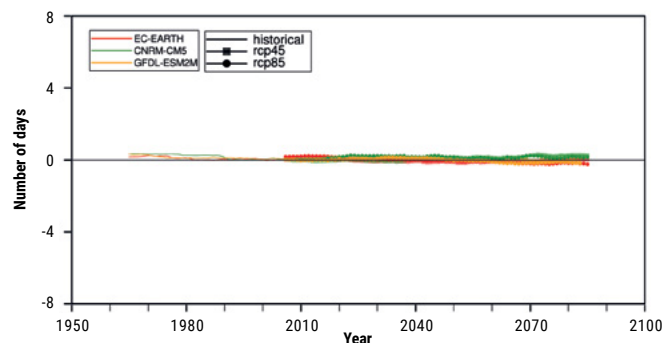


FIGURE 72

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

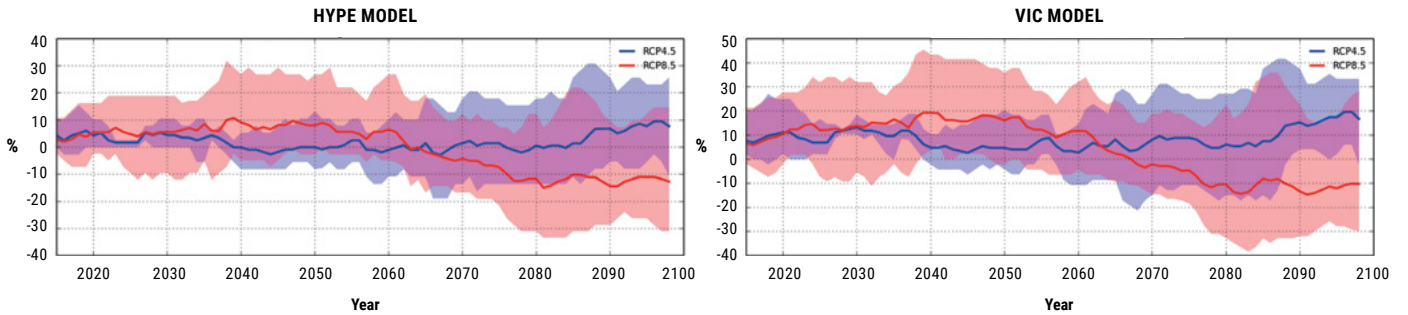


FIGURE 74

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

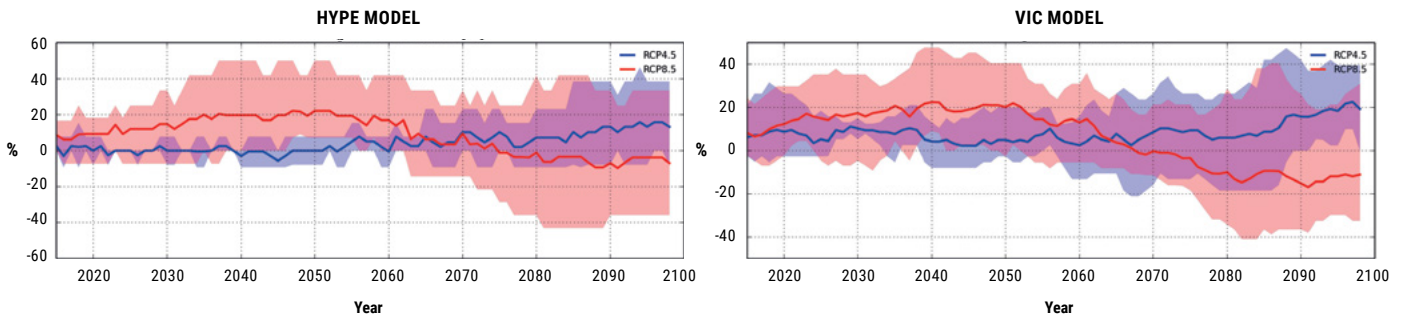
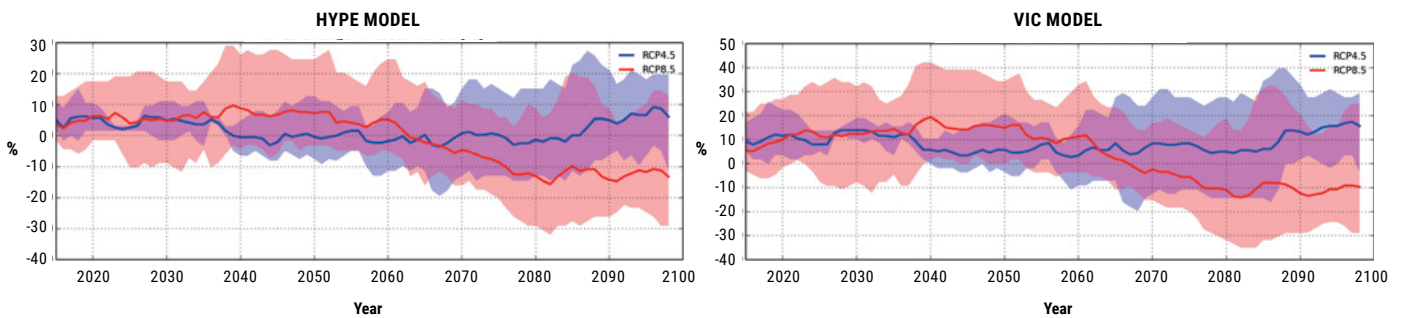


FIGURE 75

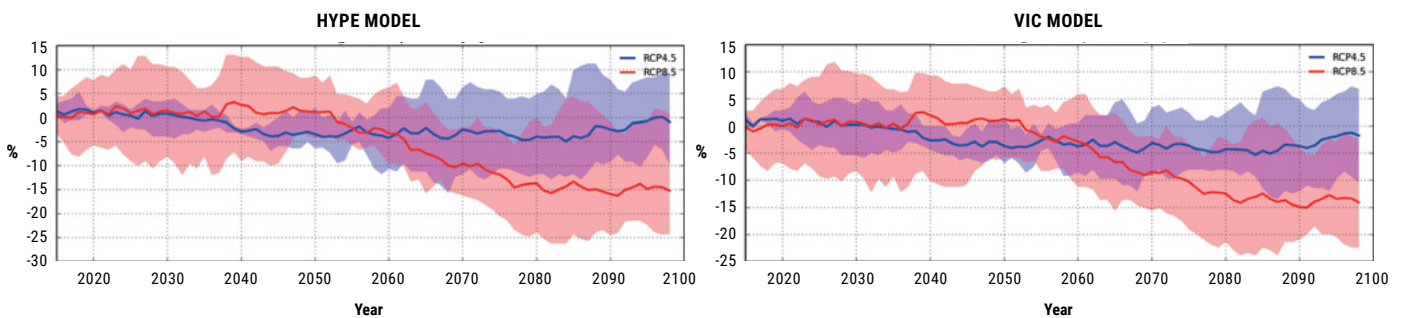
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



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

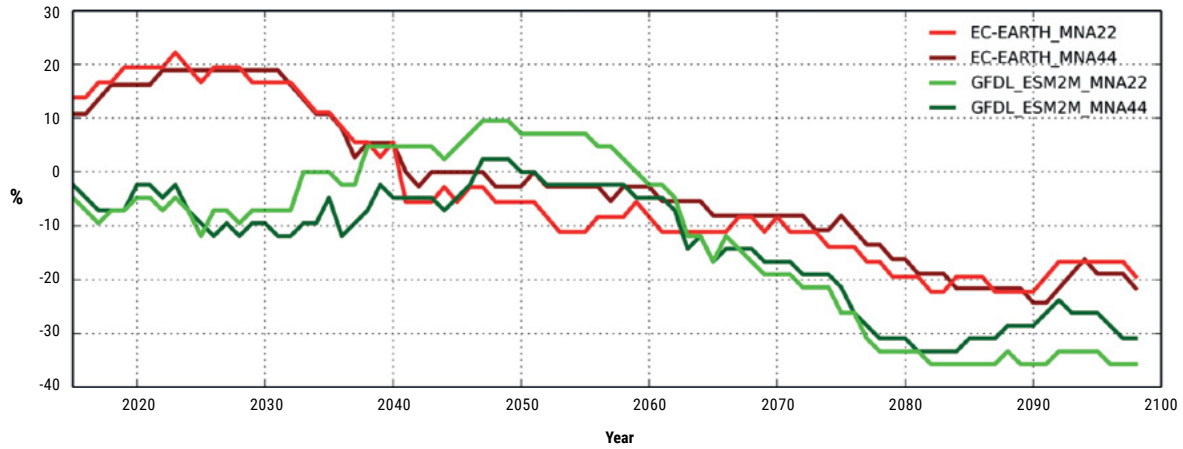


FIGURE 78

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

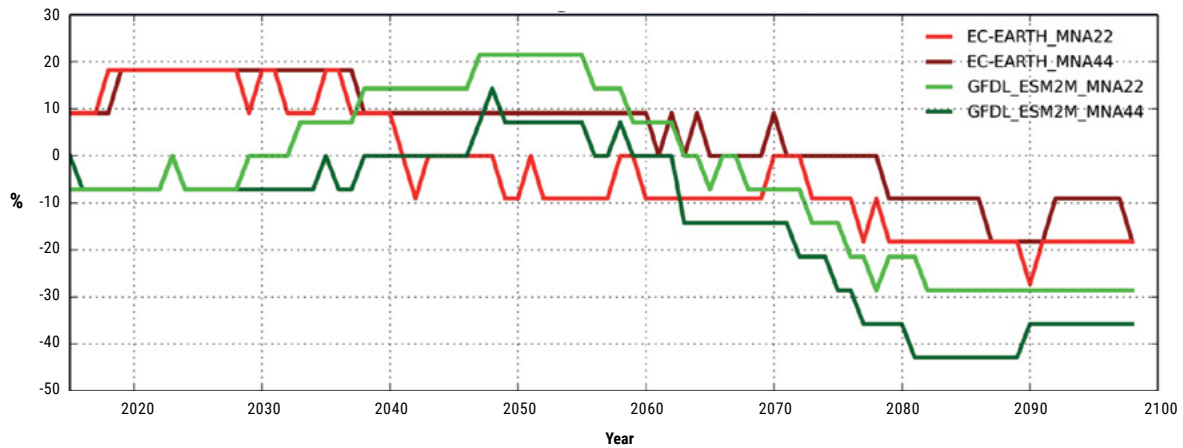
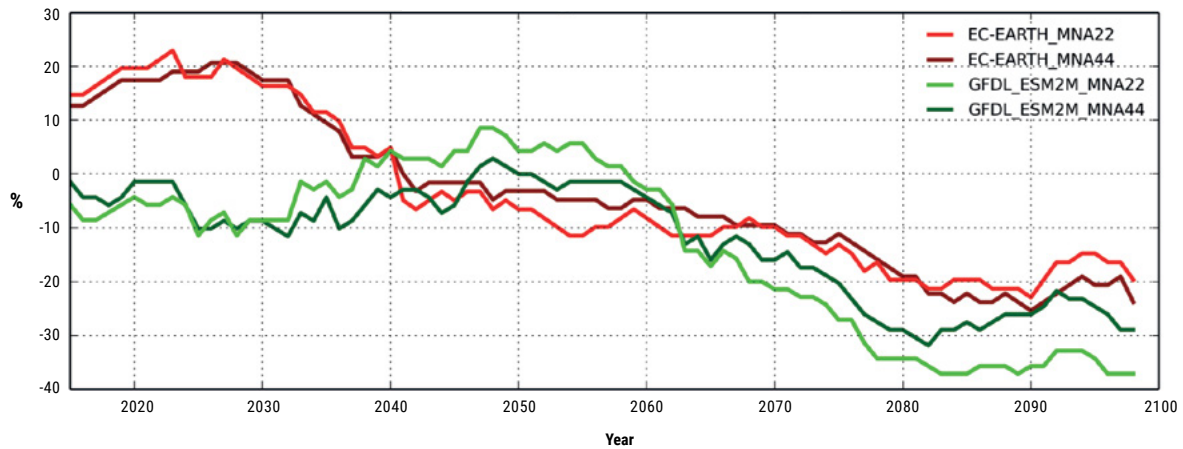
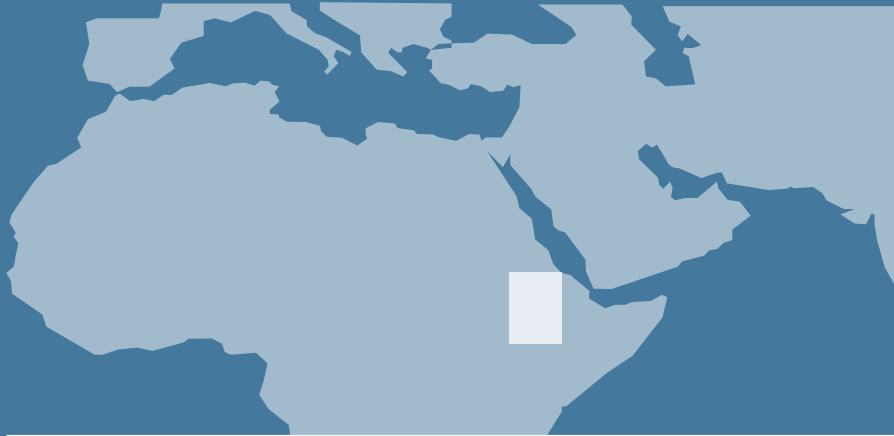


FIGURE 79

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

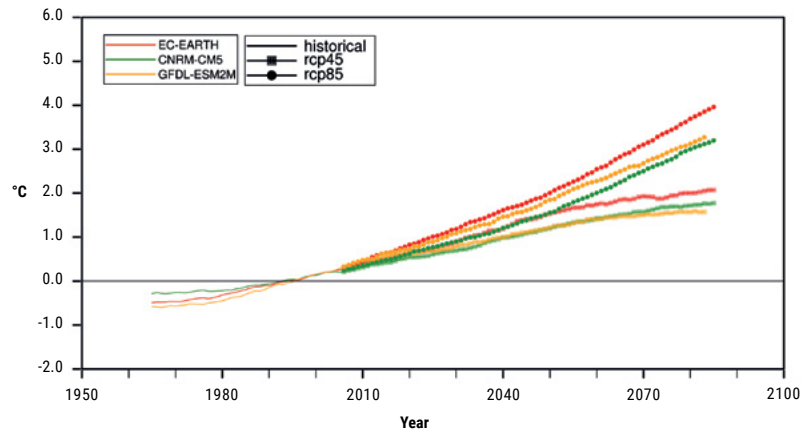


FIGURE 81

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

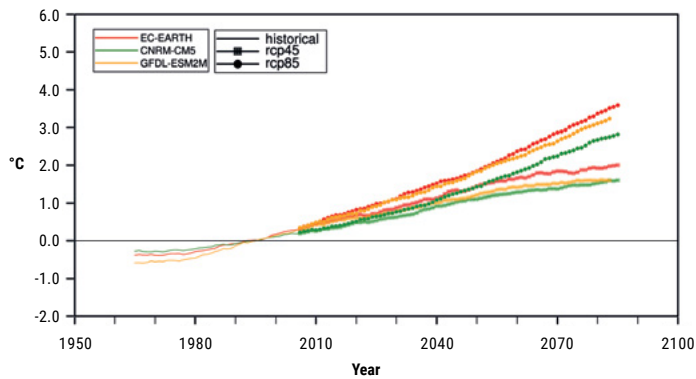


FIGURE 82

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

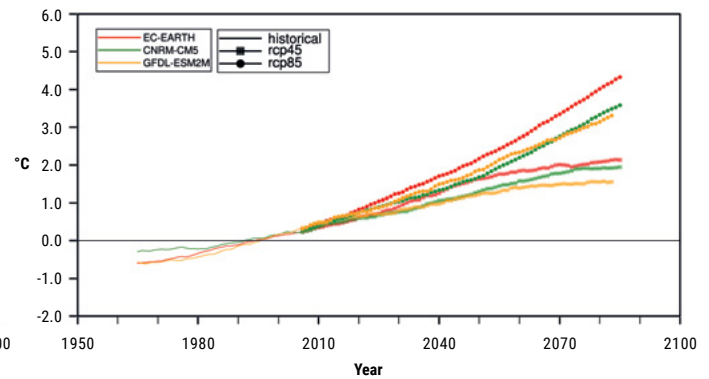


FIGURE 83

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

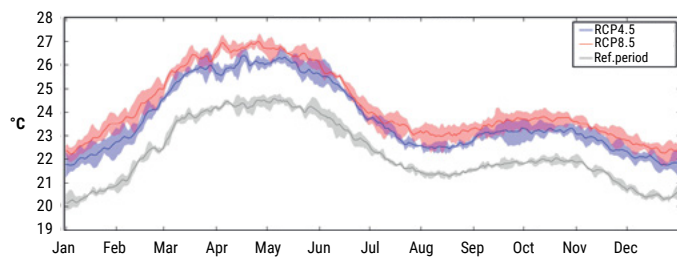
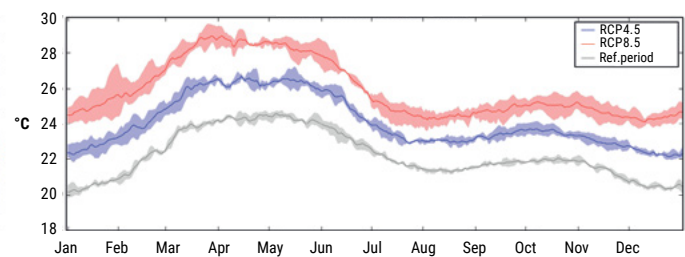


FIGURE 84

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

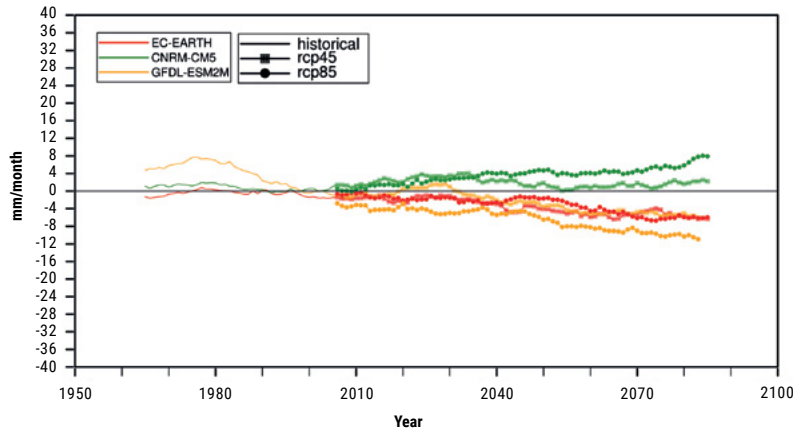


FIGURE 86

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

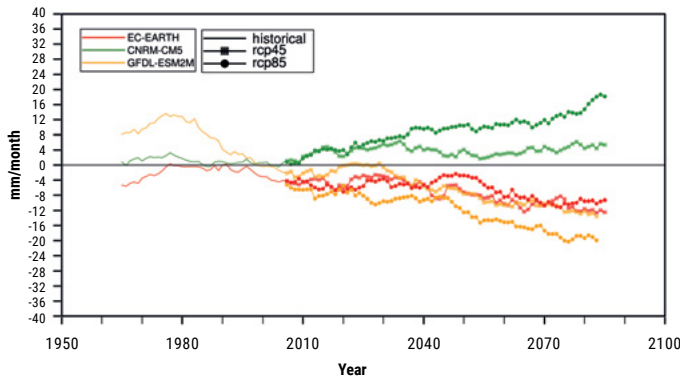


FIGURE 87

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

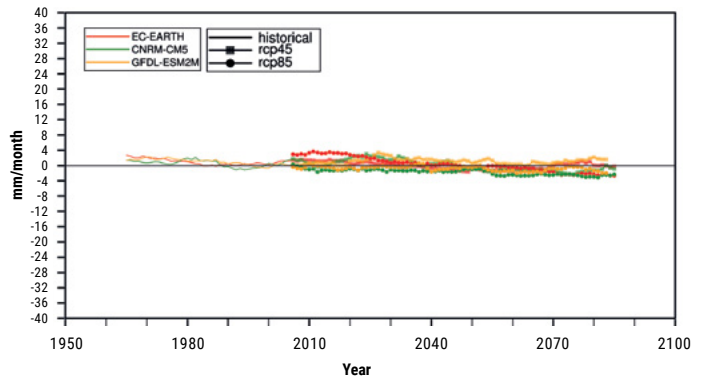


FIGURE 88

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

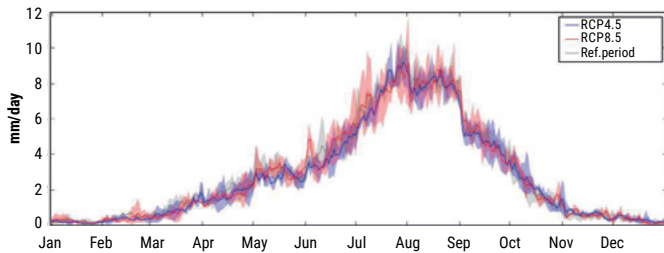
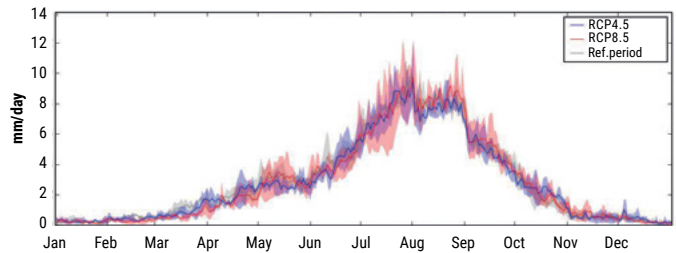


FIGURE 89

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

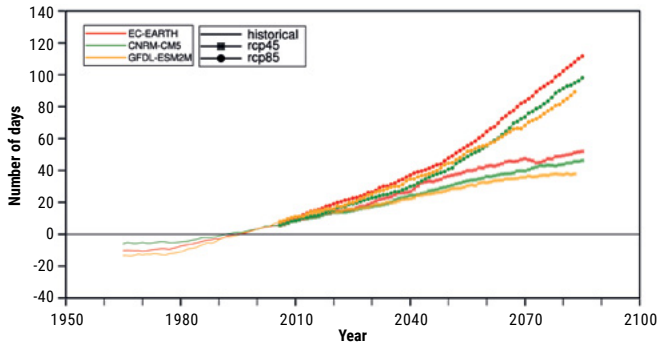


FIGURE 91

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

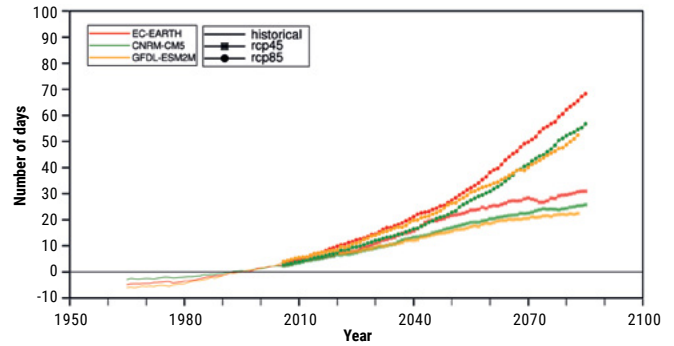
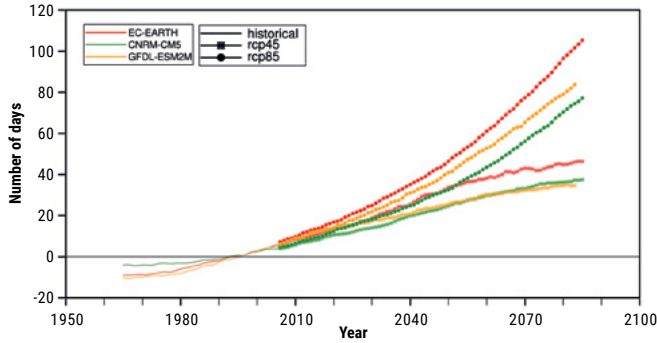


FIGURE 92

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

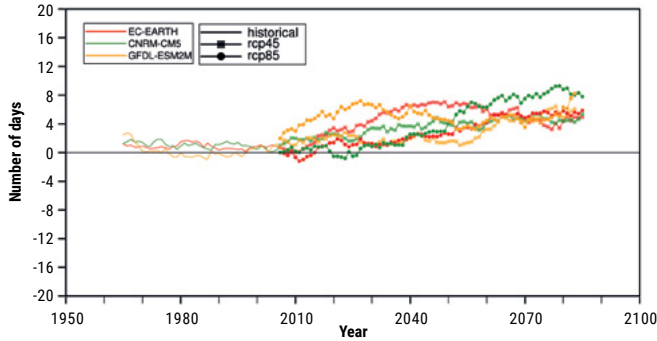


FIGURE 94

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

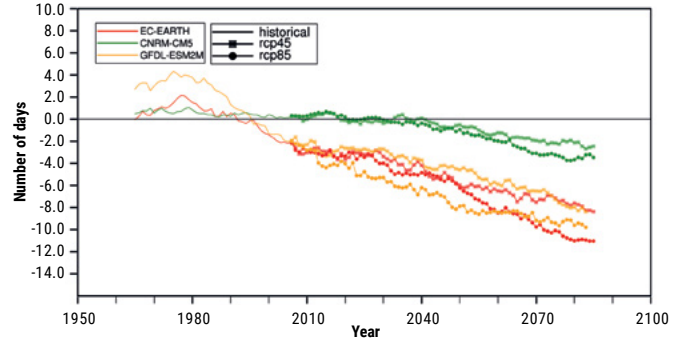


FIGURE 95

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

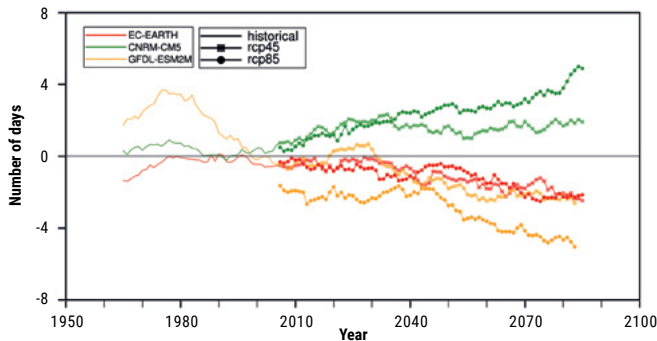
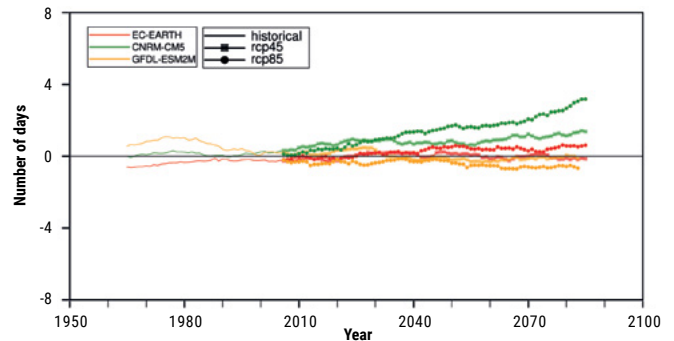


FIGURE 96

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

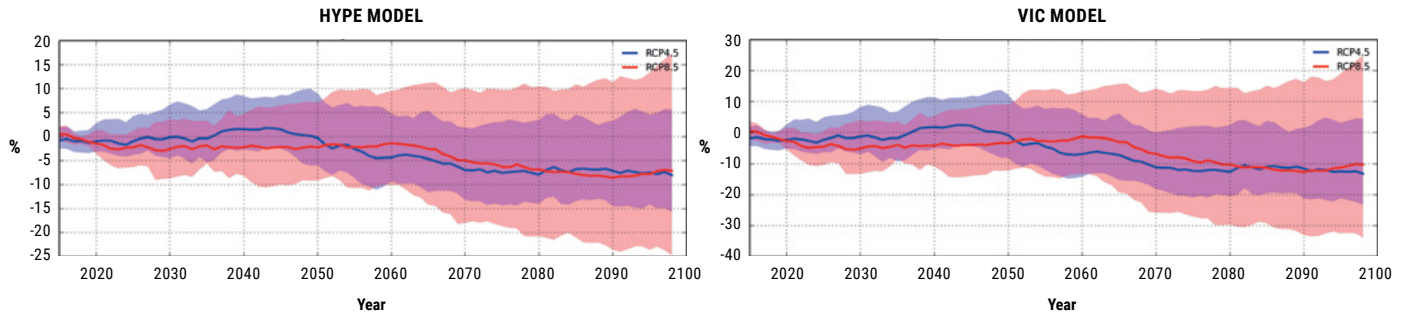


FIGURE 98

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

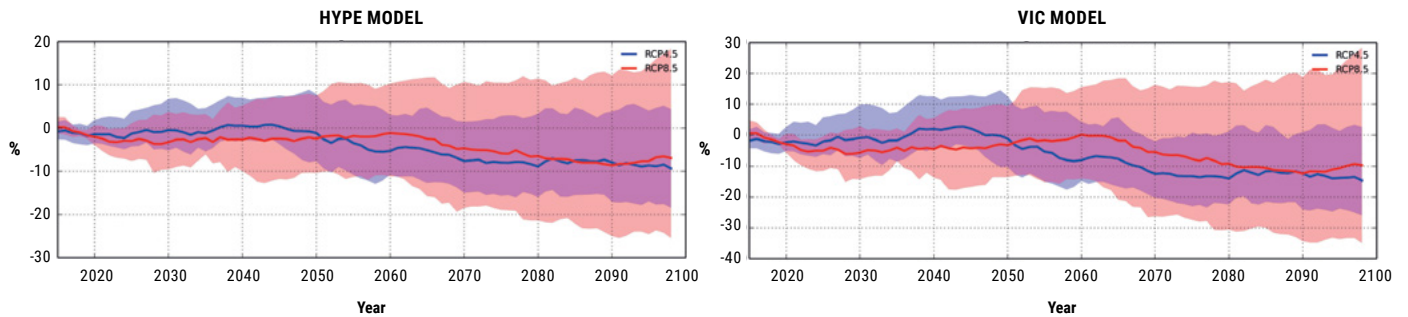
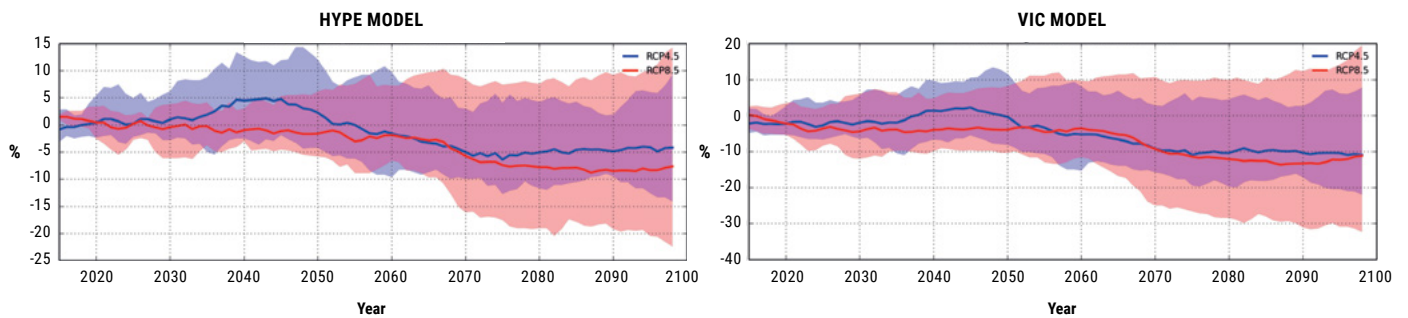


FIGURE 99

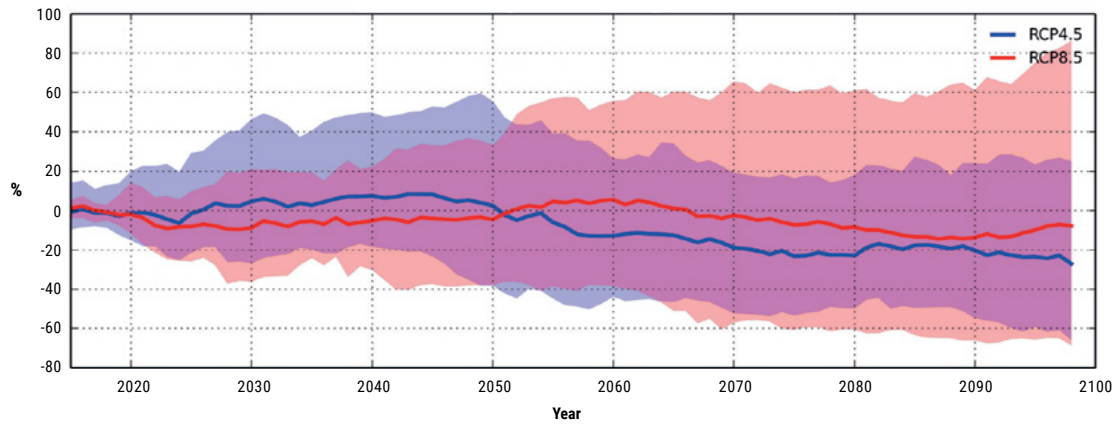
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



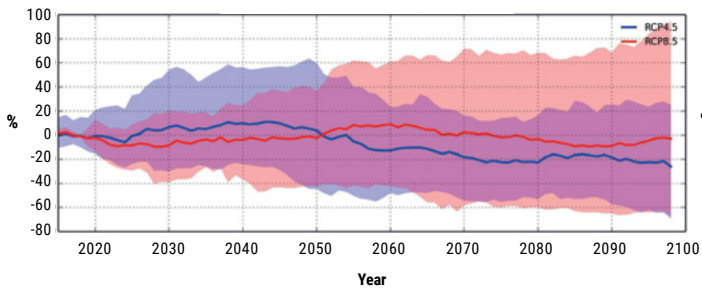
5.3. HYDROLOGICAL PARAMETERS – 5.3.2. DISCHARGE

FIGURE 100

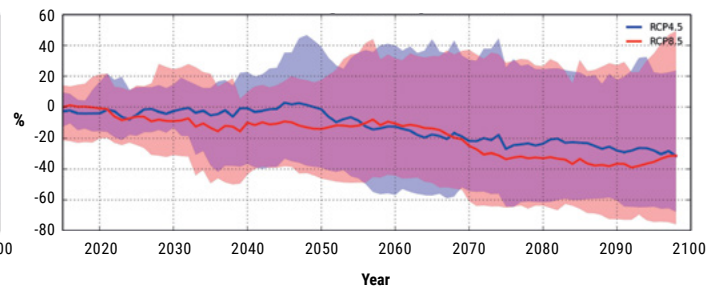
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

**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**

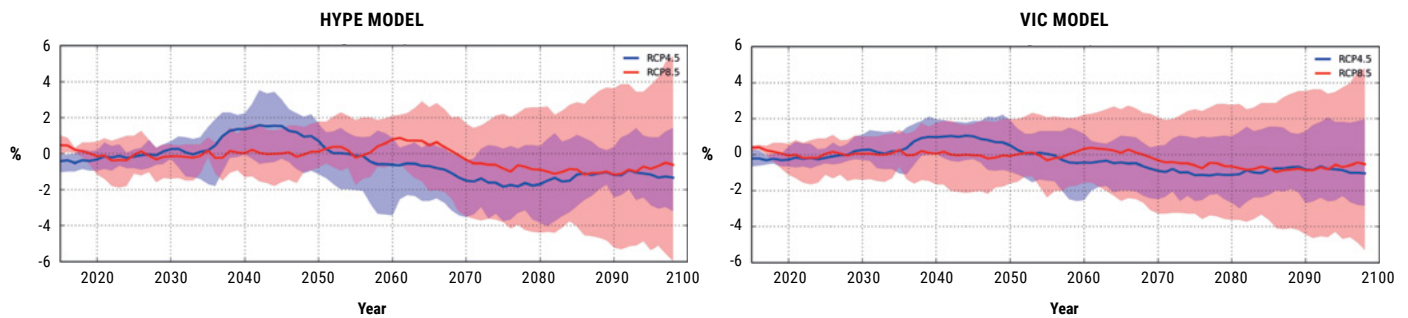
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

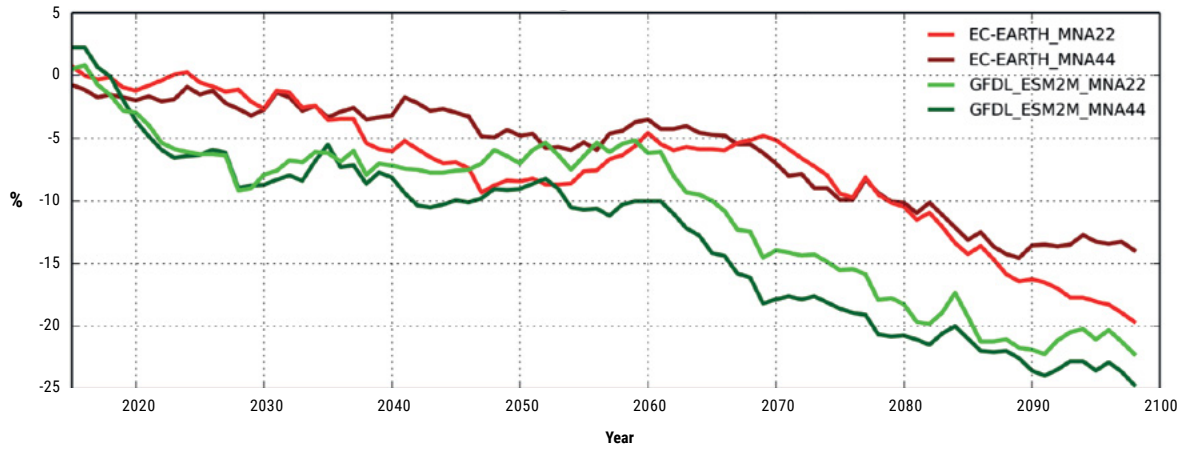


FIGURE 105

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

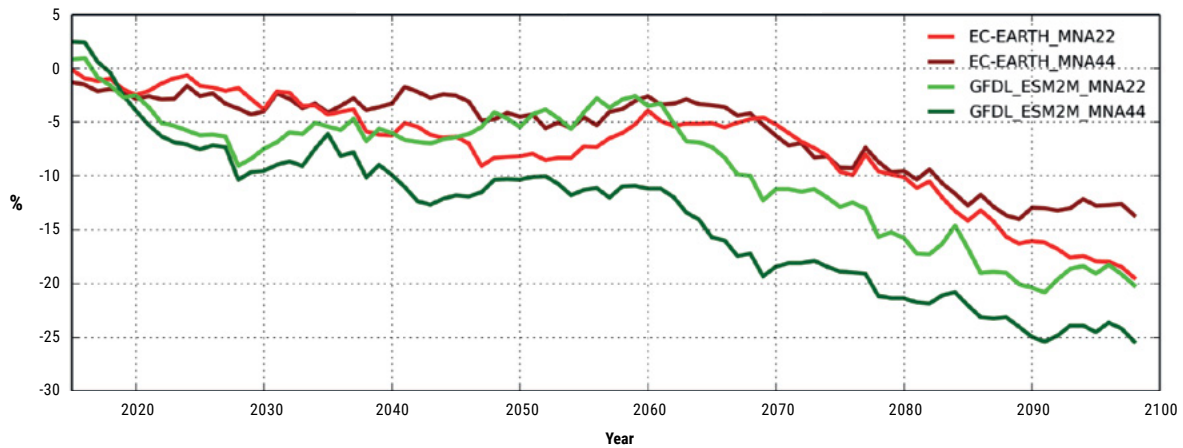
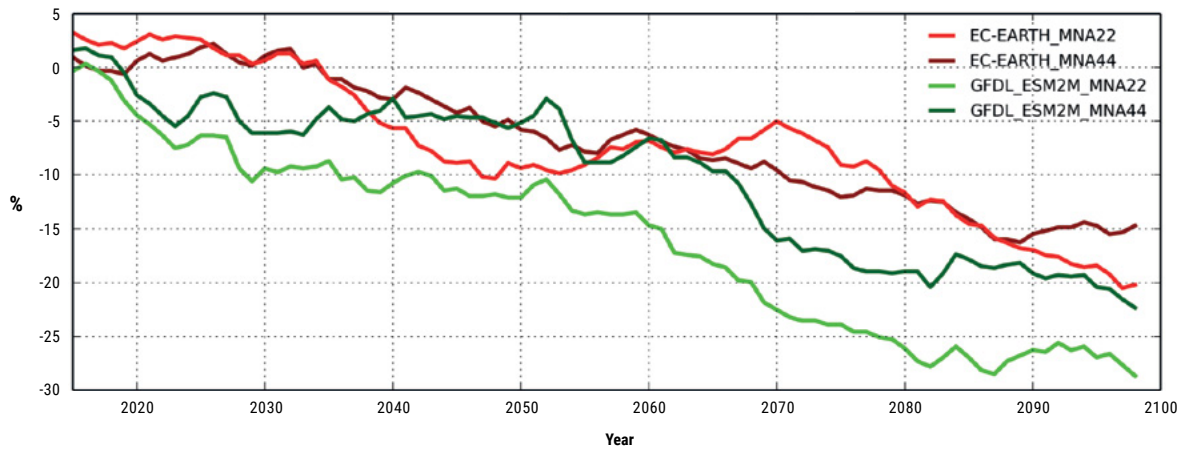


FIGURE 106

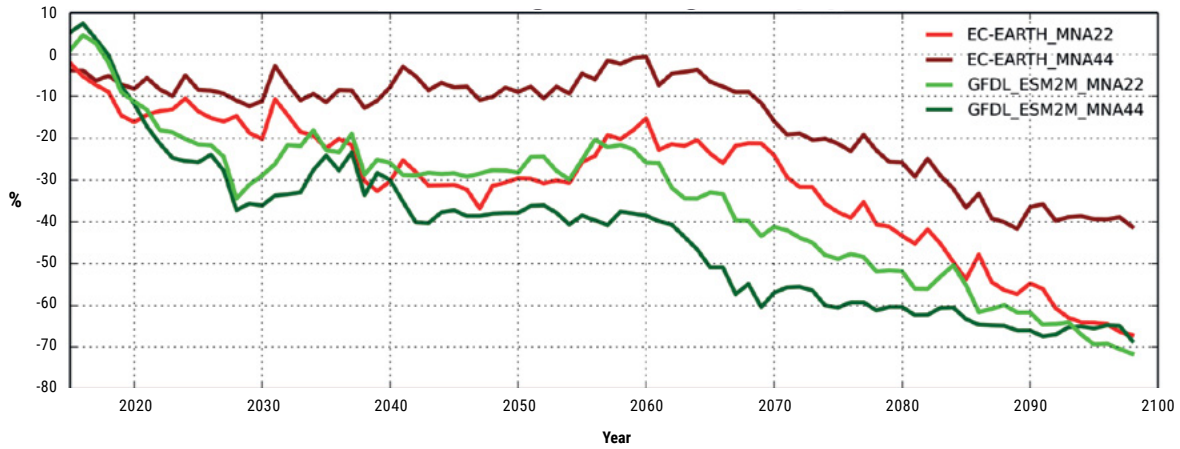
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



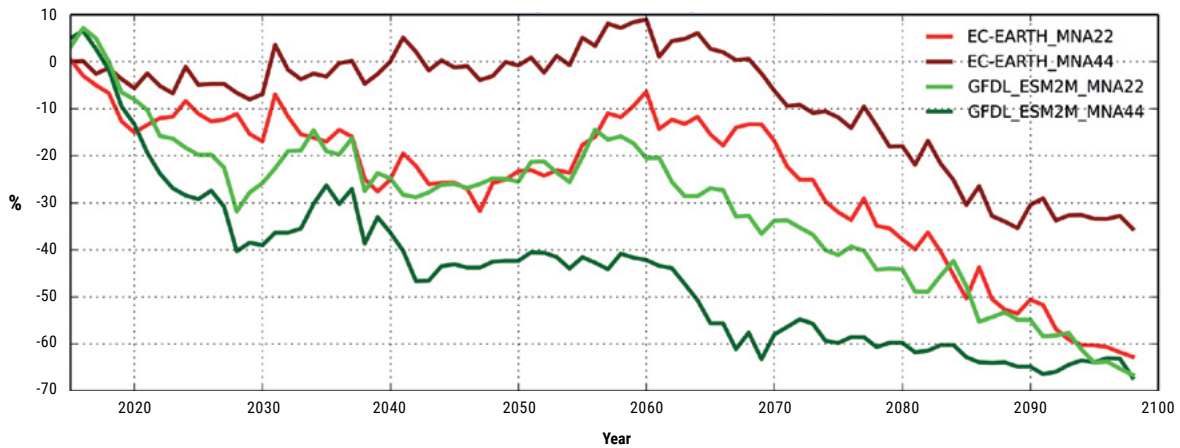
5.3. HYDROLOGICAL PARAMETERS – 5.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 5.3.4.2. DISCHARGE

FIGURE 107

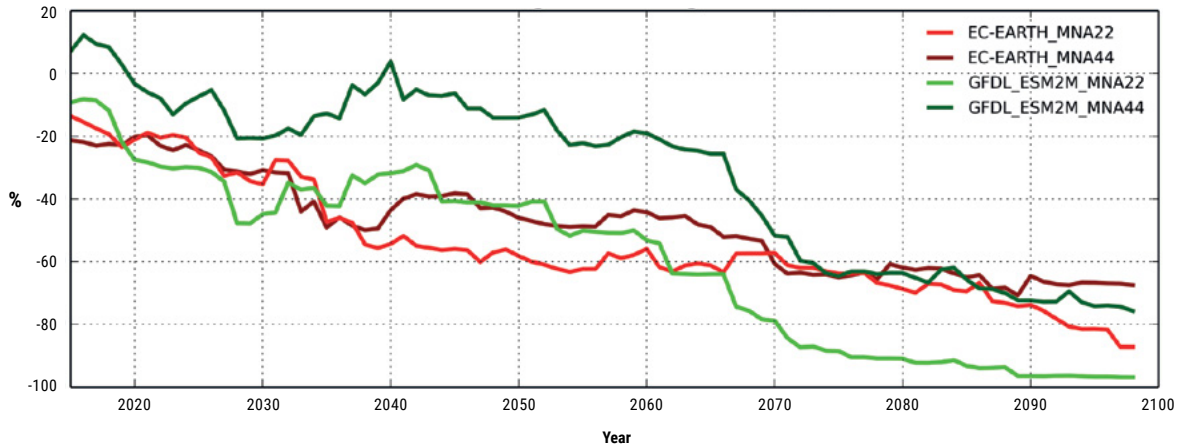
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

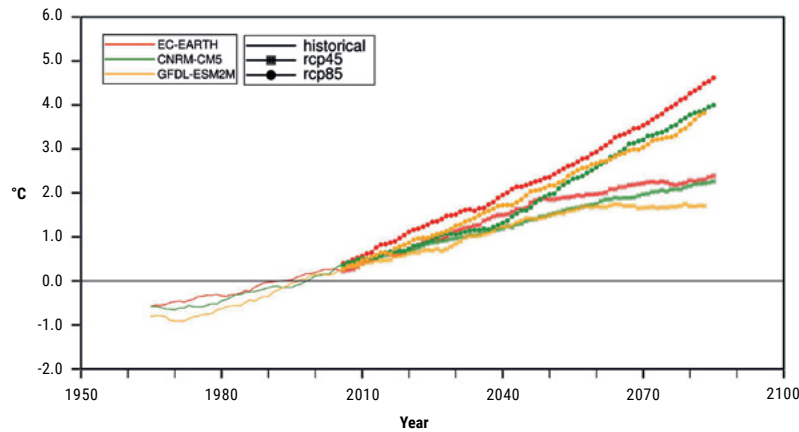


FIGURE 111

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

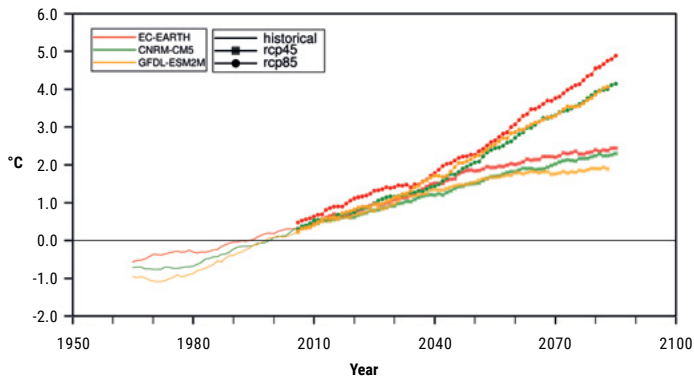


FIGURE 112

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

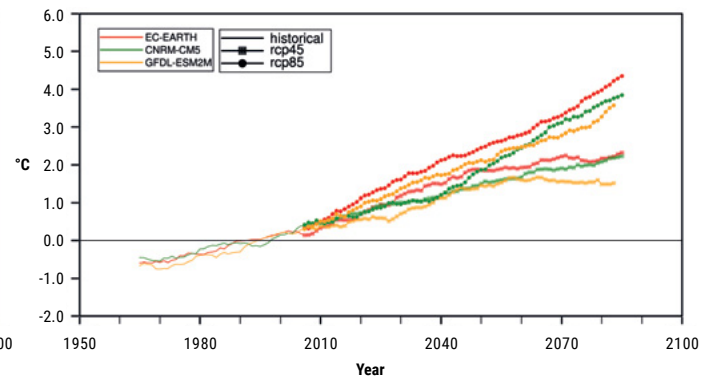


FIGURE 113

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

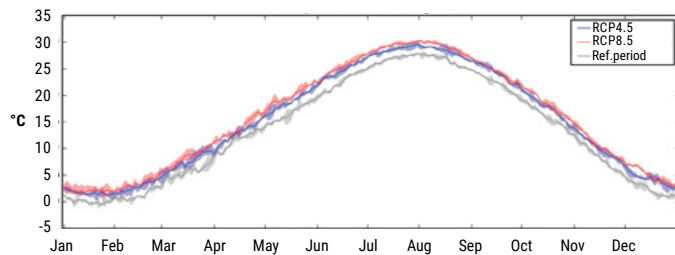
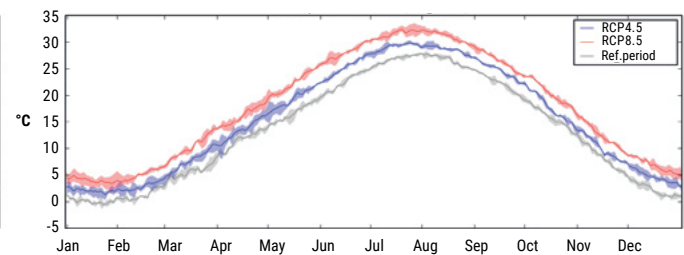


FIGURE 114

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

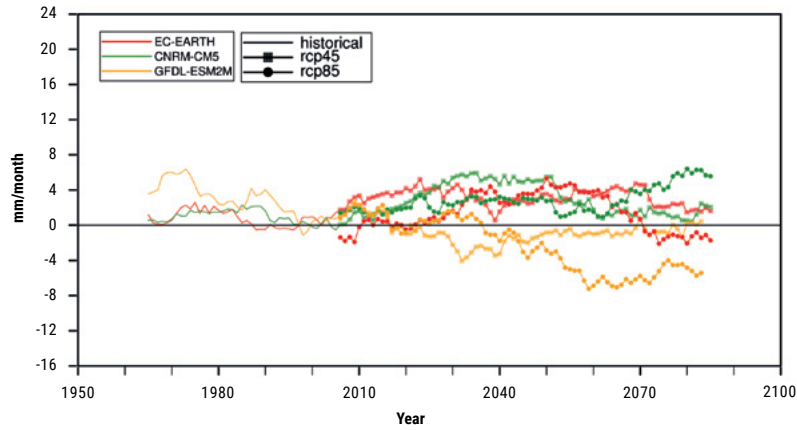


FIGURE 116

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

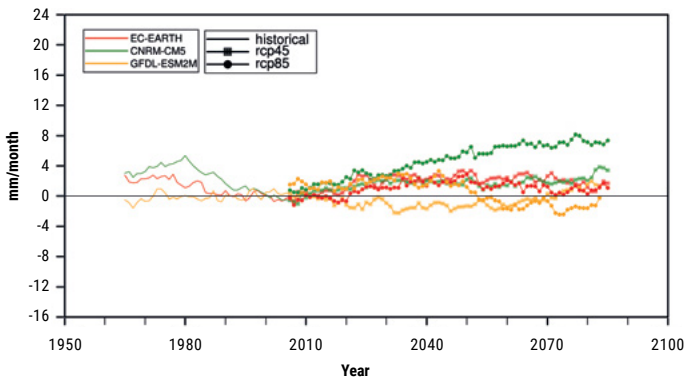


FIGURE 117

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

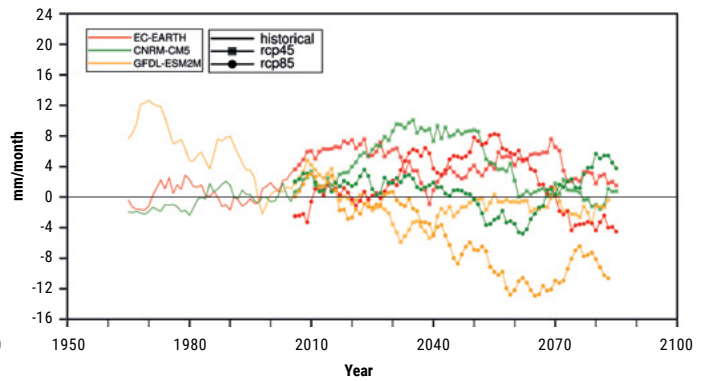


FIGURE 118

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

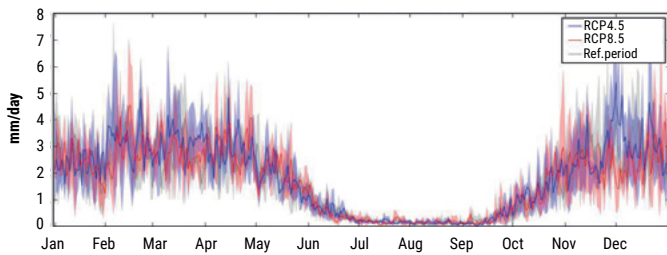
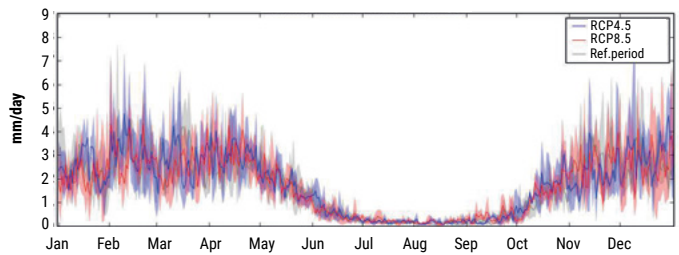


FIGURE 119

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

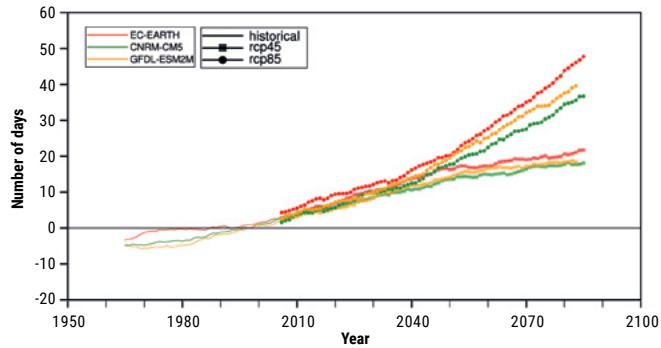


FIGURE 121

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

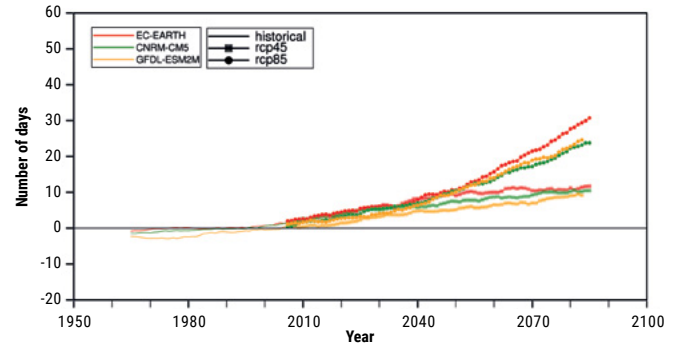
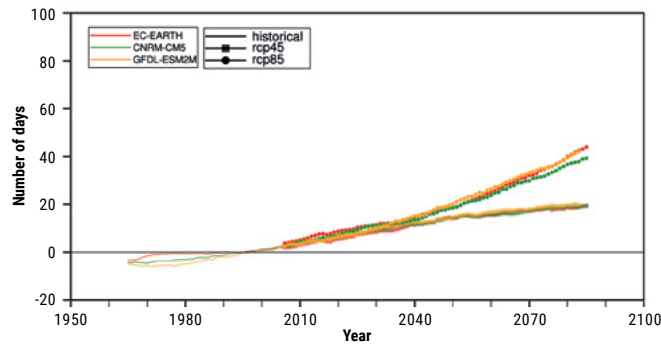


FIGURE 122

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

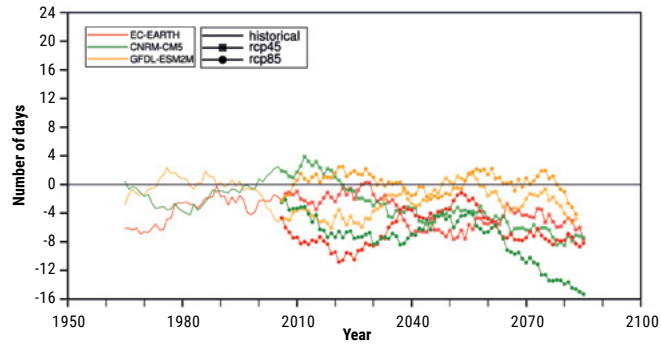


FIGURE 124

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

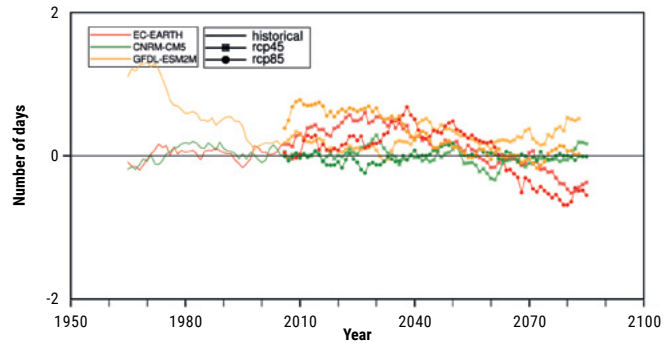


FIGURE 125

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

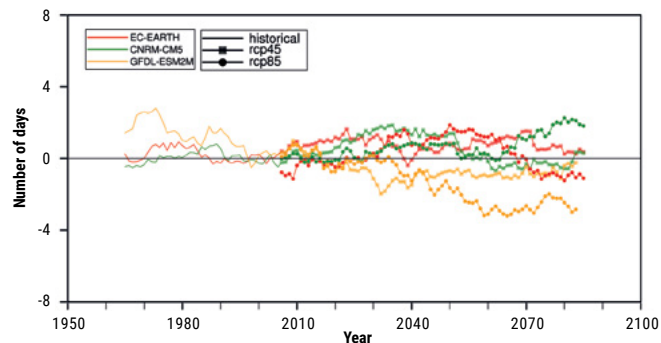
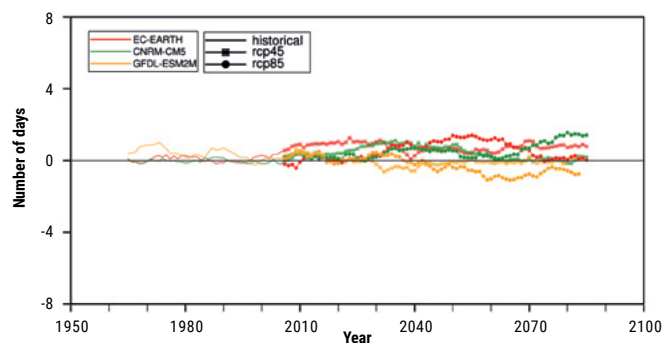


FIGURE 126

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

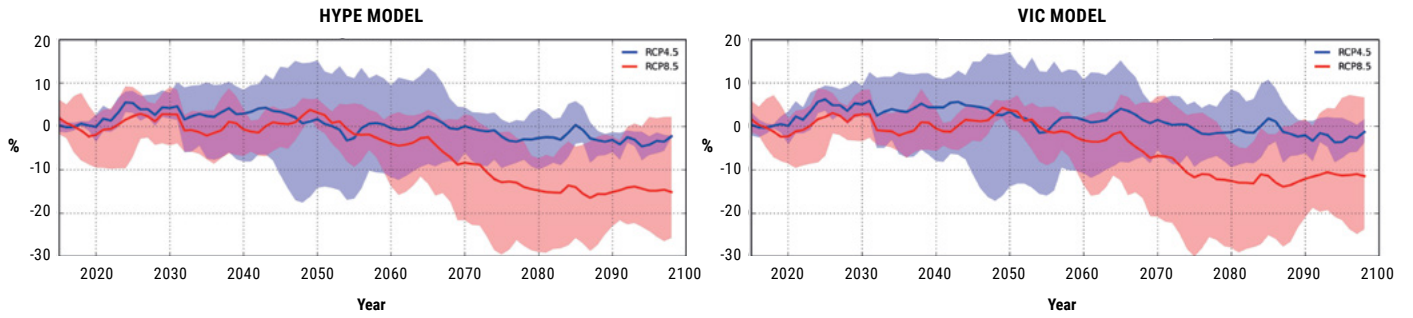


FIGURE 128

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

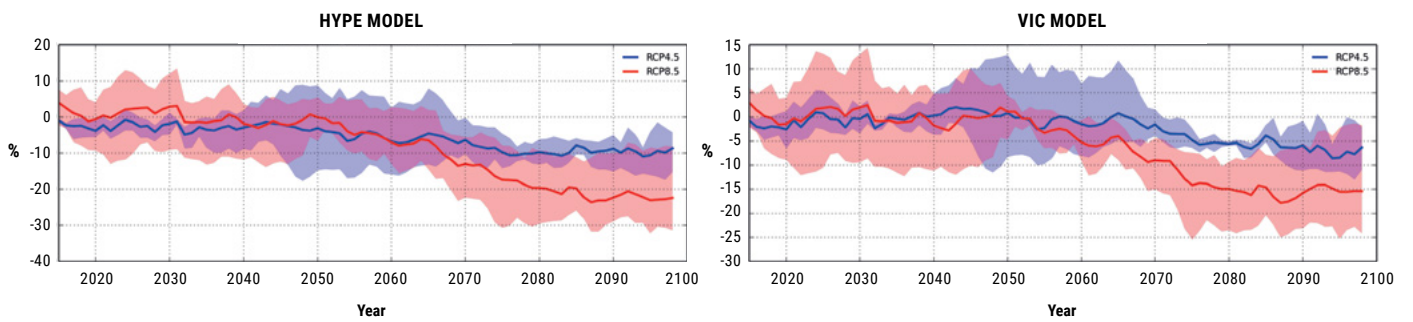
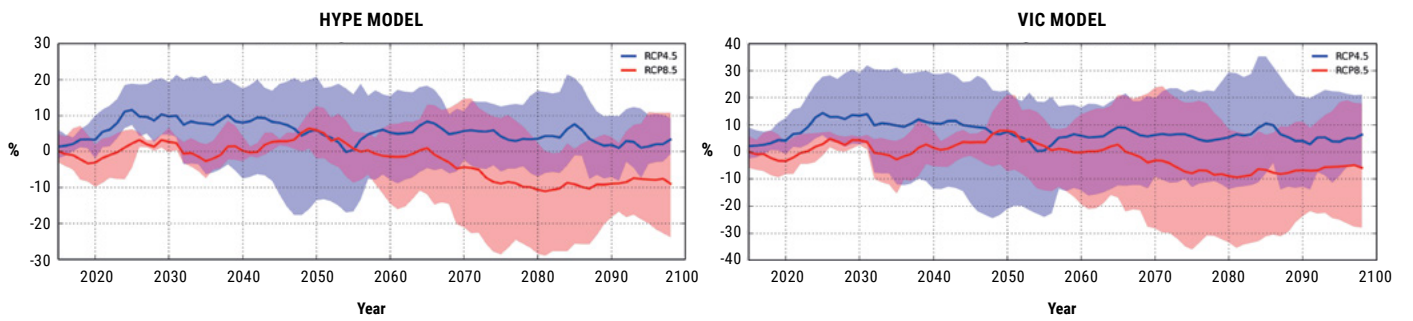


FIGURE 129

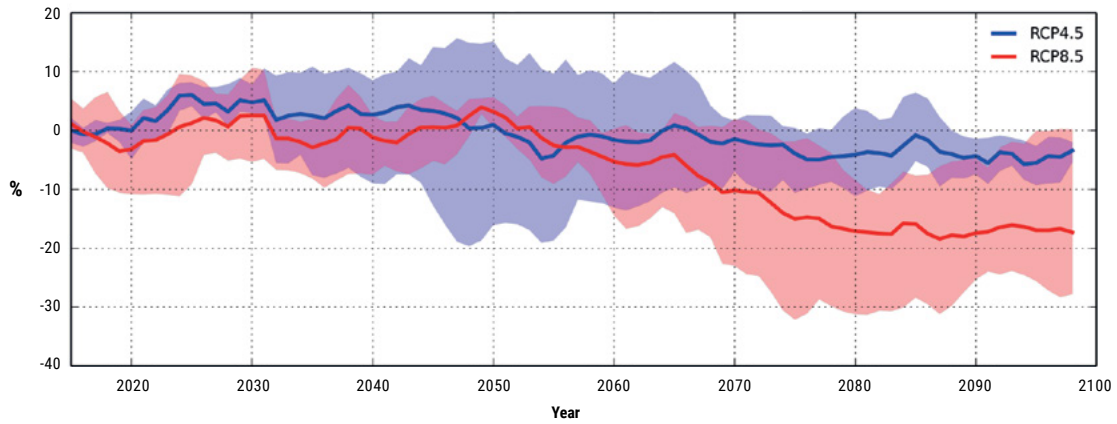
Mean change in seasonal runoff (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using two hydrological models



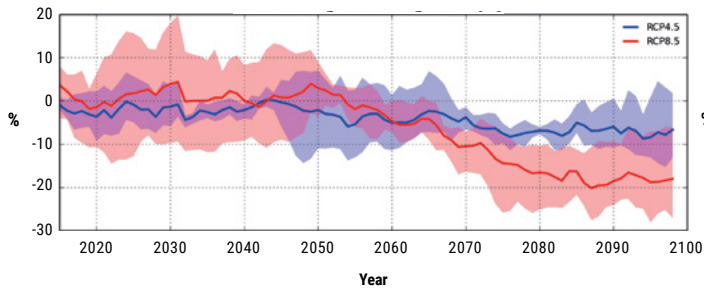
6.3. HYDROLOGICAL PARAMETERS – 6.3.2. DISCHARGE

FIGURE 130

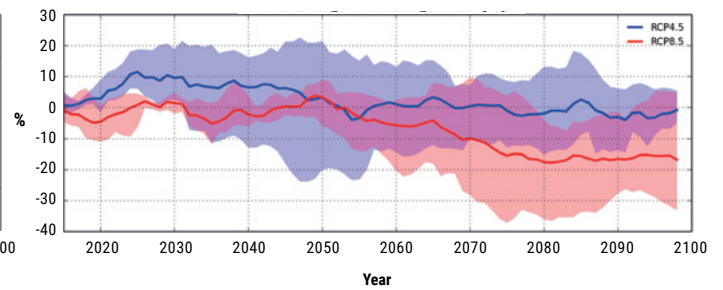
Mean change in annual discharge over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model

**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**

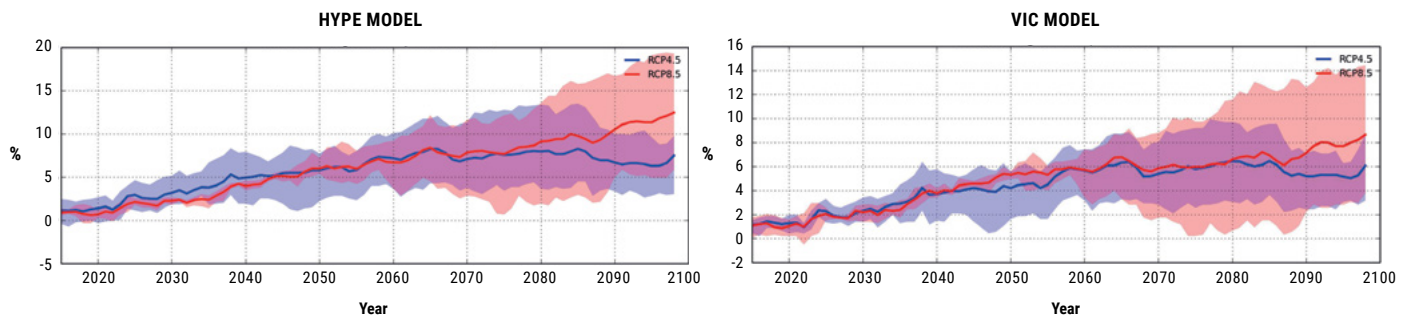
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

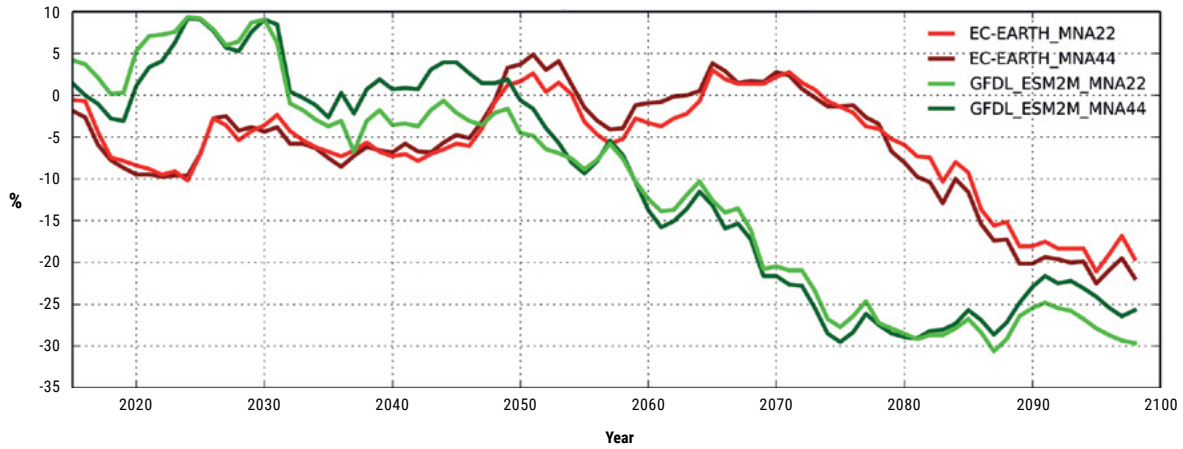


FIGURE 135

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

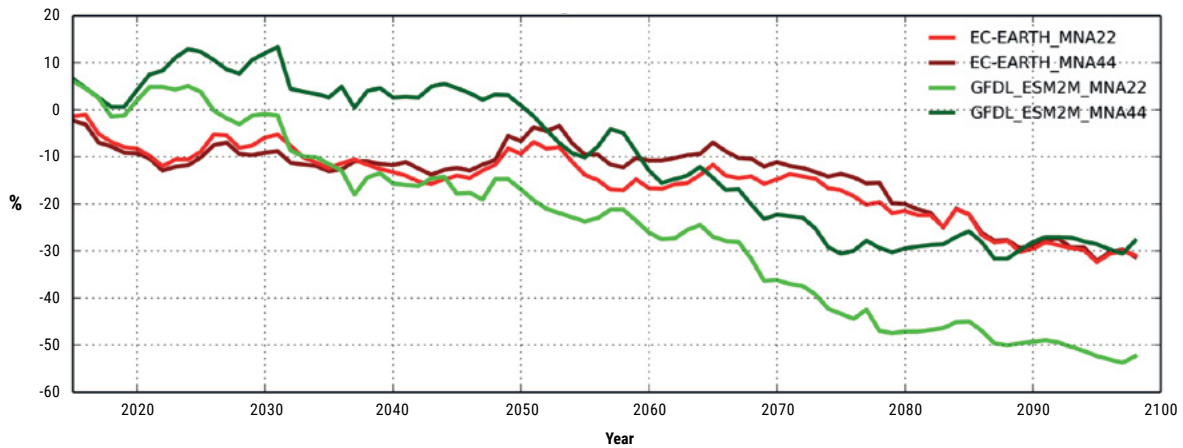
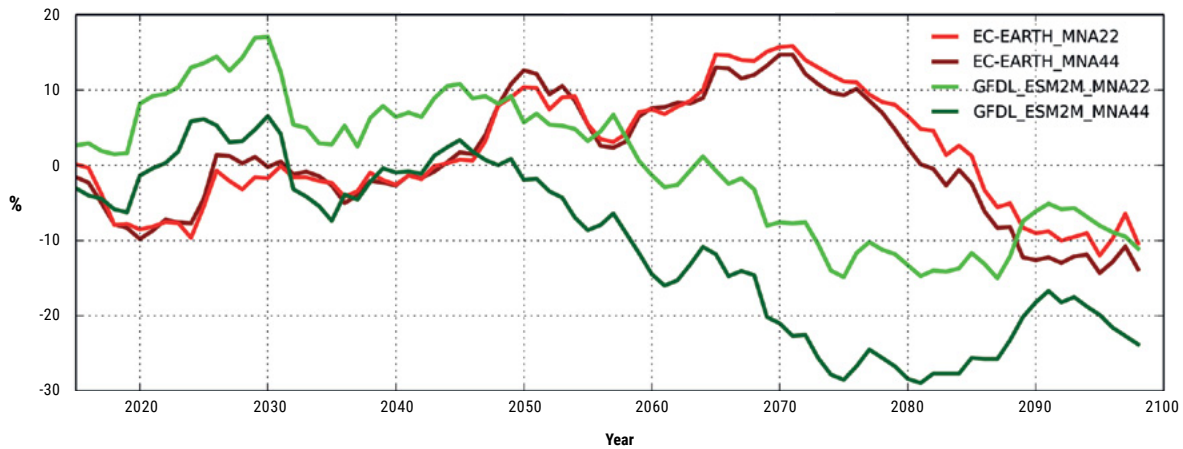


FIGURE 136

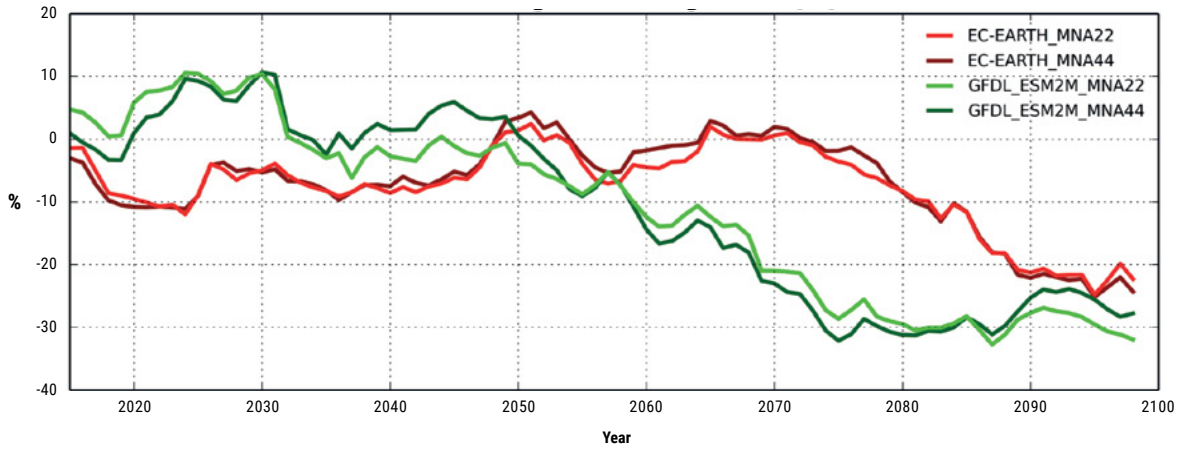
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



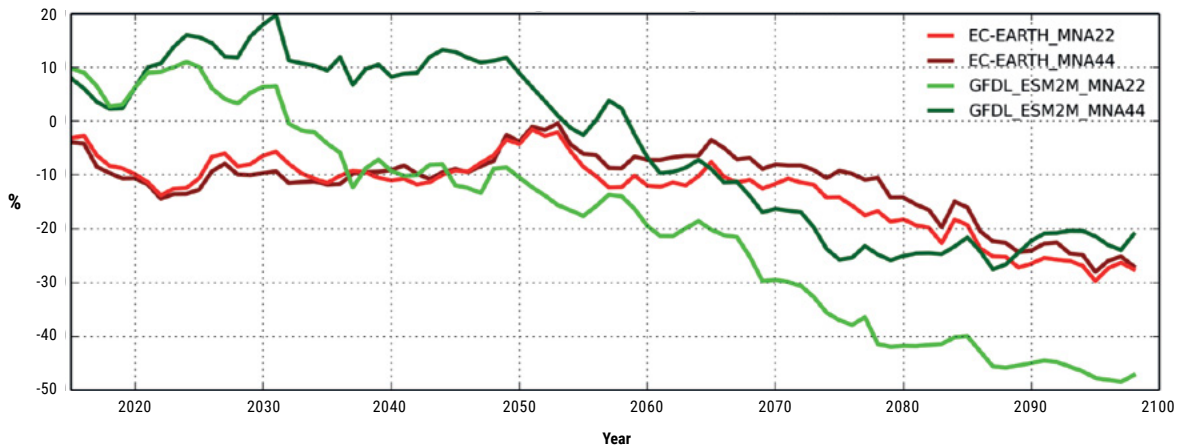
6.3. HYDROLOGICAL PARAMETERS – 6.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 6.3.4.2. DISCHARGE

FIGURE 137

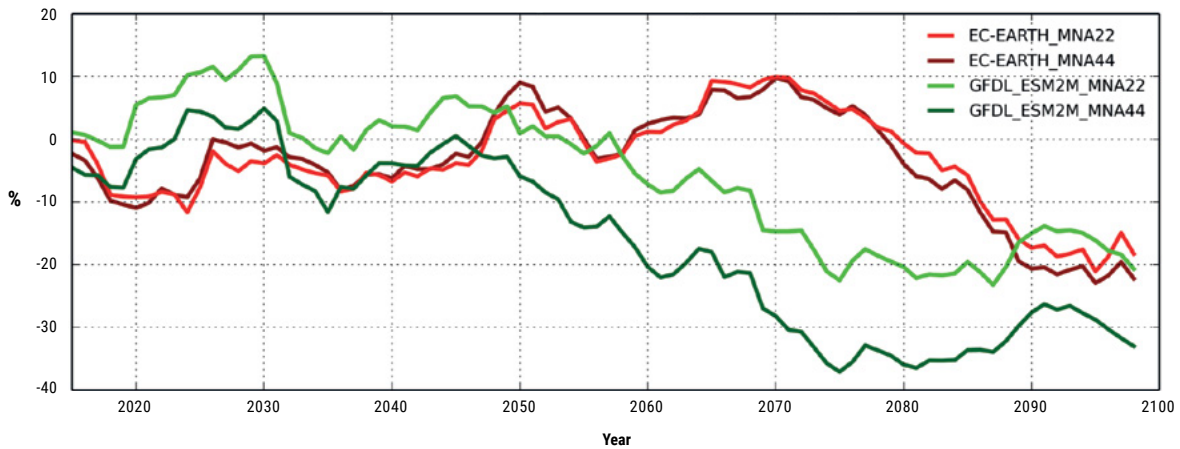
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

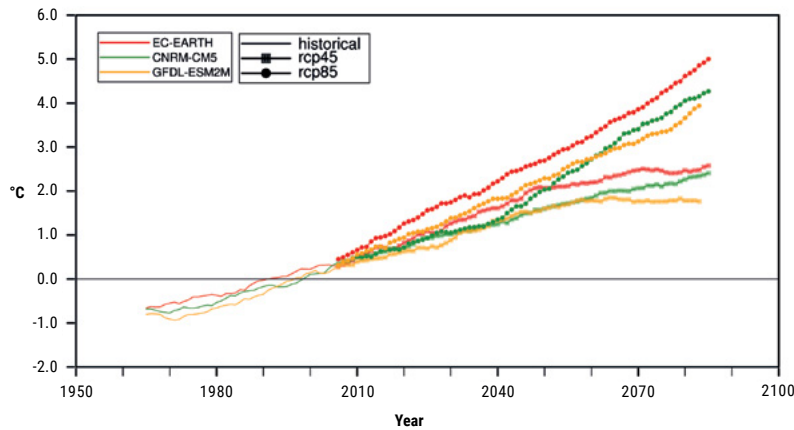


FIGURE 141

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

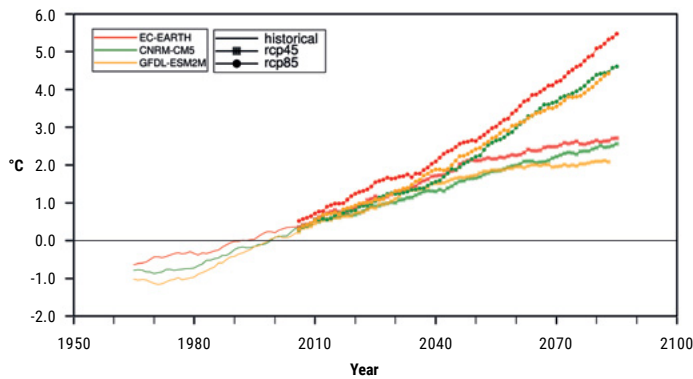


FIGURE 142

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

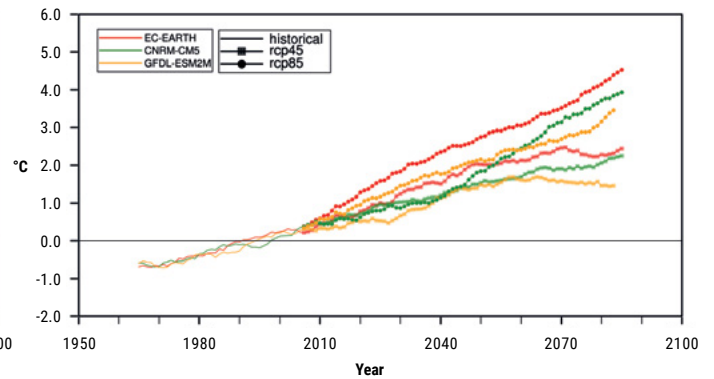


FIGURE 143

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

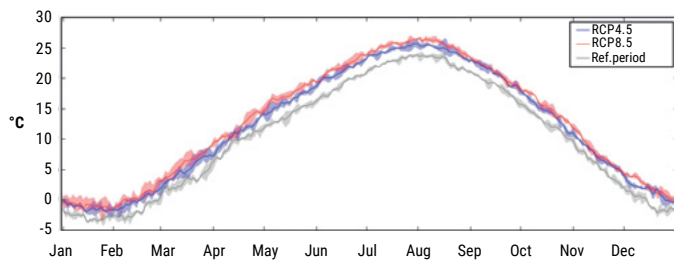
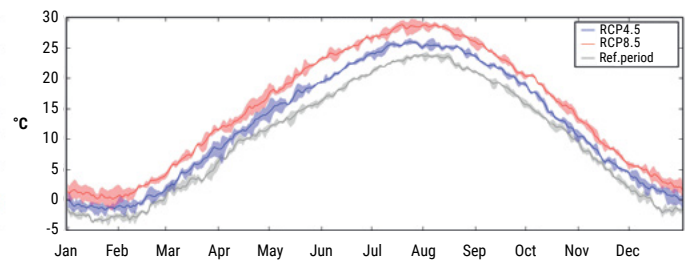


FIGURE 144

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

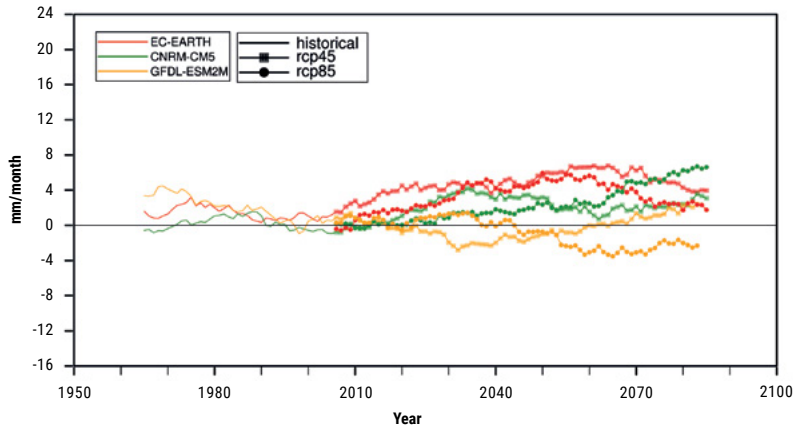


FIGURE 146

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

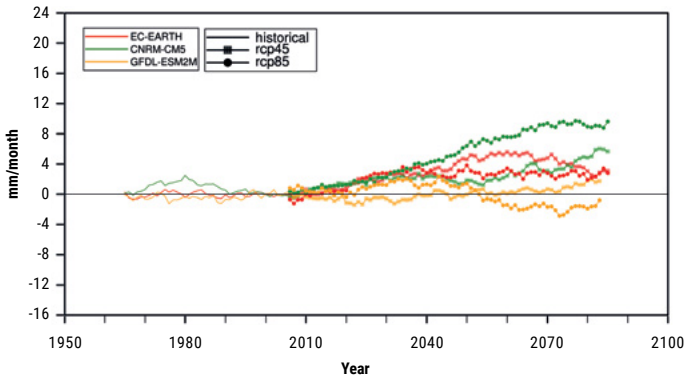


FIGURE 147

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

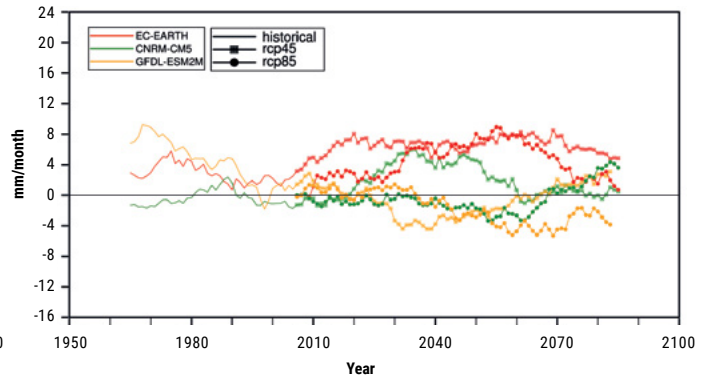


FIGURE 148

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

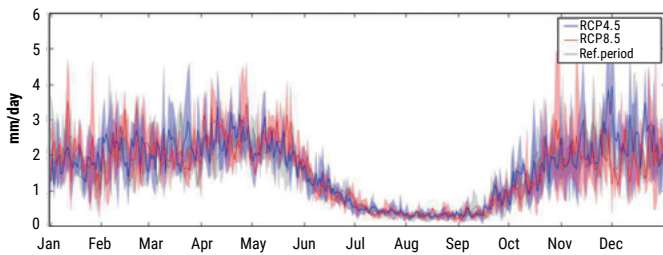
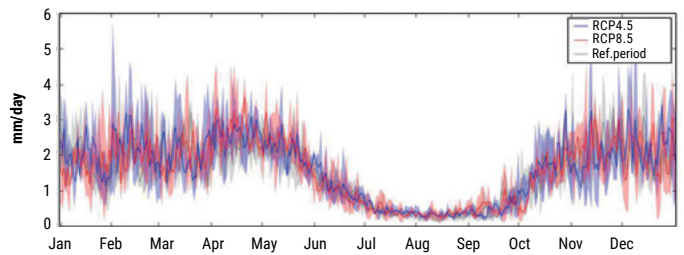


FIGURE 149

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

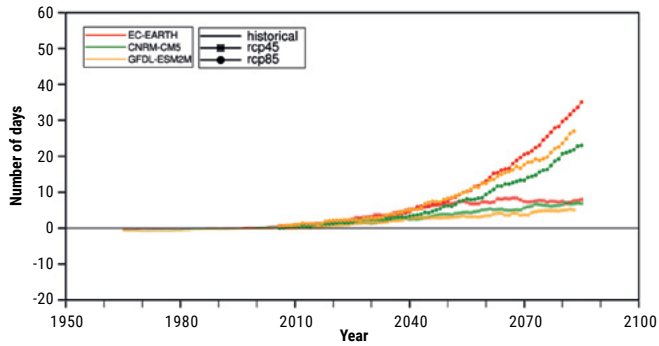


FIGURE 151

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

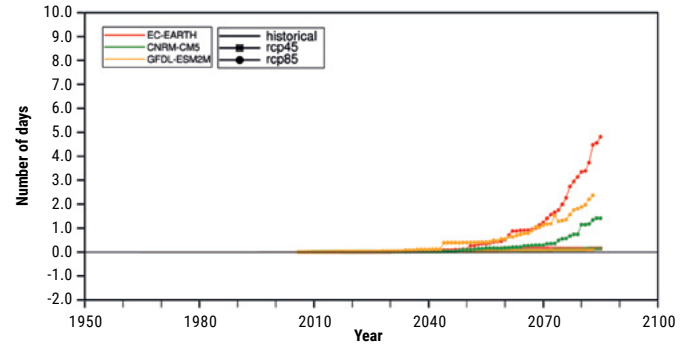
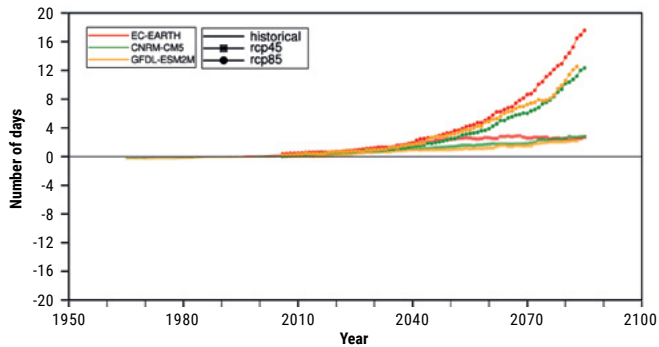


FIGURE 152

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

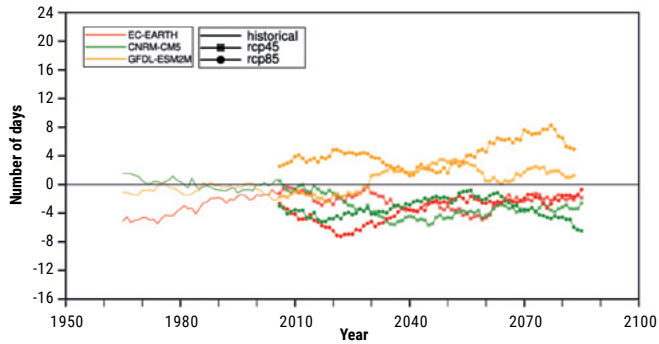


FIGURE 154

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

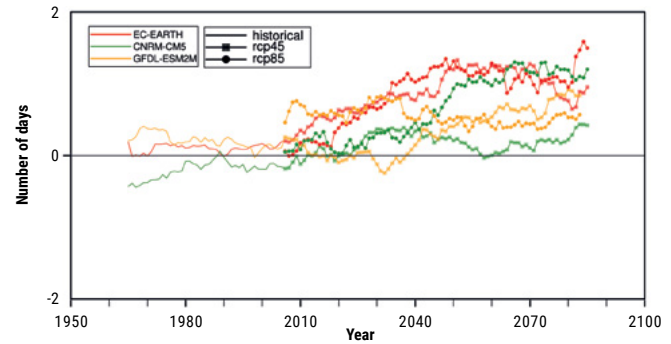


FIGURE 155

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

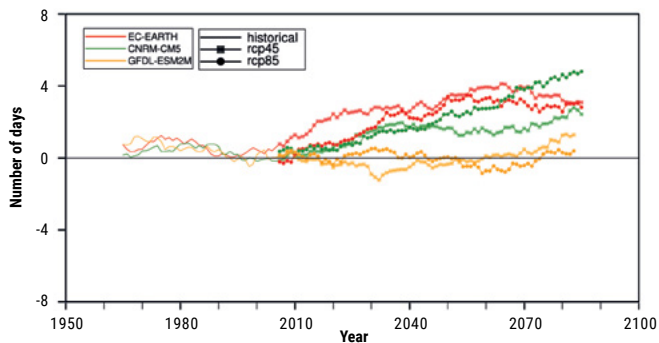
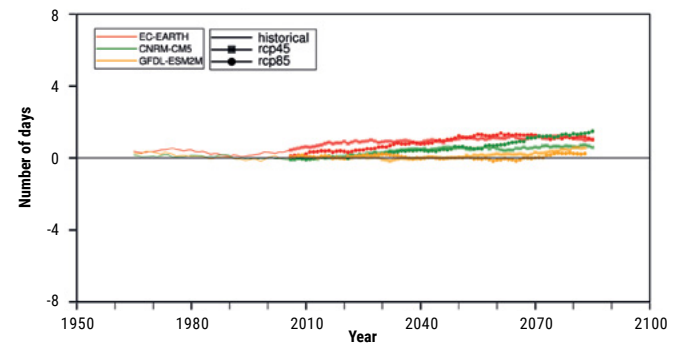


FIGURE 156

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

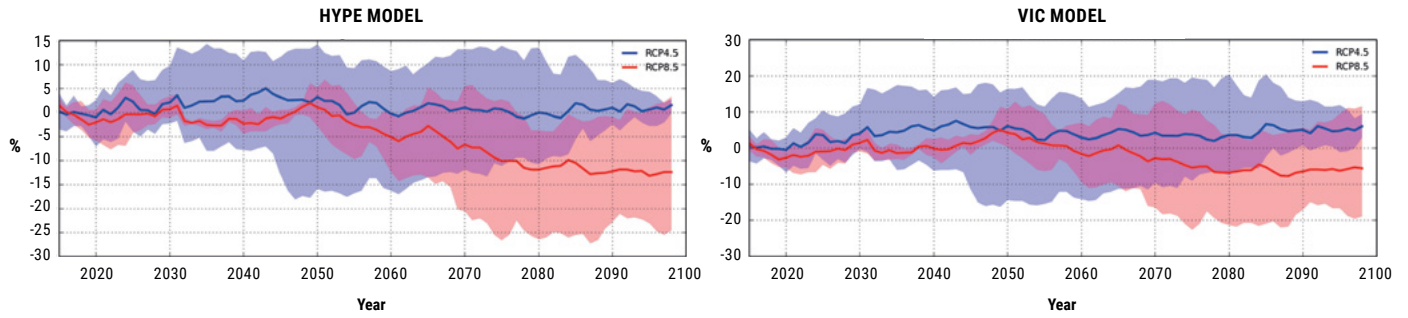


FIGURE 158

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

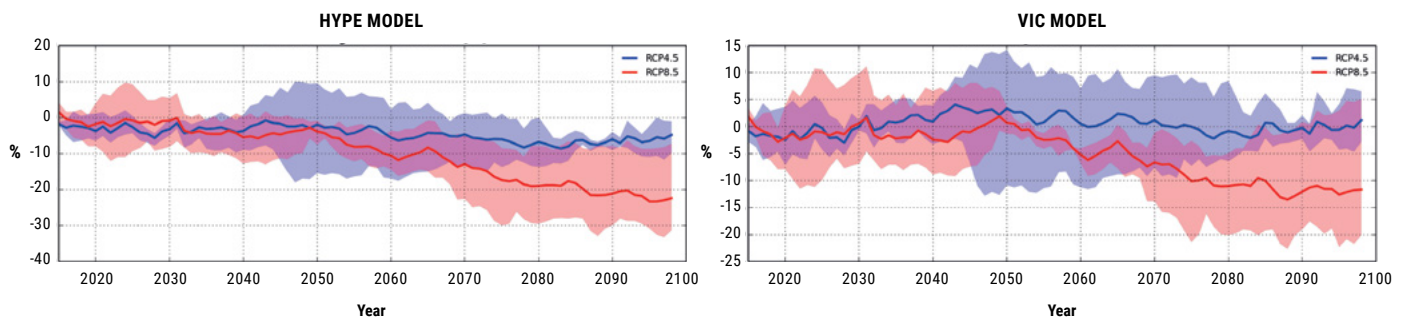
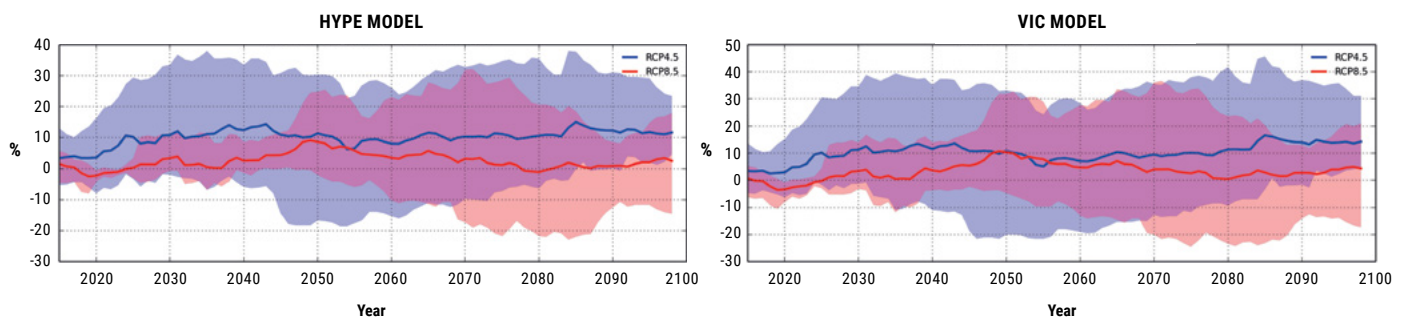


FIGURE 159

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

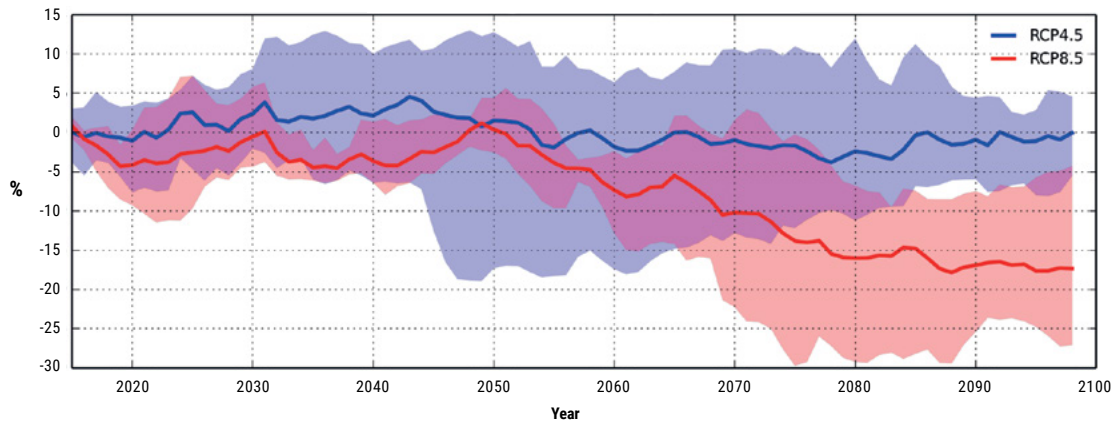


FIGURE 161

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

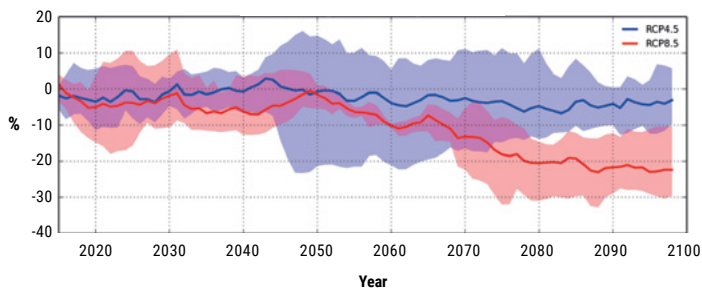
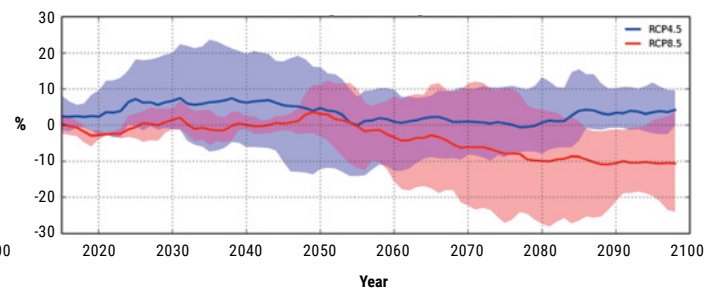


FIGURE 162

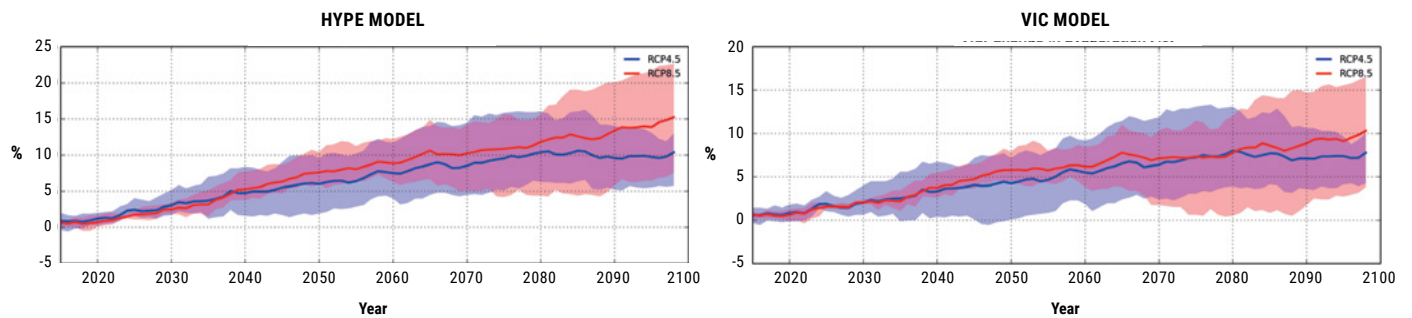
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

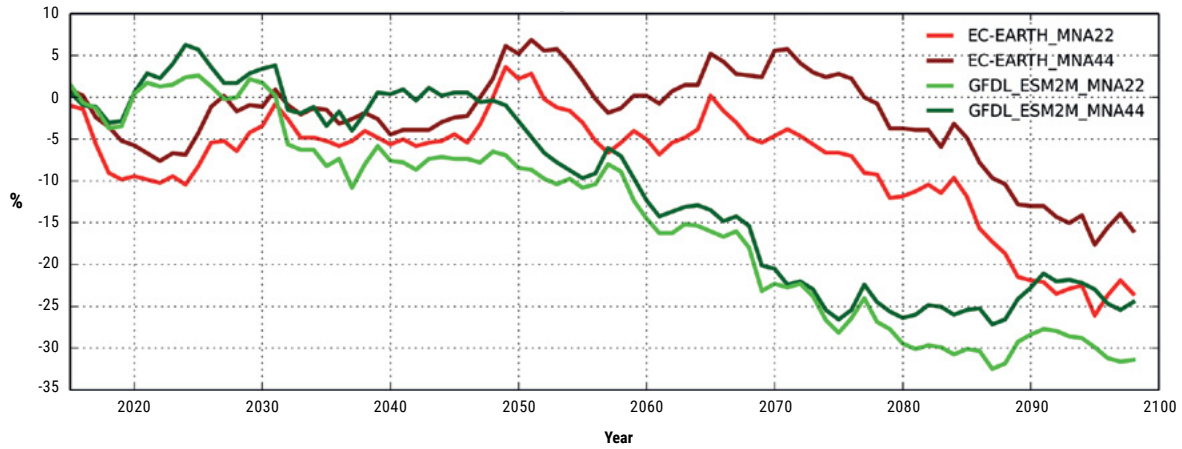


FIGURE 165

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

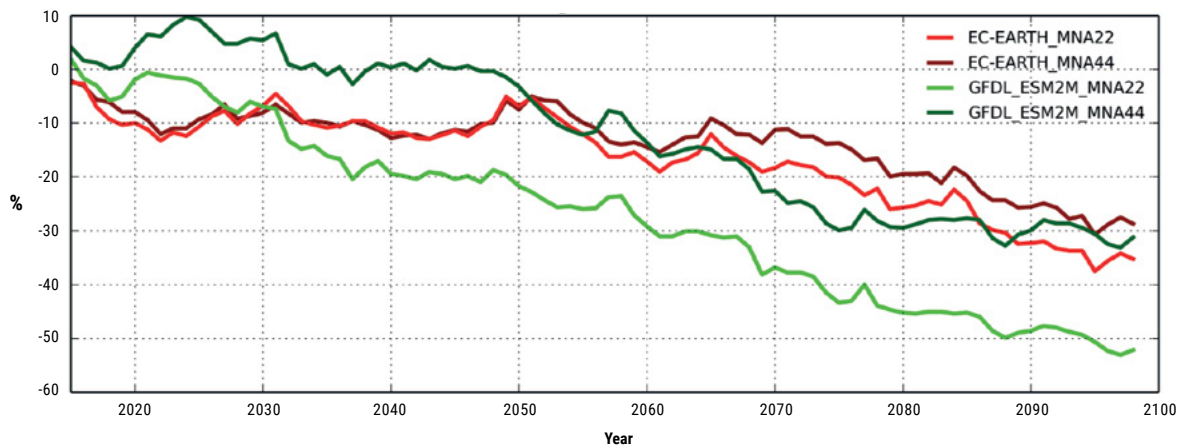
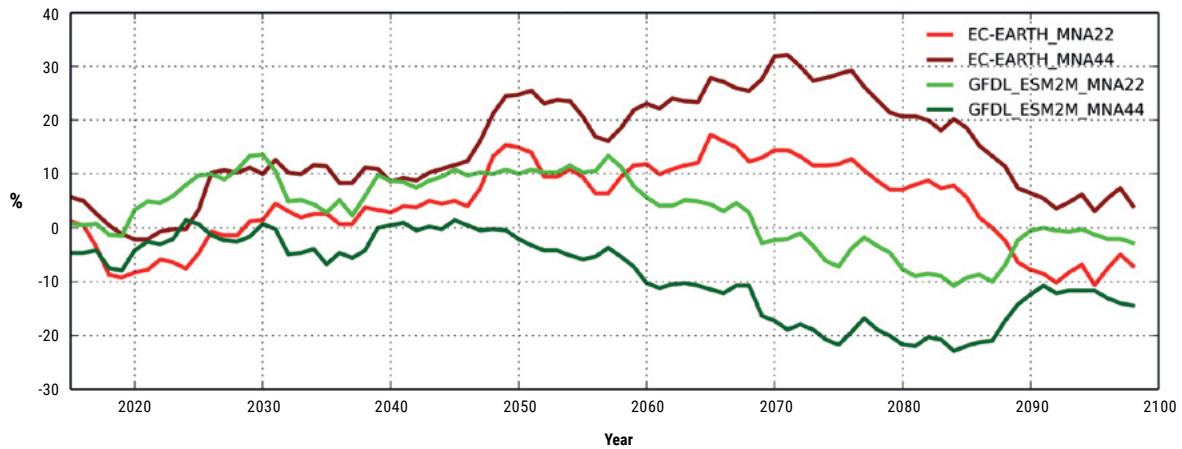


FIGURE 166

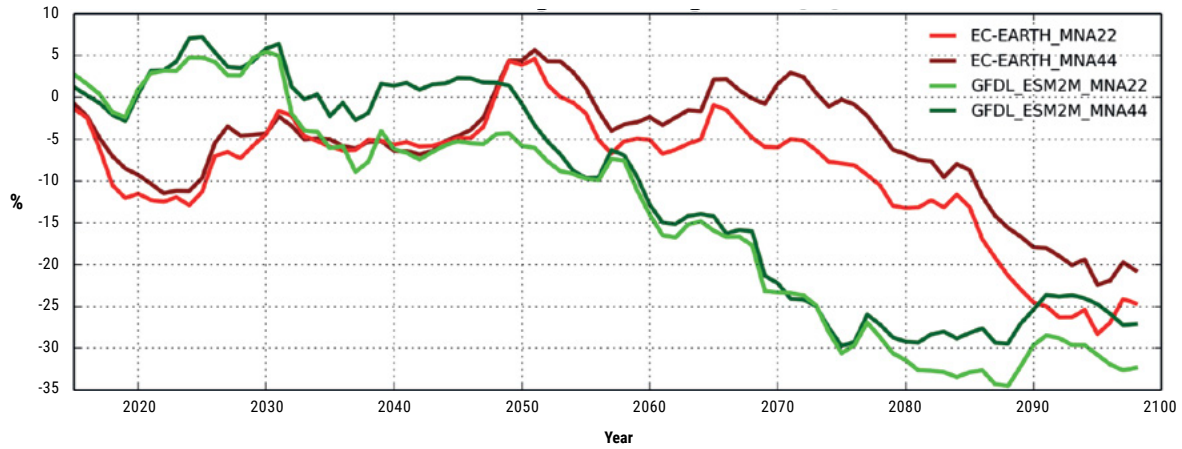
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



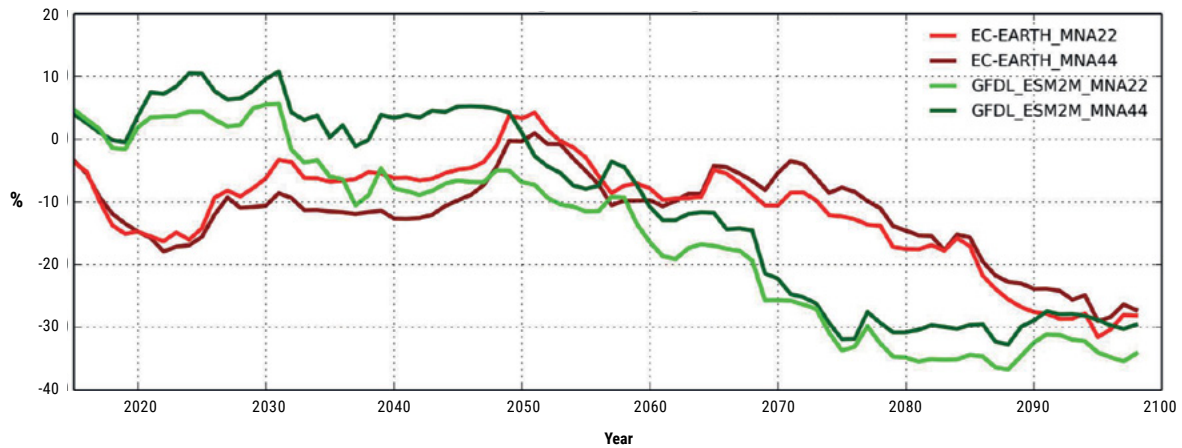
7.3. HYDROLOGICAL PARAMETERS – 7.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 7.3.4.2. DISCHARGE

FIGURE 167

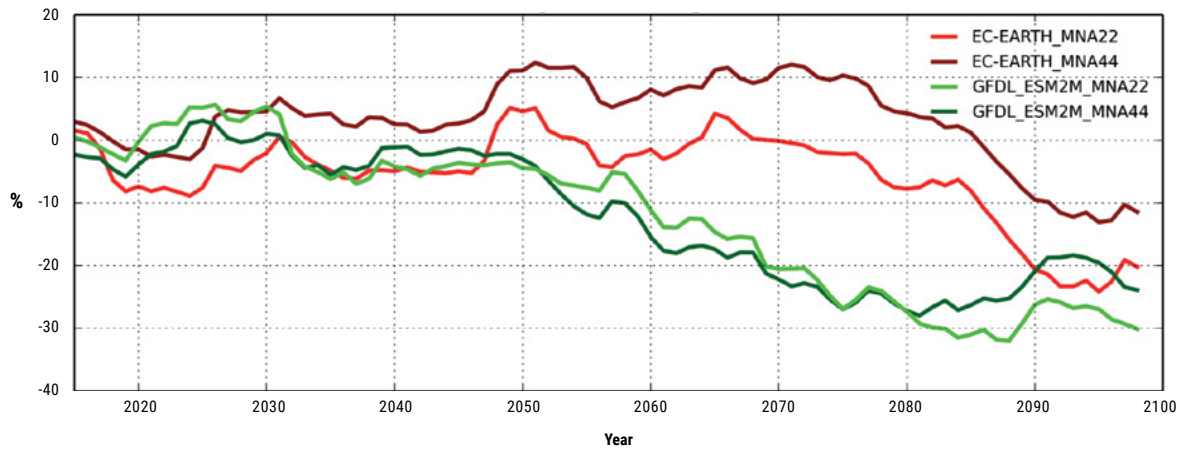
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

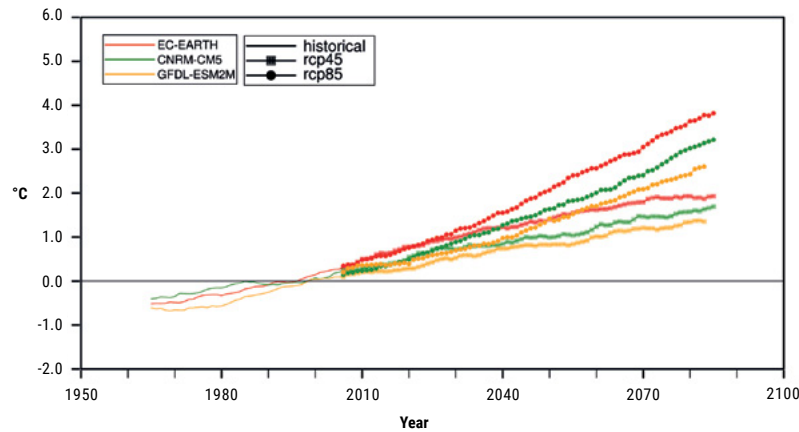


FIGURE 171

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

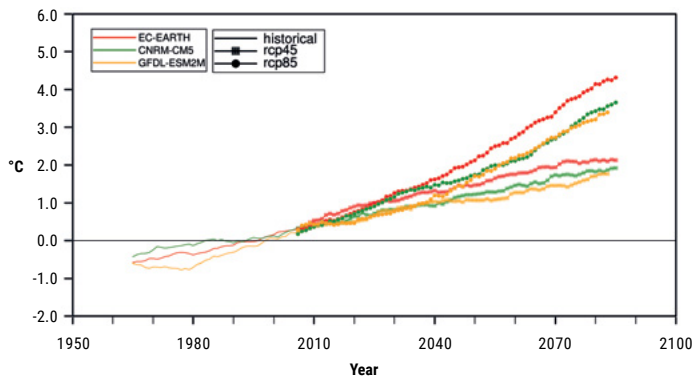


FIGURE 172

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

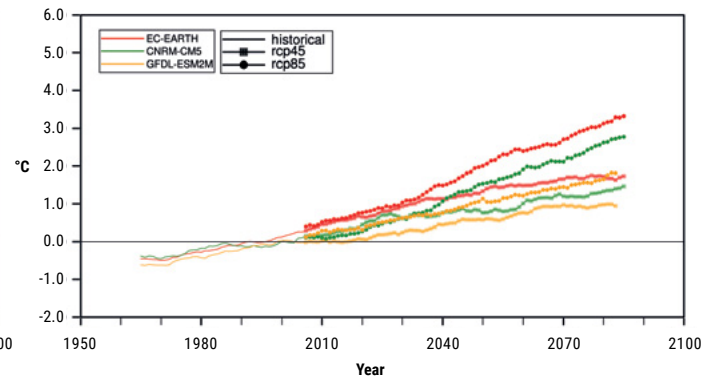


FIGURE 173

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

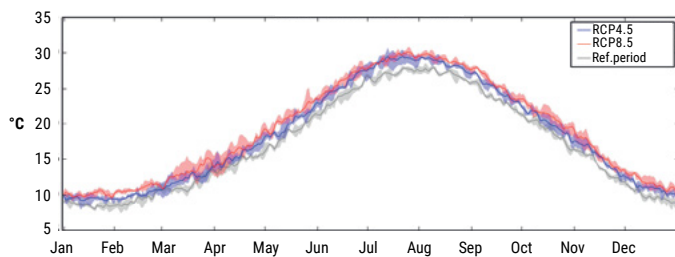
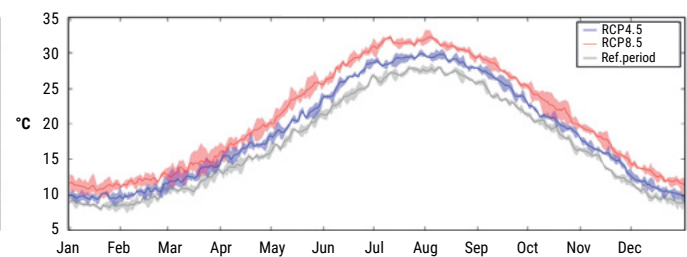


FIGURE 174

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

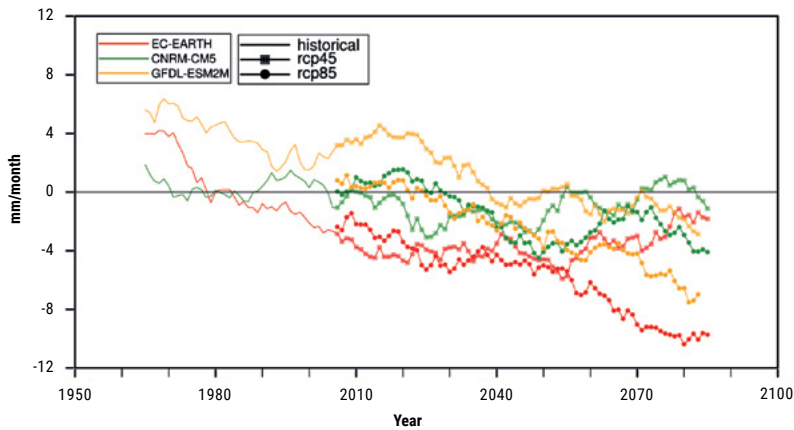


FIGURE 176

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

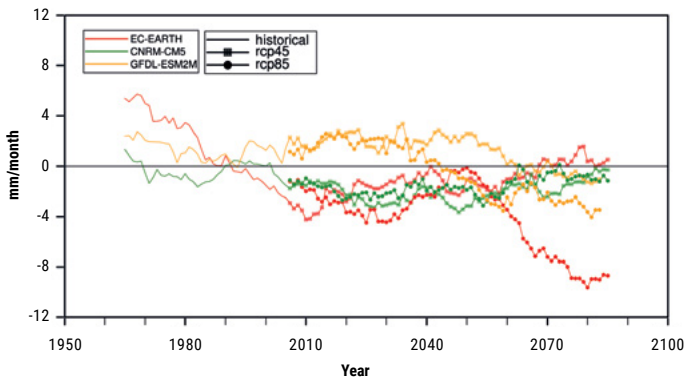


FIGURE 177

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

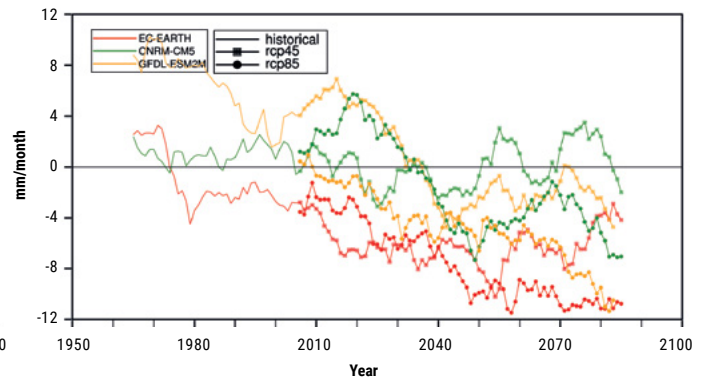


FIGURE 178

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

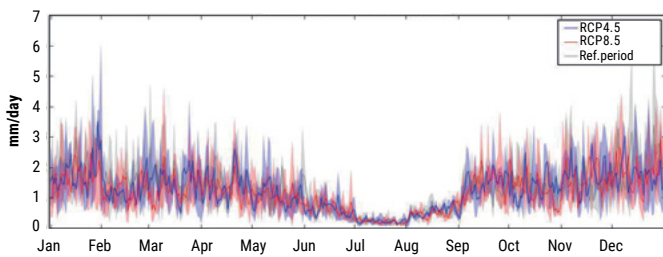
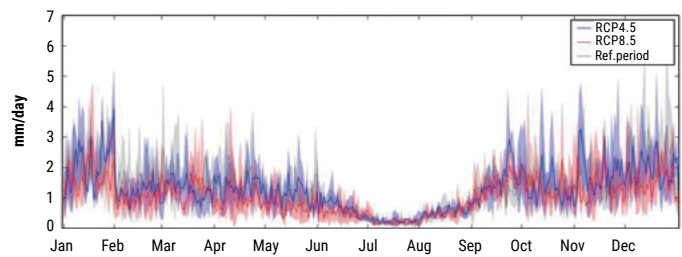


FIGURE 179

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

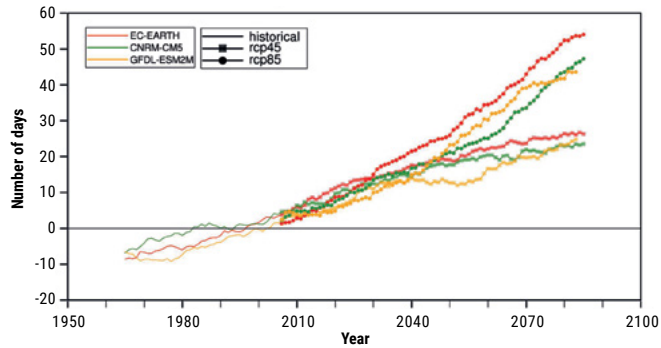


FIGURE 181

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

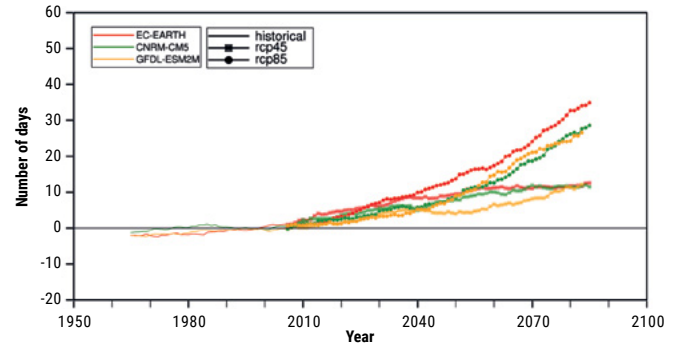
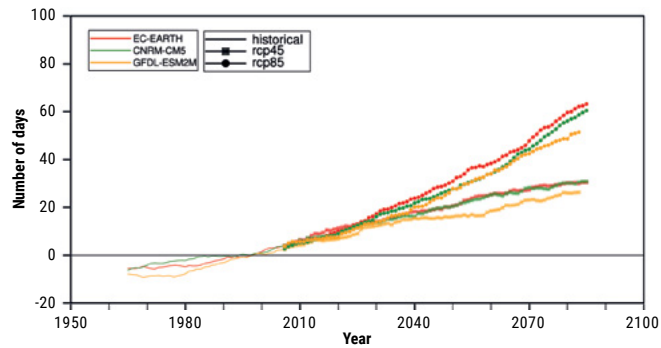


FIGURE 182

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

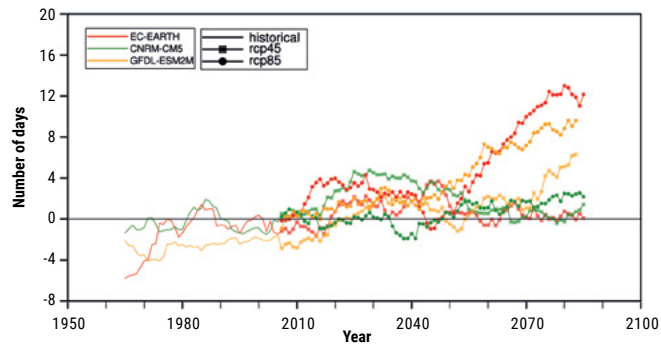


FIGURE 184

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

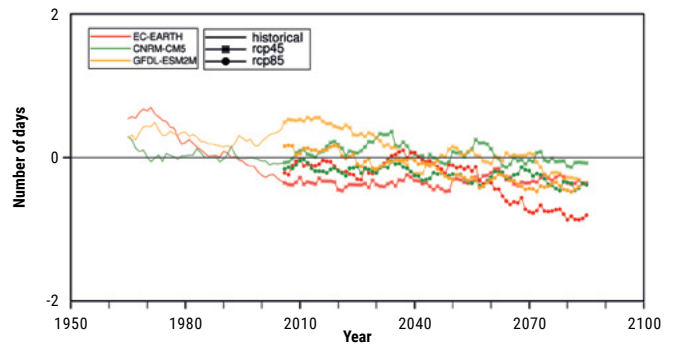


FIGURE 185

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

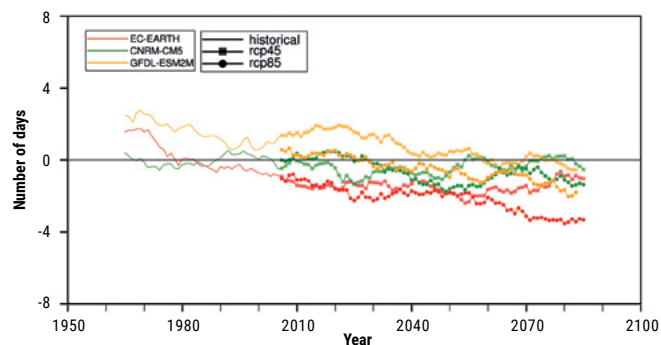
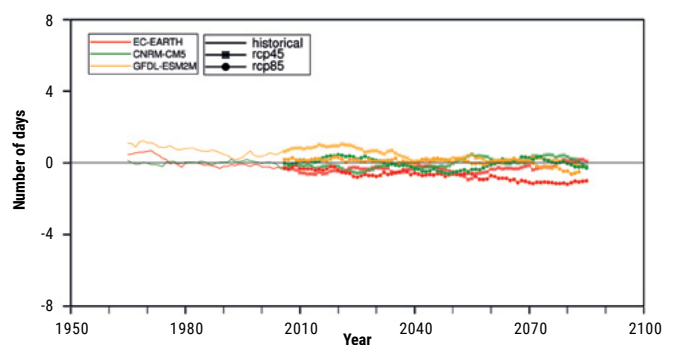


FIGURE 186

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

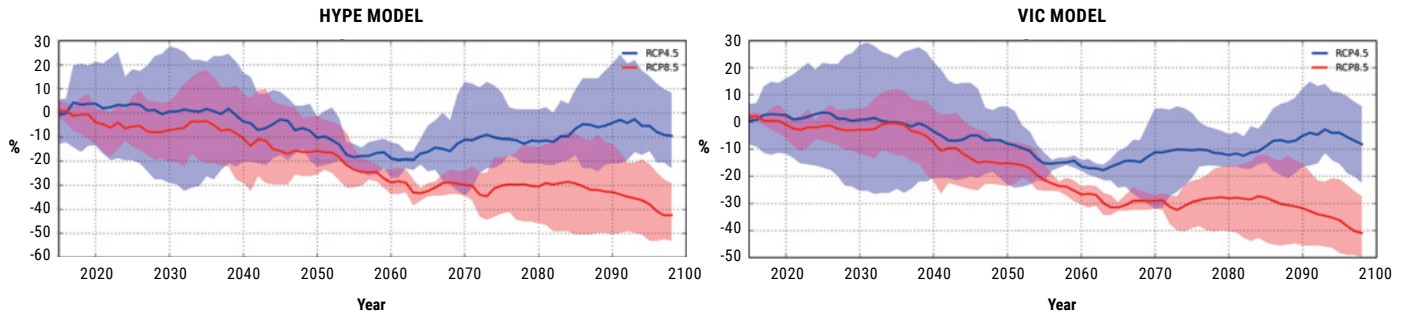


FIGURE 188

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

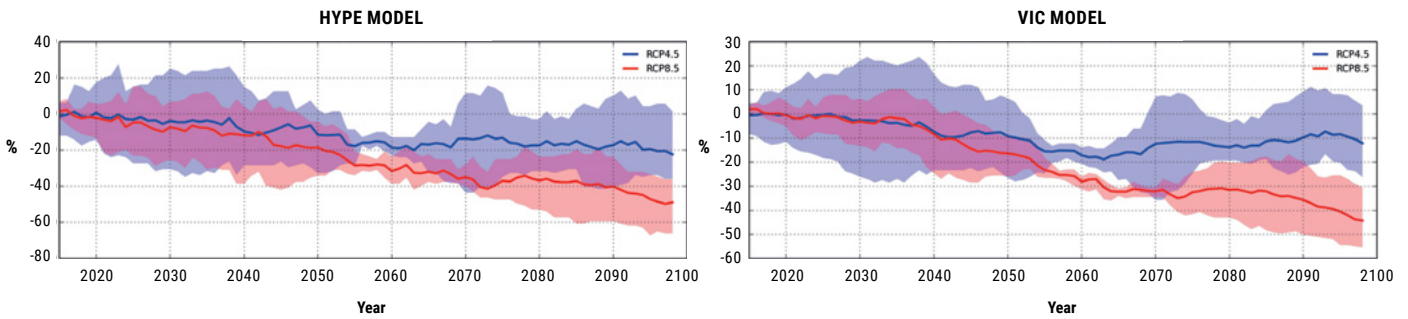
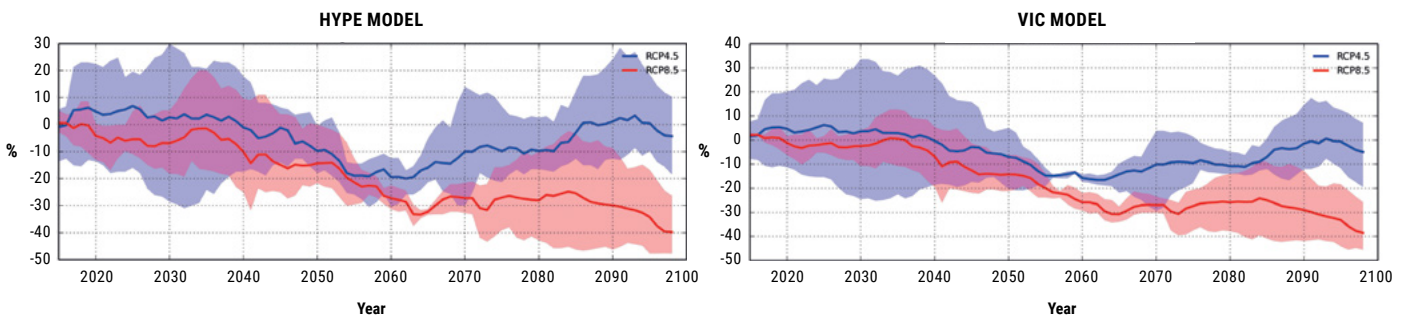


FIGURE 189

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

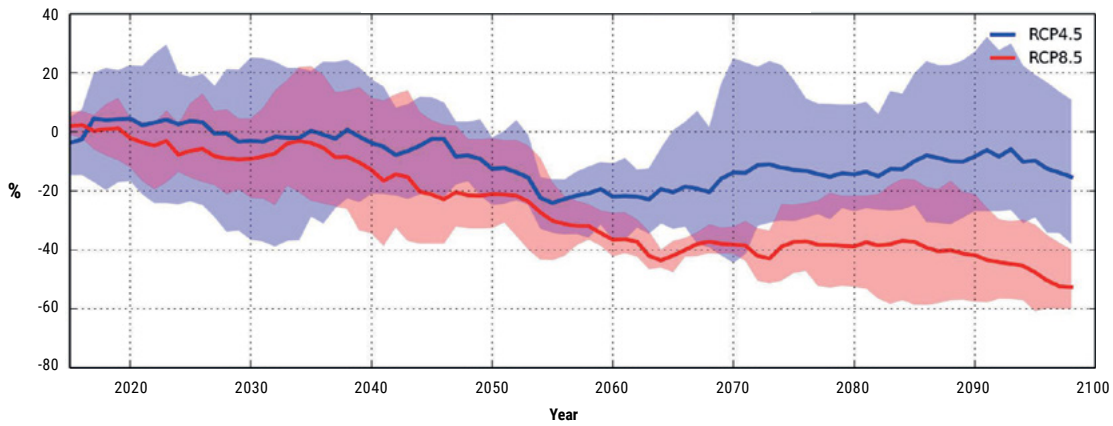


FIGURE 191

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

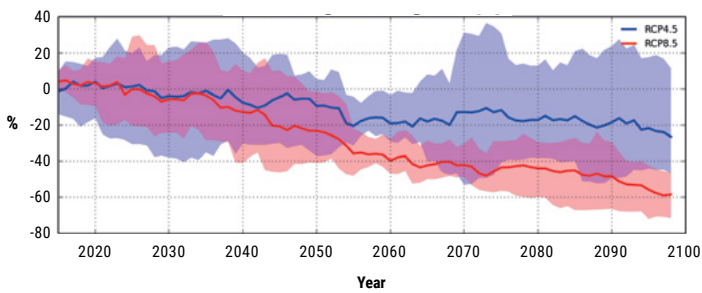
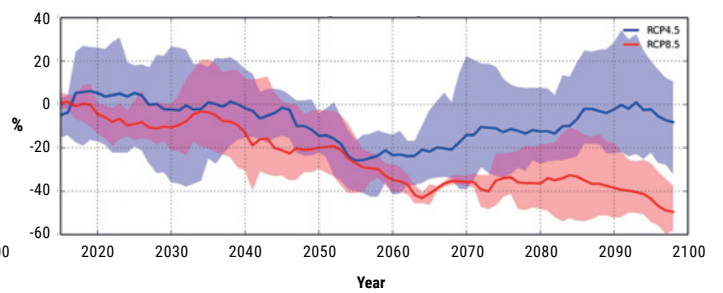


FIGURE 192

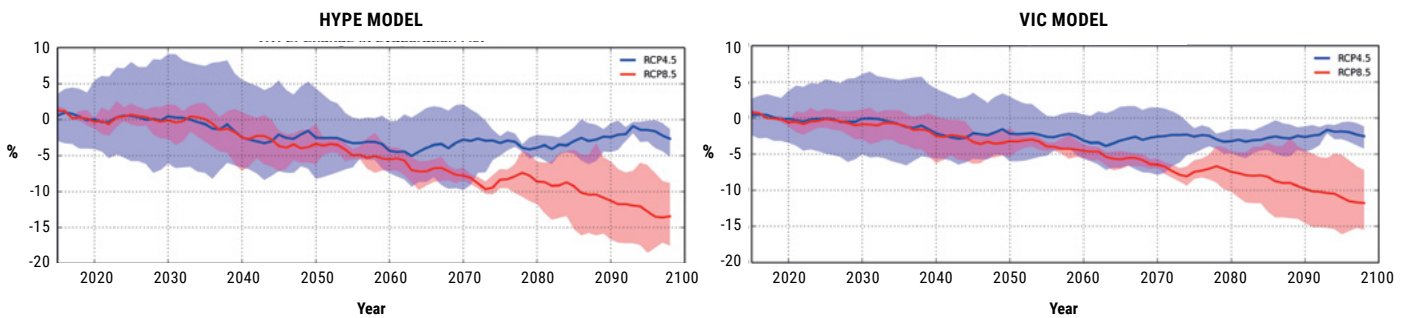
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

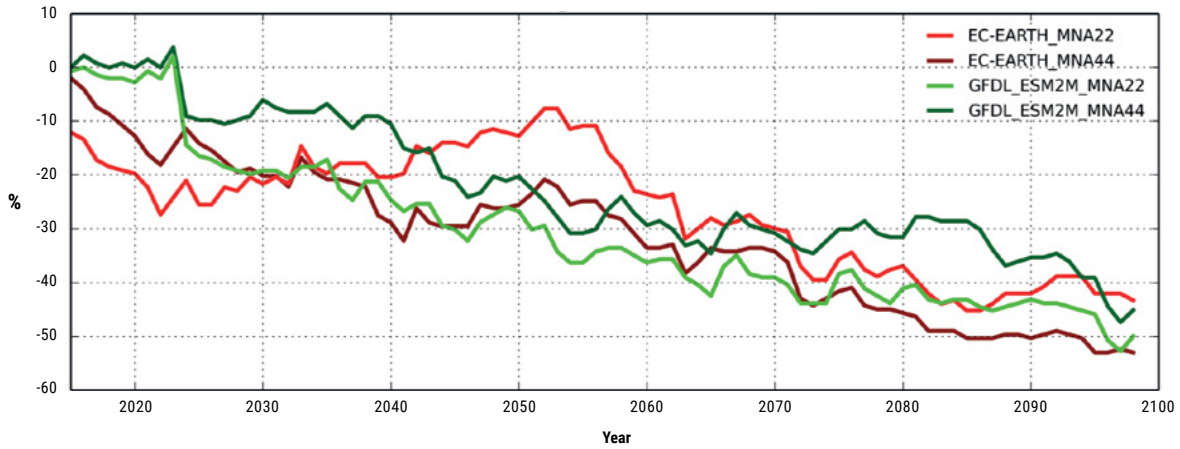


FIGURE 195

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

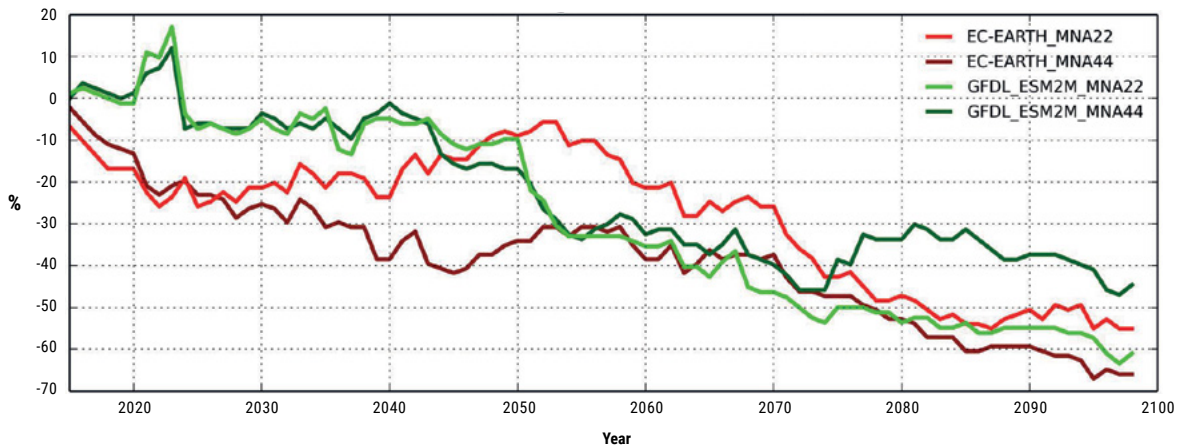
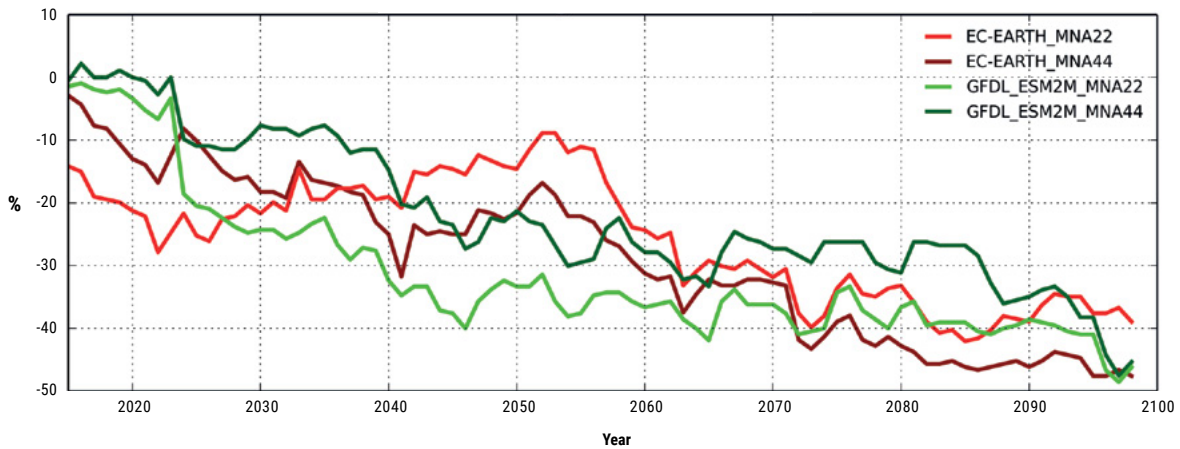


FIGURE 196

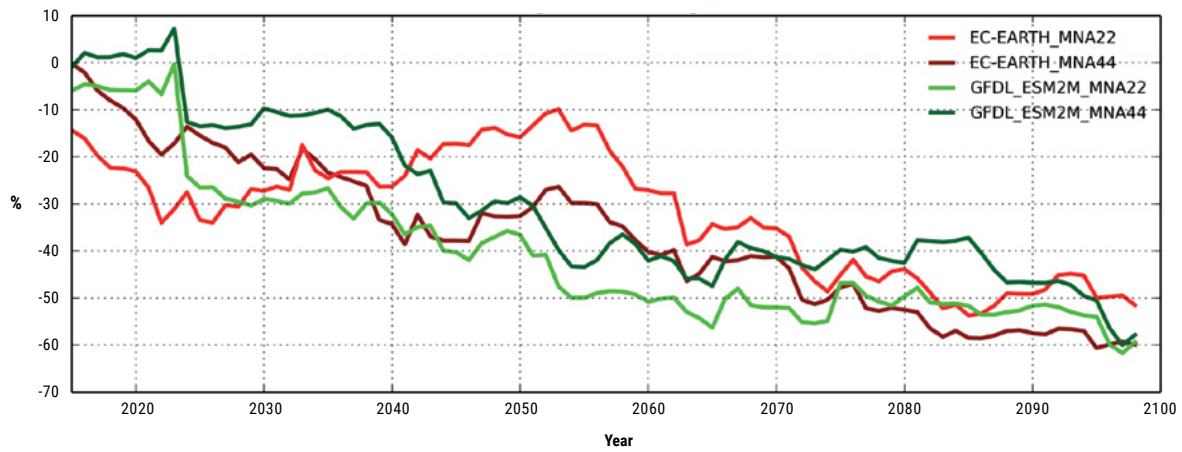
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



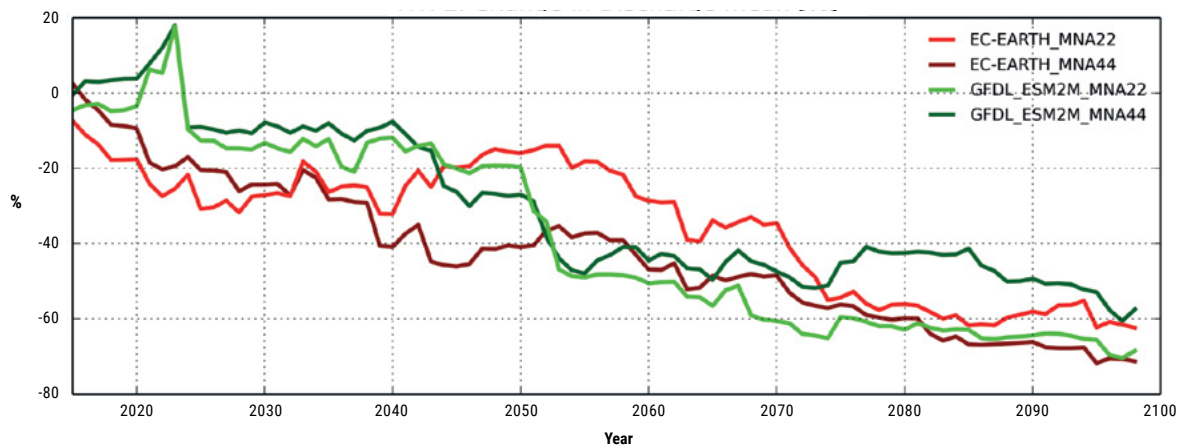
8.3. HYDROLOGICAL PARAMETERS – 8.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 8.3.4.2. DISCHARGE

FIGURE 197

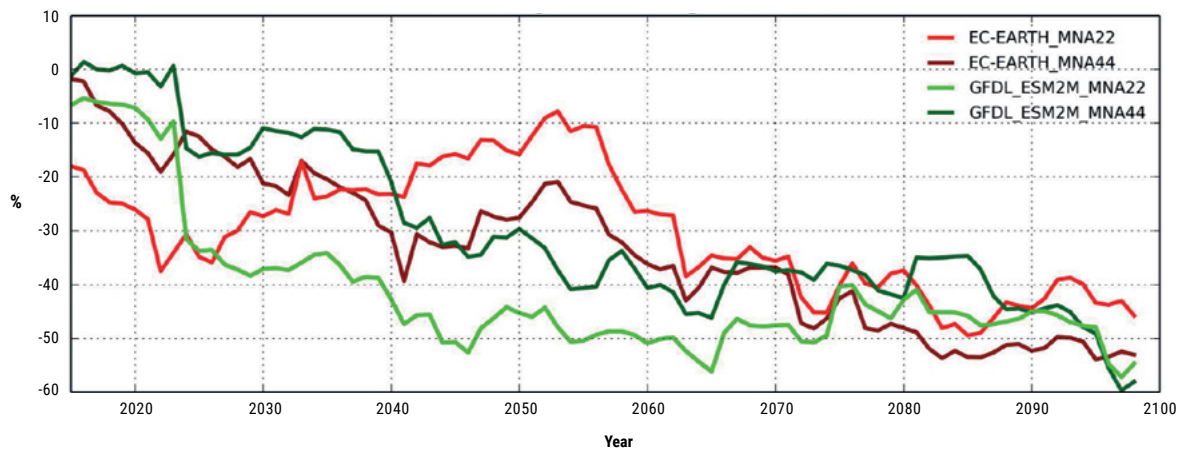
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

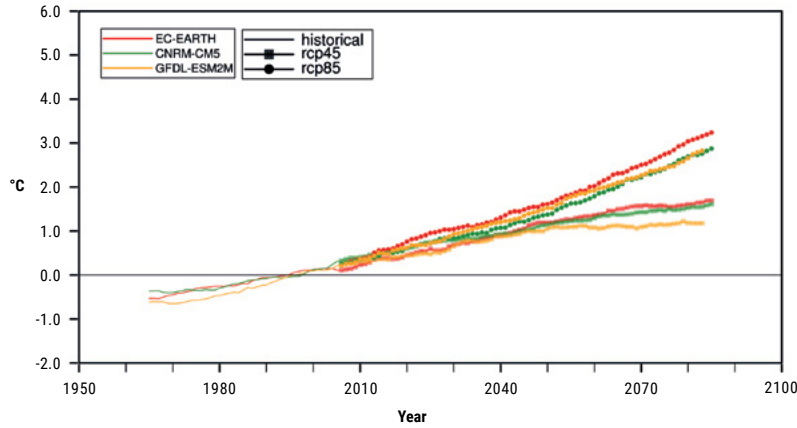


FIGURE 201

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

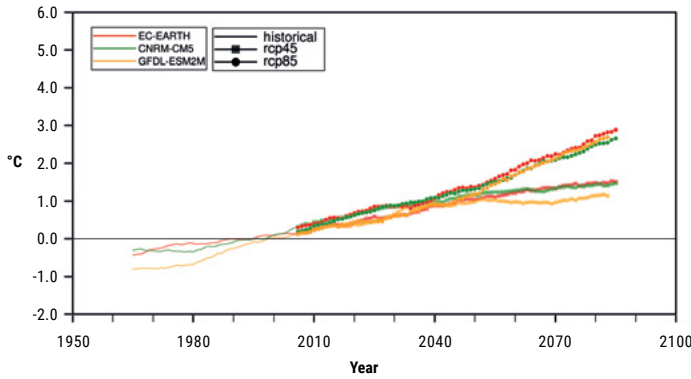


FIGURE 202

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

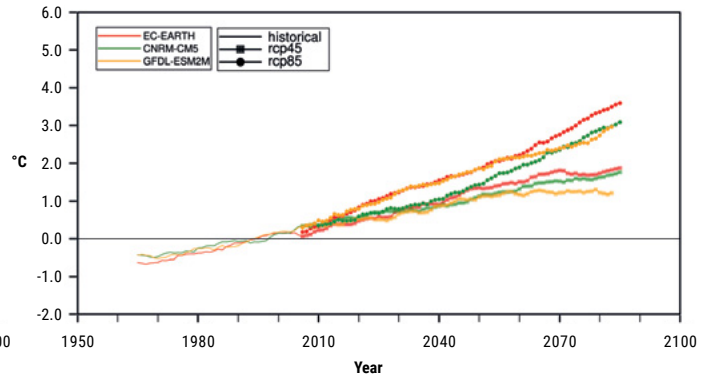


FIGURE 203

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

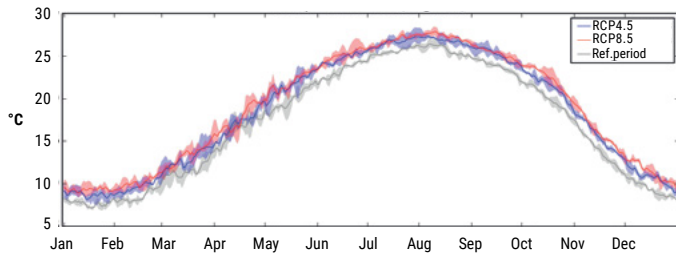
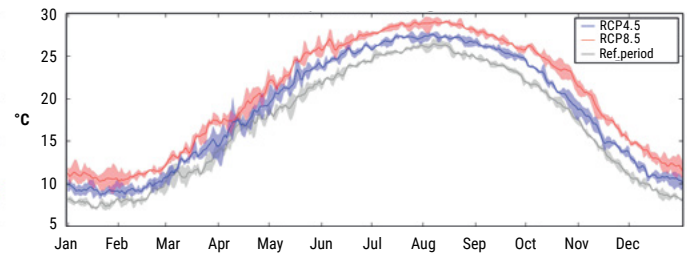


FIGURE 204

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

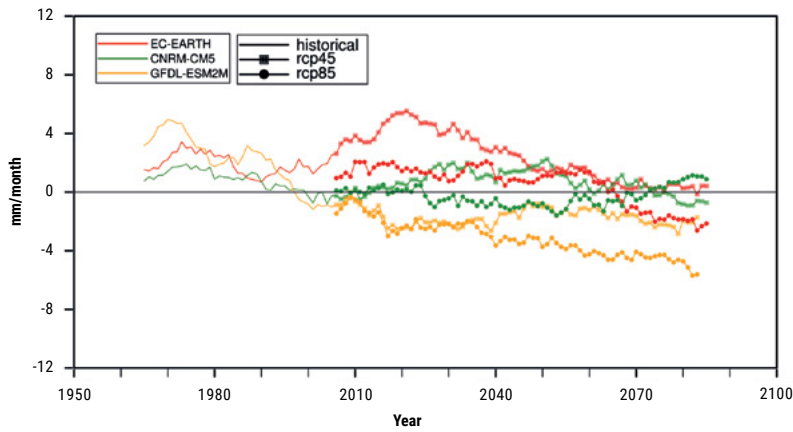


FIGURE 206

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

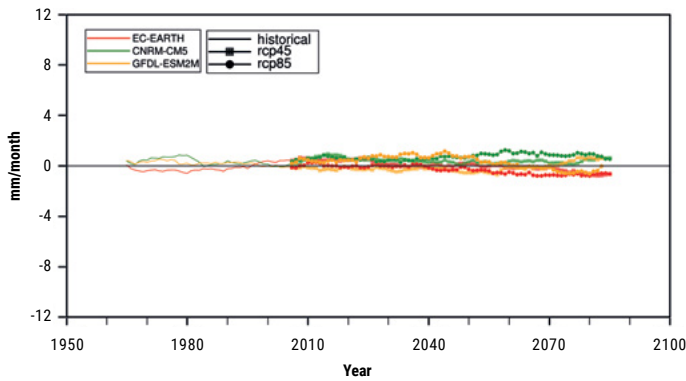


FIGURE 207

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

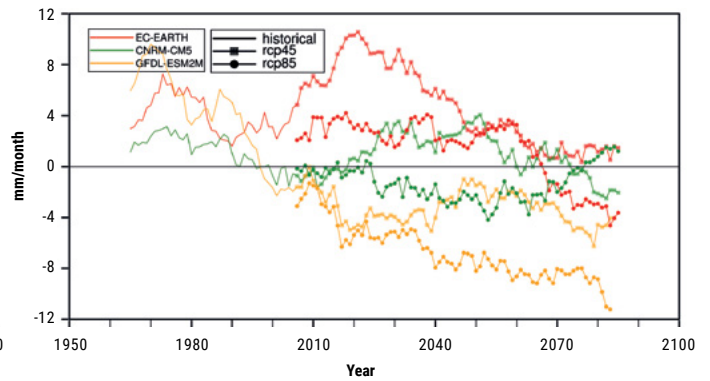


FIGURE 208

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

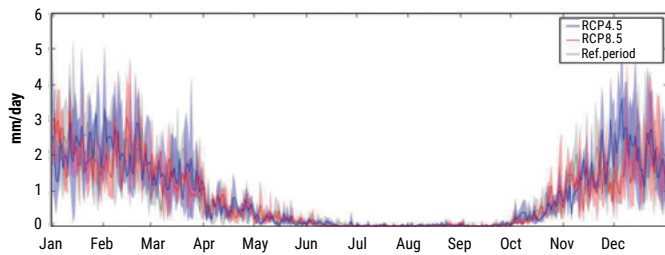
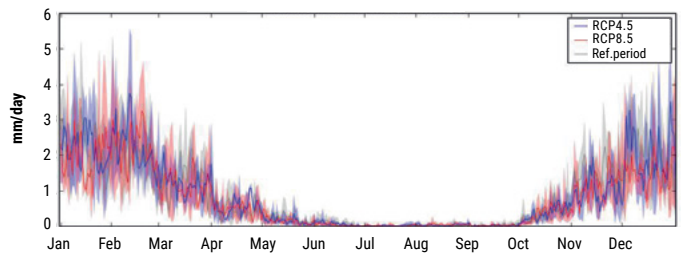


FIGURE 209

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

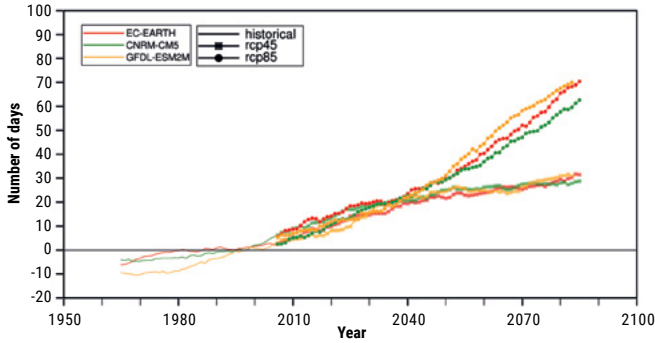


FIGURE 211
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

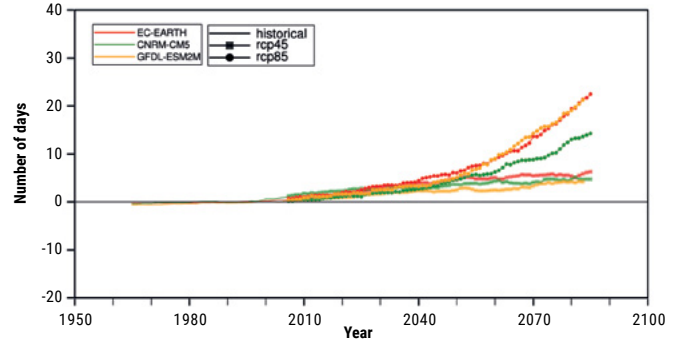
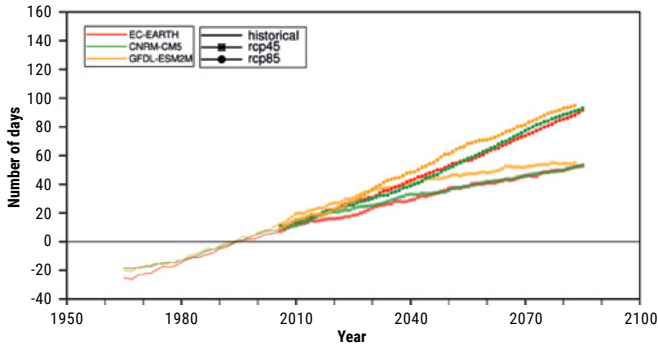


FIGURE 212
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections



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

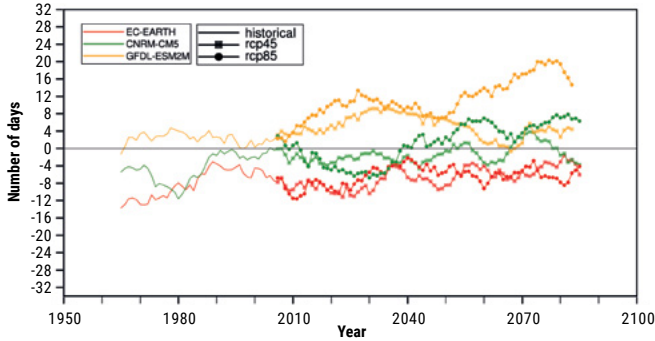


FIGURE 214
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

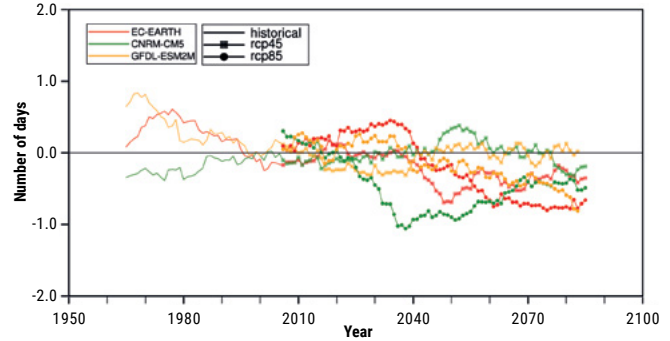


FIGURE 215
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

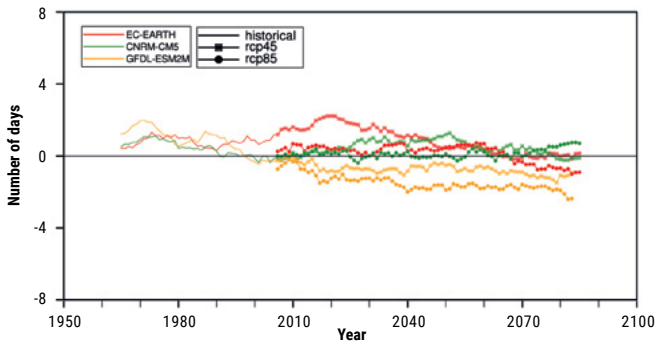
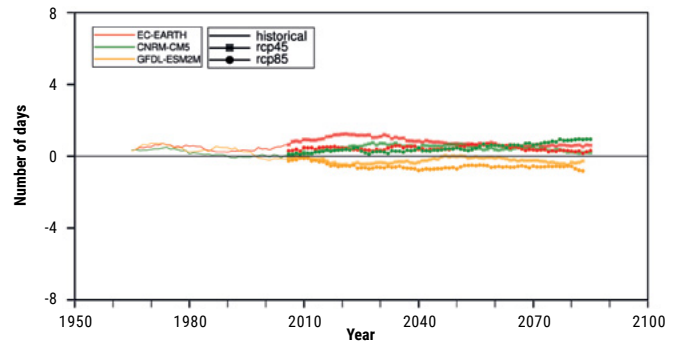


FIGURE 216
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



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

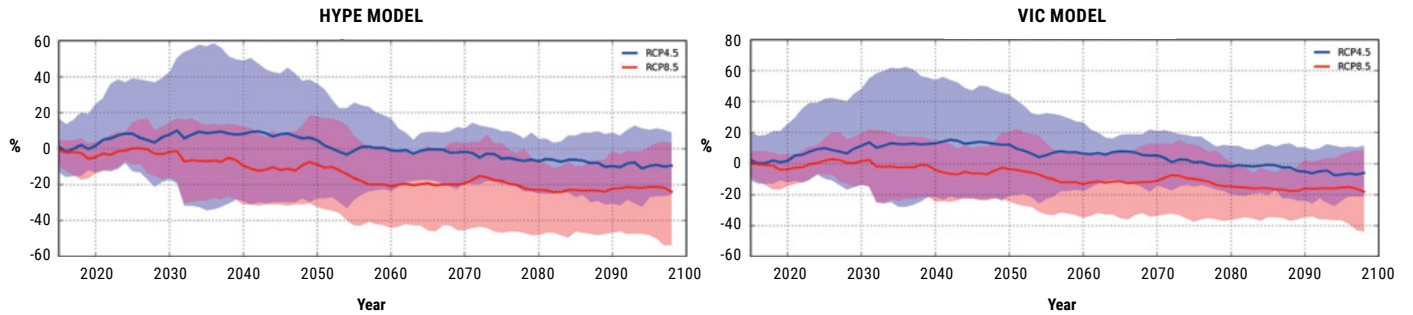


FIGURE 218

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

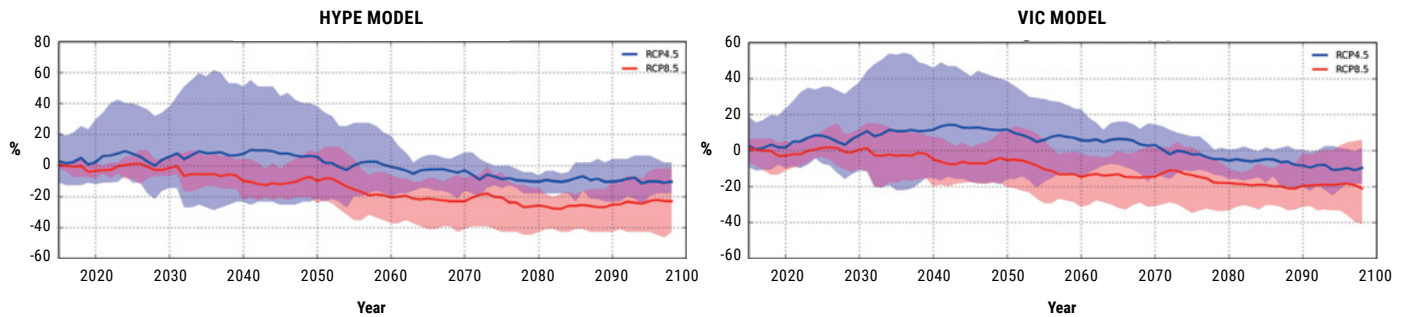
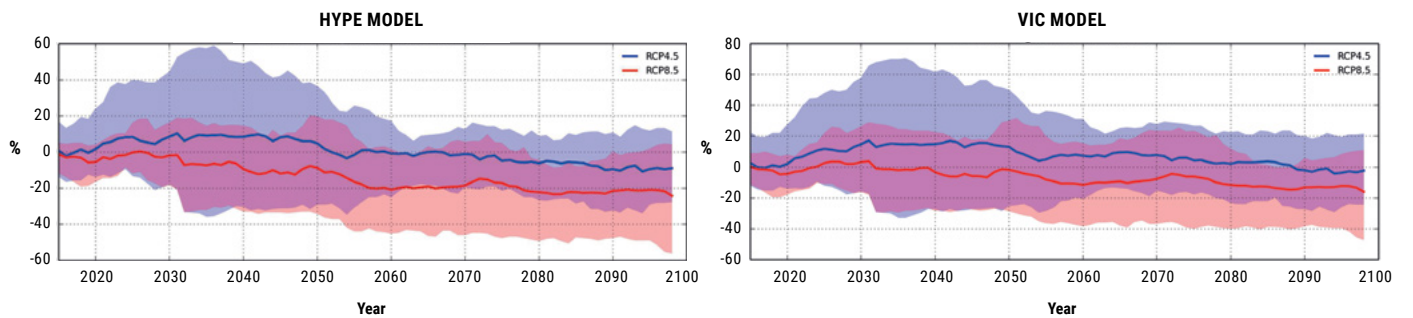


FIGURE 219

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

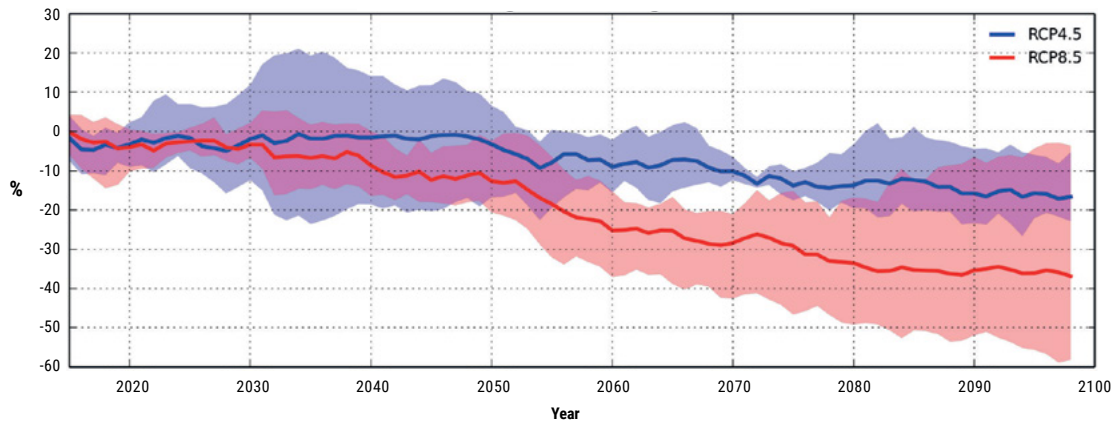


FIGURE 221

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

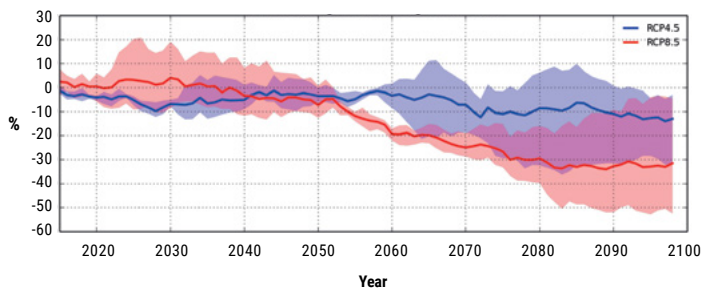
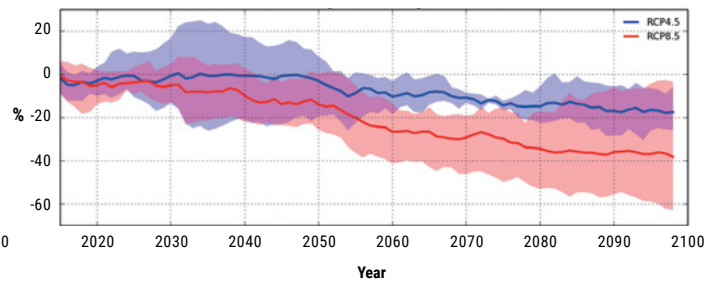


FIGURE 222

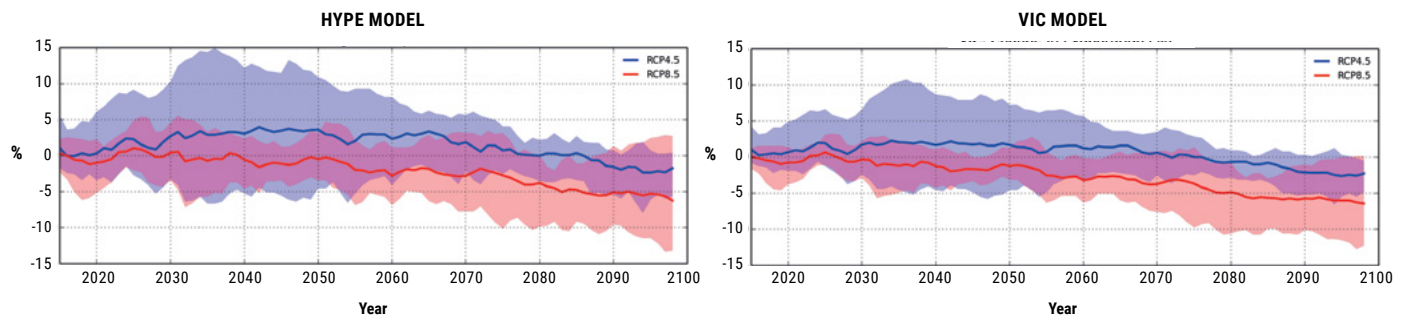
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

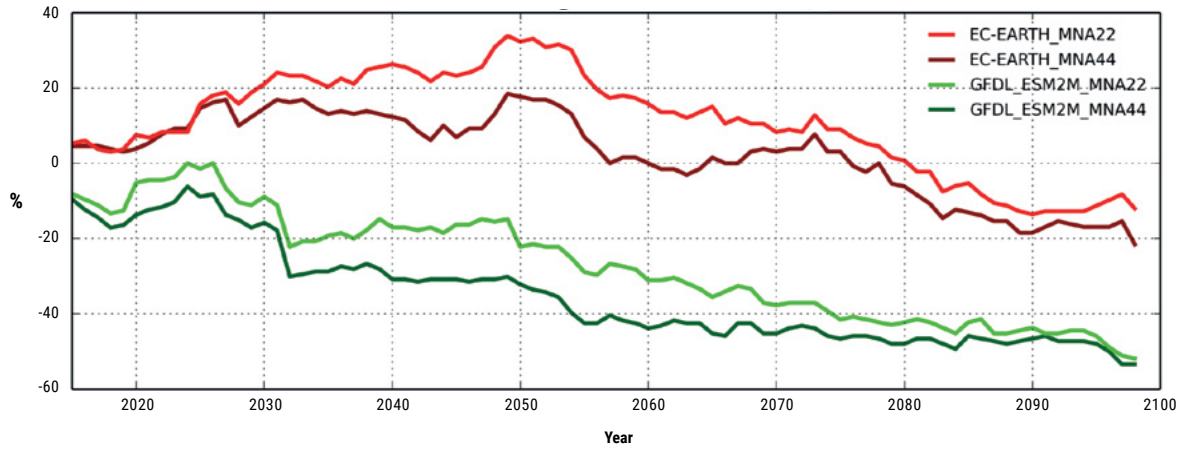


FIGURE 225

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

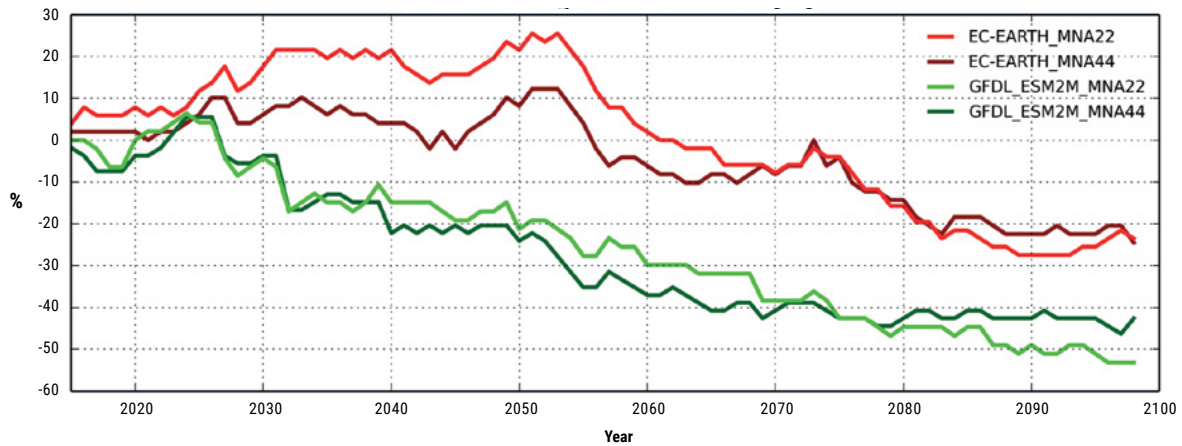
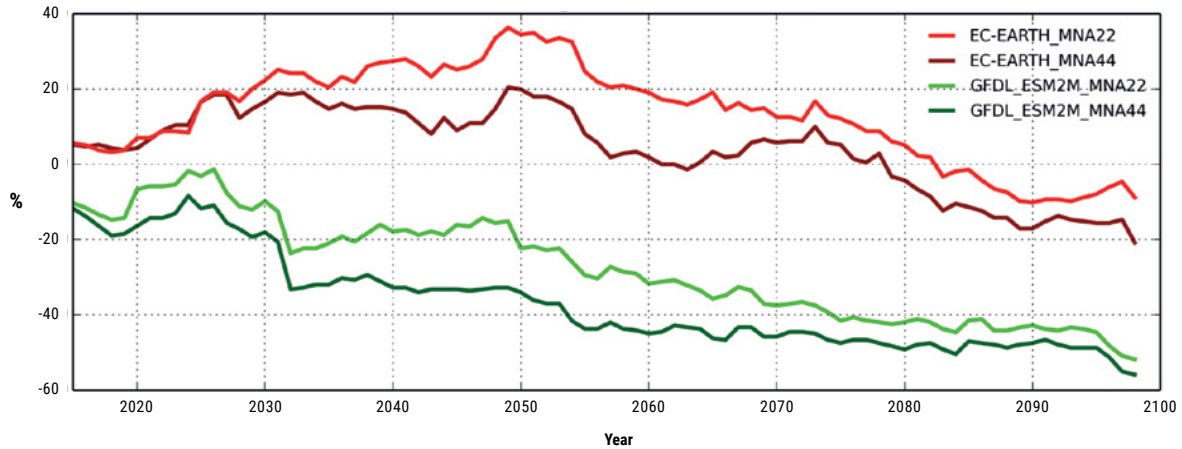


FIGURE 226

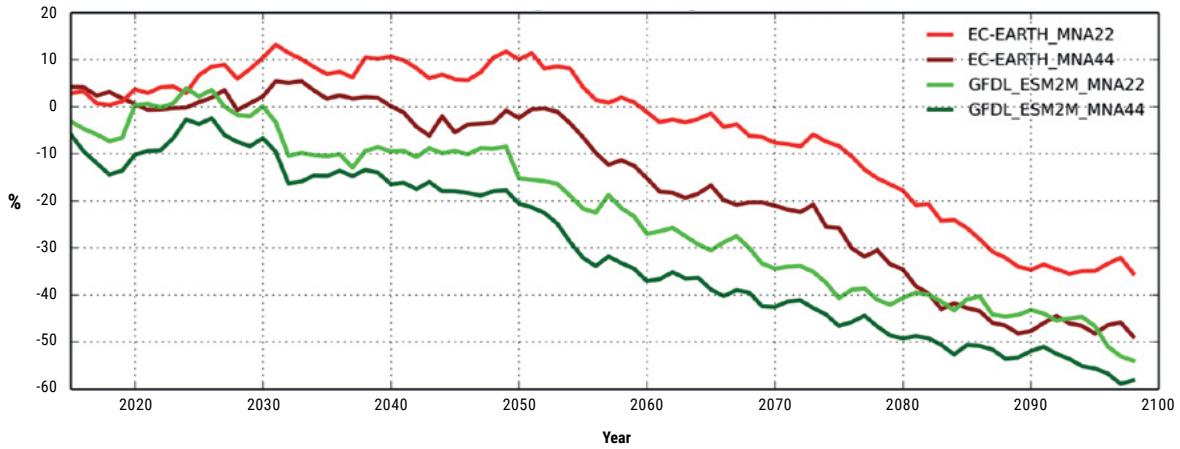
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



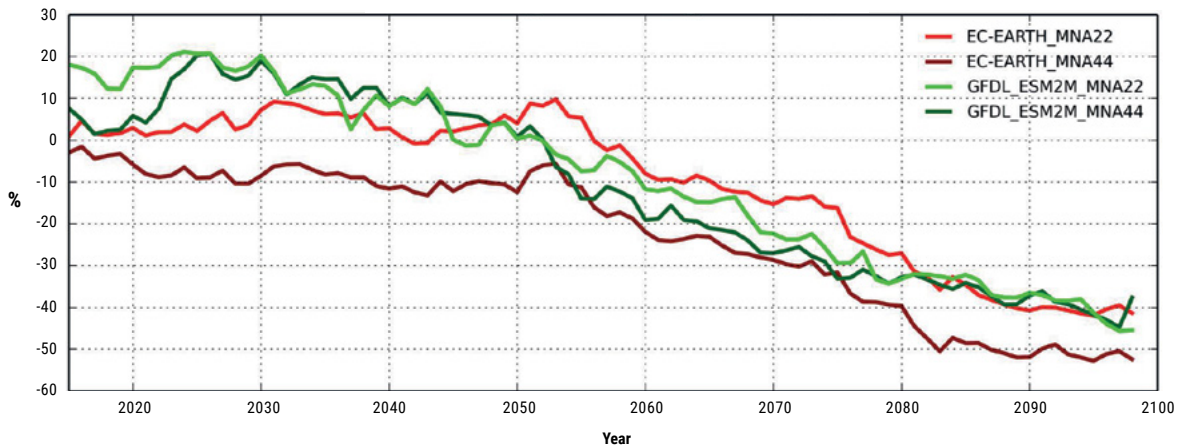
9.3. HYDROLOGICAL PARAMETERS – 9.3.4. COMPARISON 50 KM VS 25 KM RESOLUTIONS – 9.3.4.2. DISCHARGE

FIGURE 227

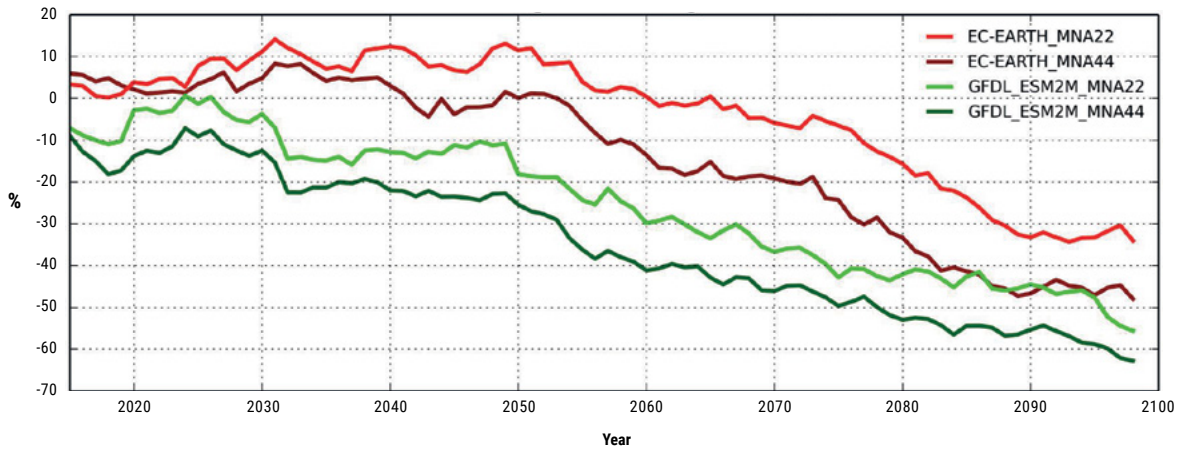
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

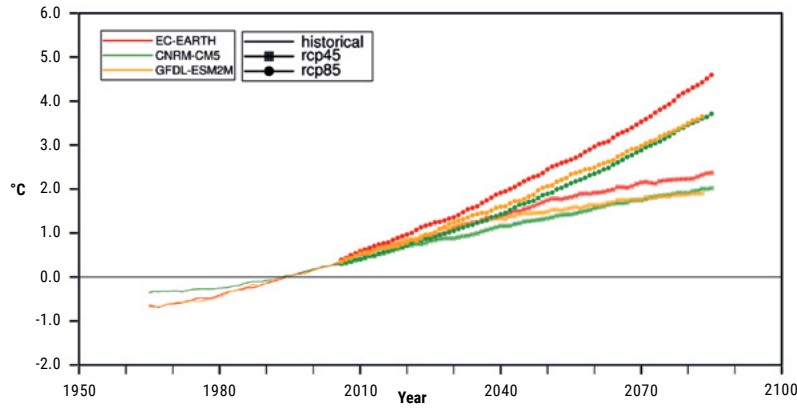


FIGURE 231

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

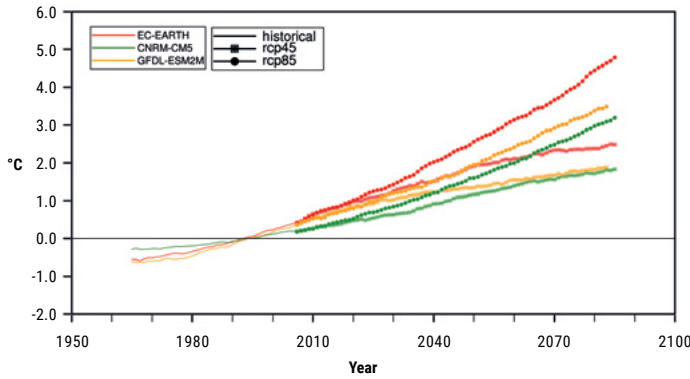


FIGURE 232

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

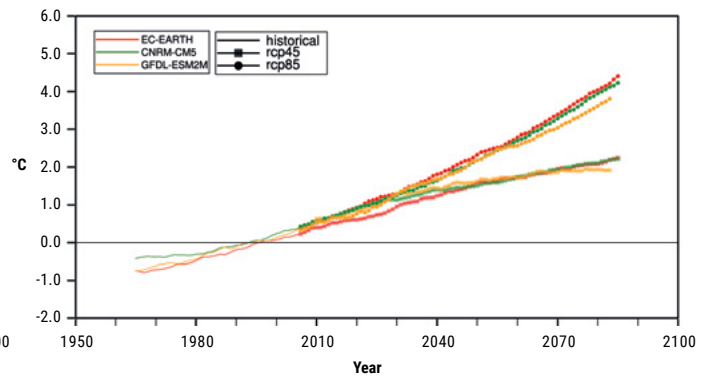


FIGURE 233

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

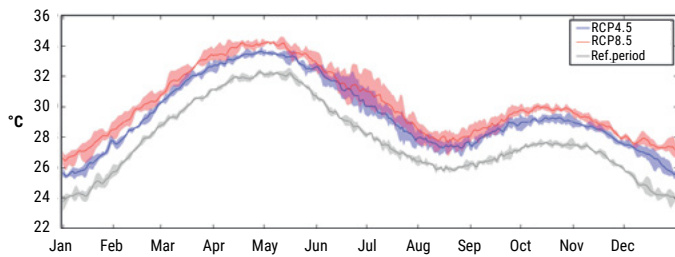
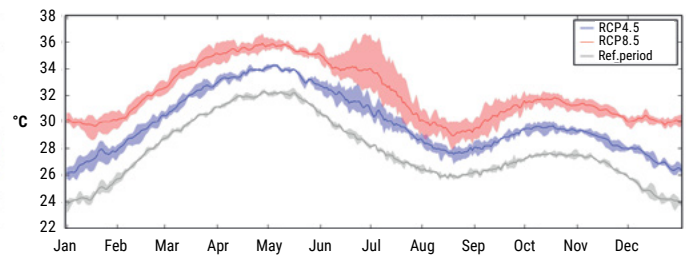


FIGURE 234

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

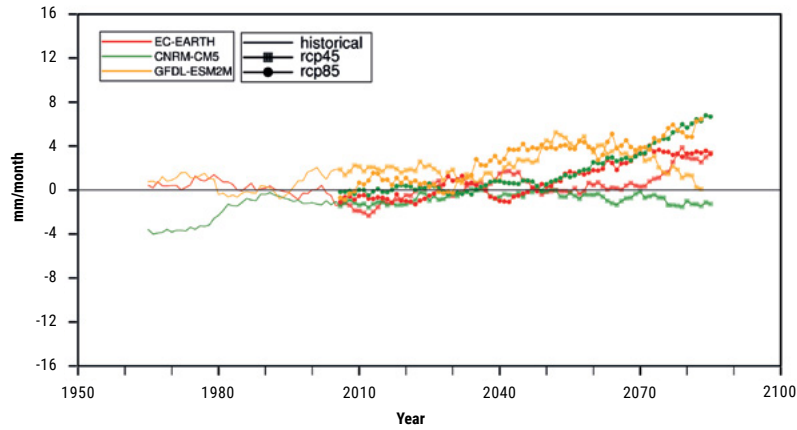


FIGURE 236

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

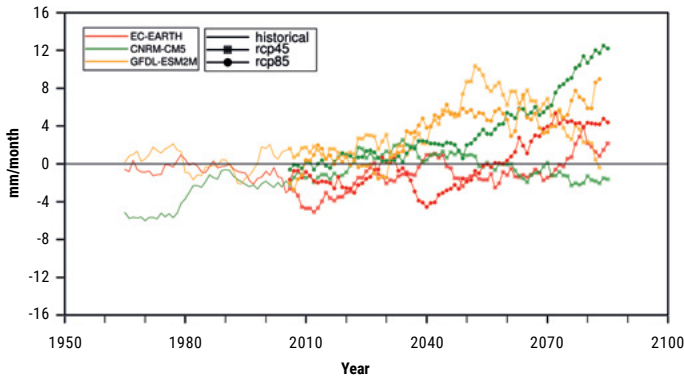


FIGURE 237

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

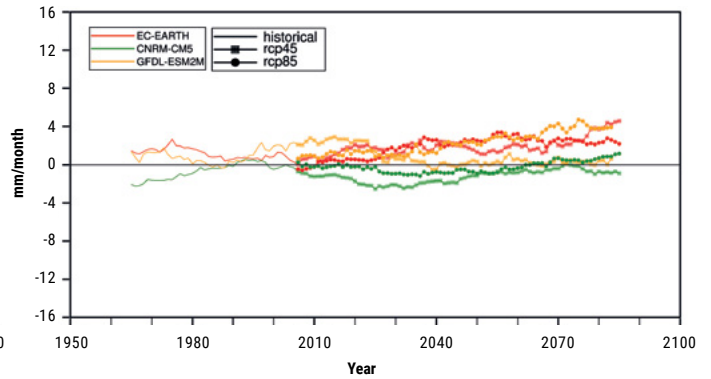


FIGURE 238

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

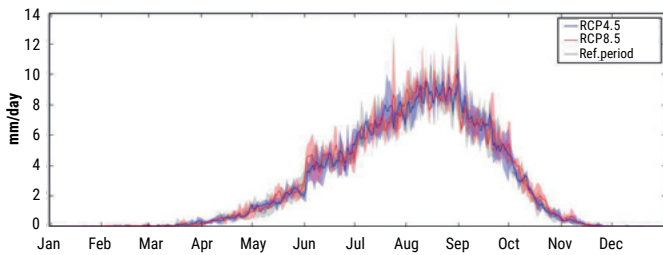
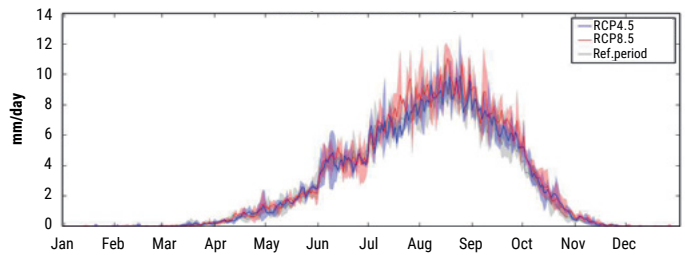


FIGURE 239

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

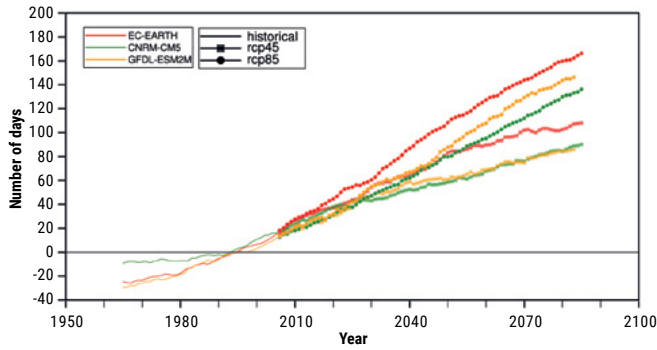


FIGURE 241
Mean change in SU40 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

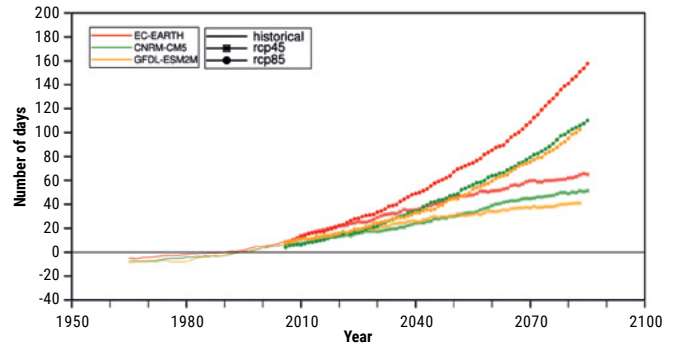
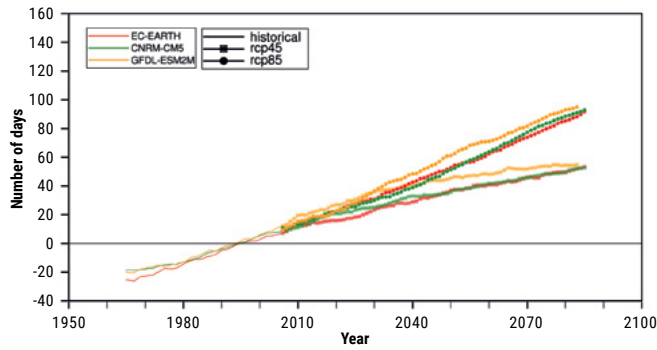


FIGURE 242
Mean change in TR over time for ensemble of three RCP 4.5 and RCP 8.5 projections



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

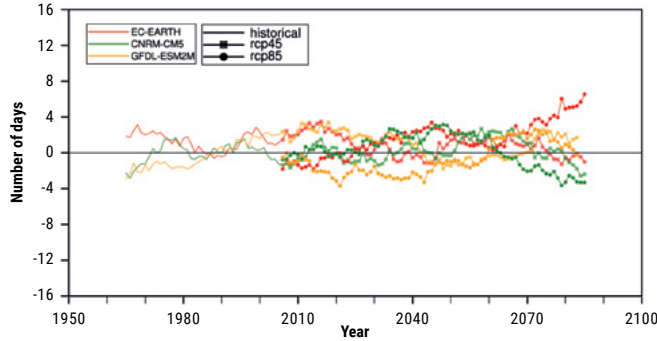


FIGURE 244
Mean change in CWD over time for ensemble of three RCP 4.5 and RCP 8.5 projections

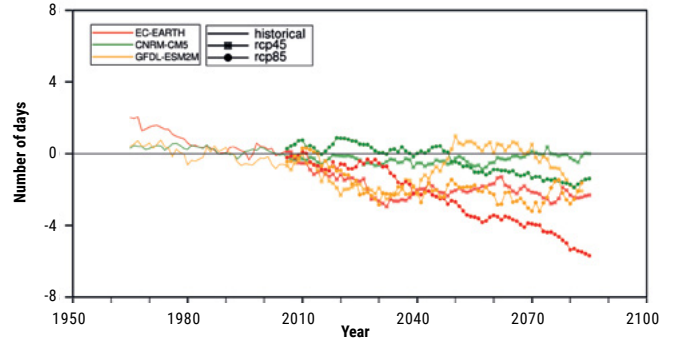


FIGURE 245
Mean change in R10 over time for ensemble of three RCP 4.5 and RCP 8.5 projections

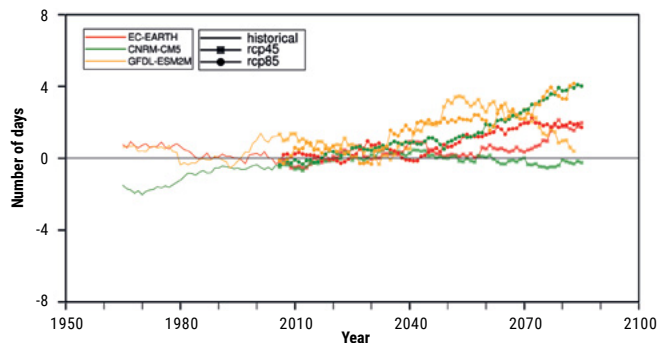
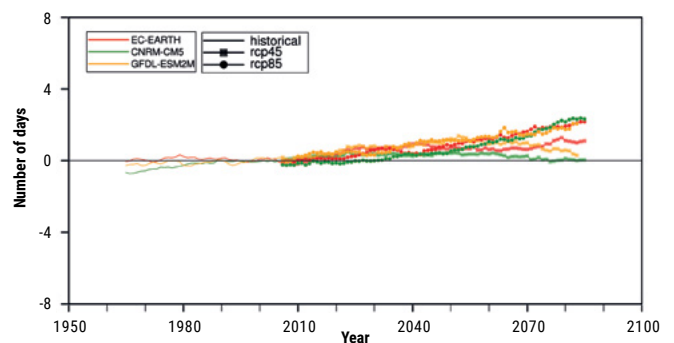


FIGURE 246
Mean change in R20 over time for ensemble of three RCP 4.5 and RCP 8.5 projections



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

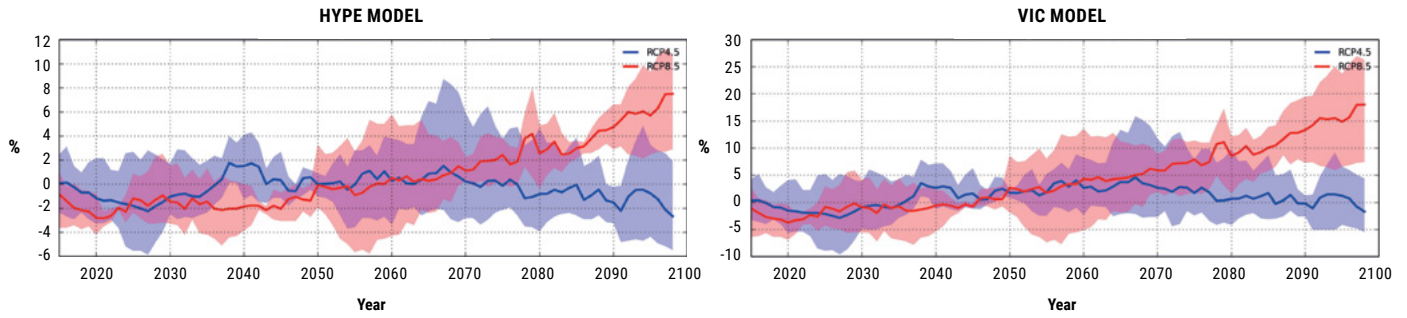


FIGURE 248

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

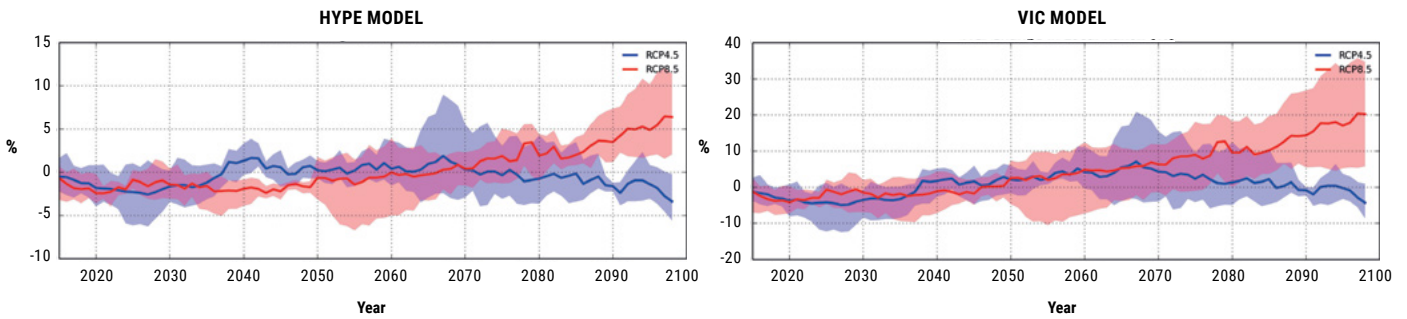
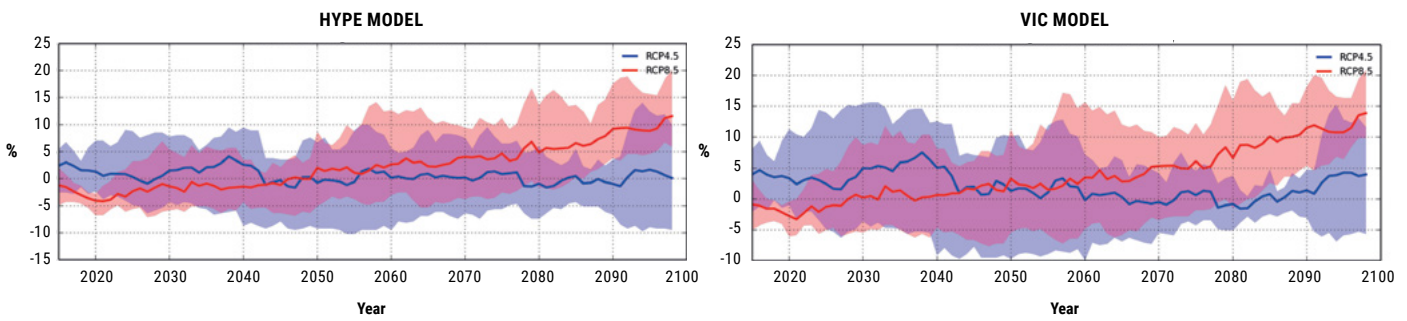


FIGURE 249

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

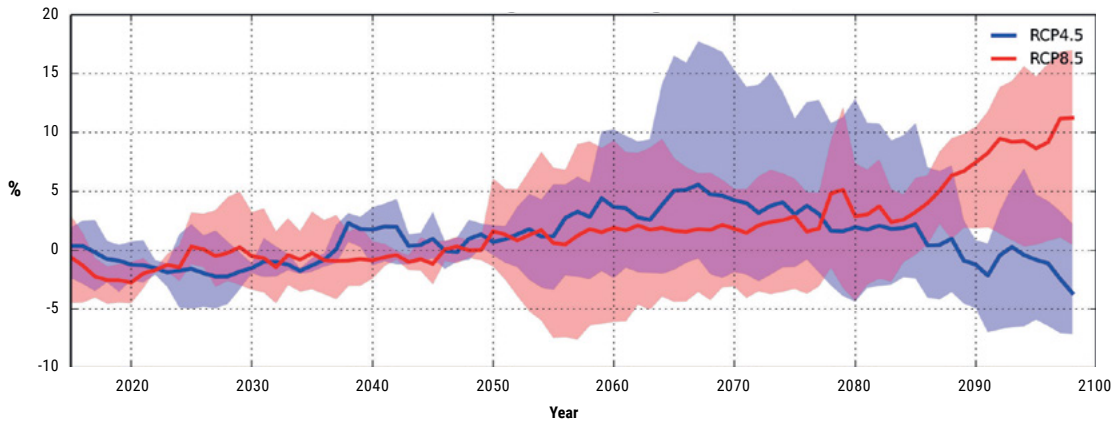


FIGURE 251

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

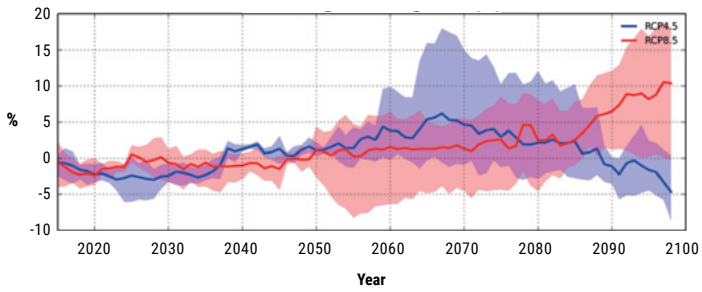
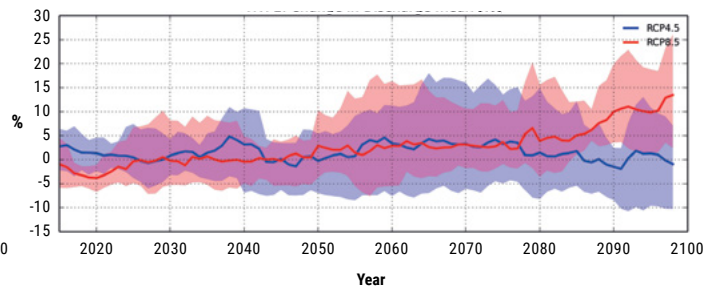


FIGURE 252

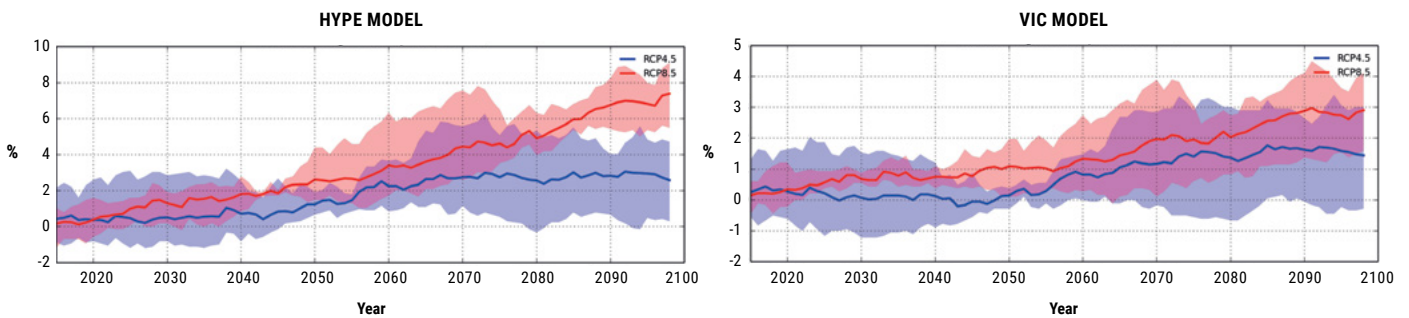
Mean change in seasonal discharge (October-March) over time for ensemble of three RCP 4.5 and RCP 8.5 projections using HYPE model



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

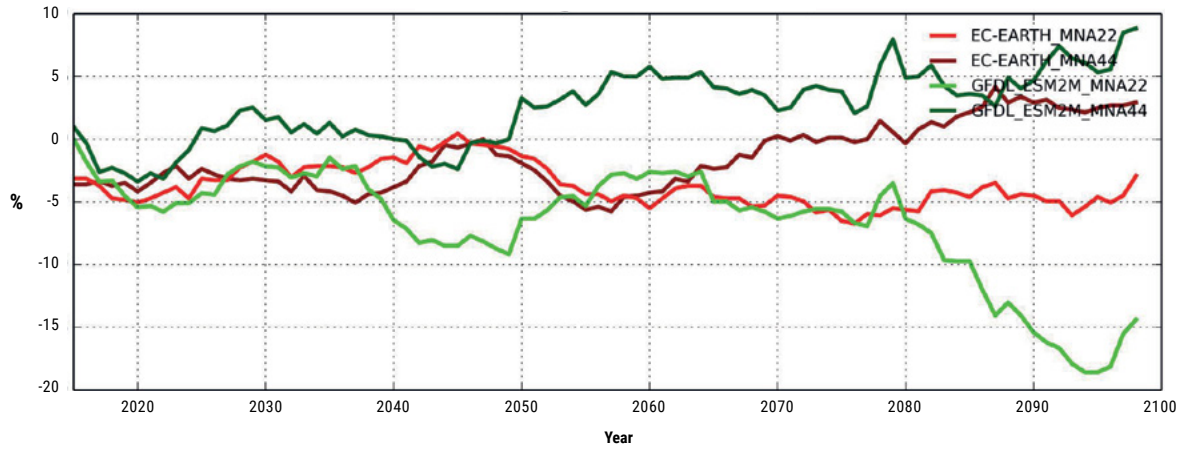


FIGURE 255

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

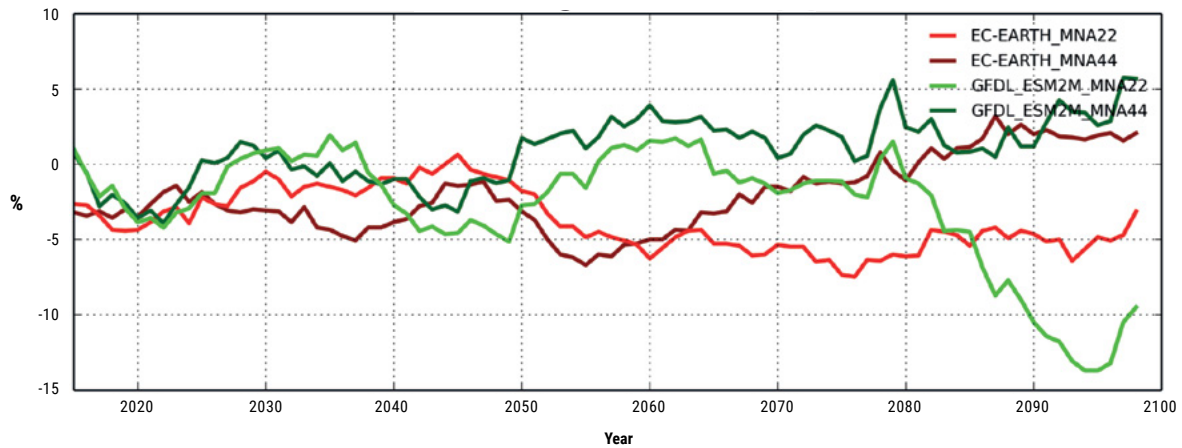
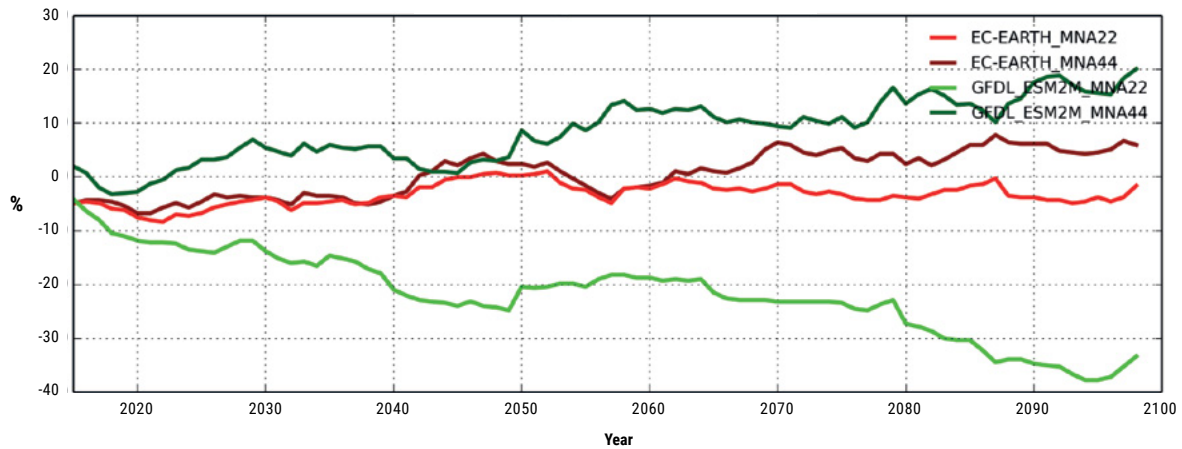


FIGURE 256

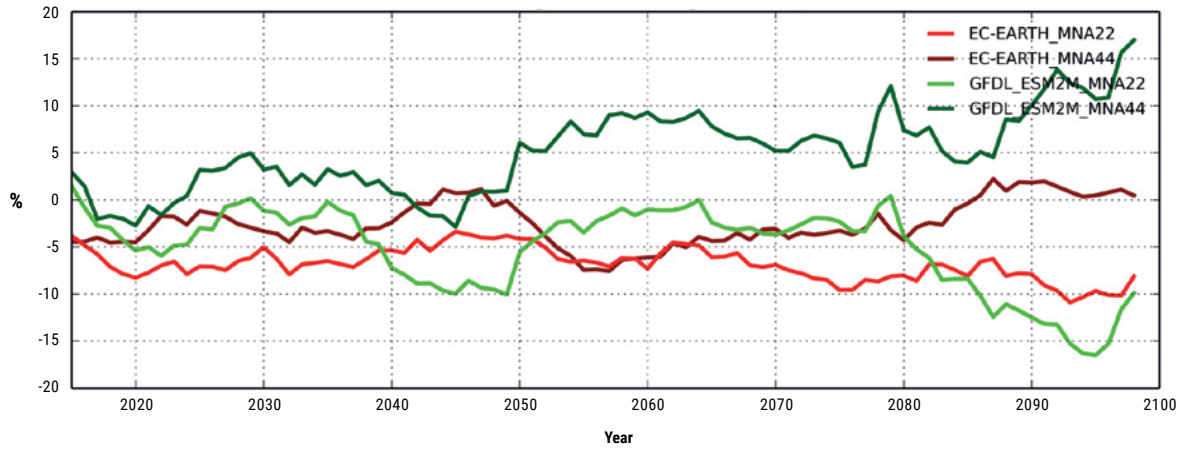
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in seasonal runoff (October-March) over time for two RCP 8.5 projections using HYPE model



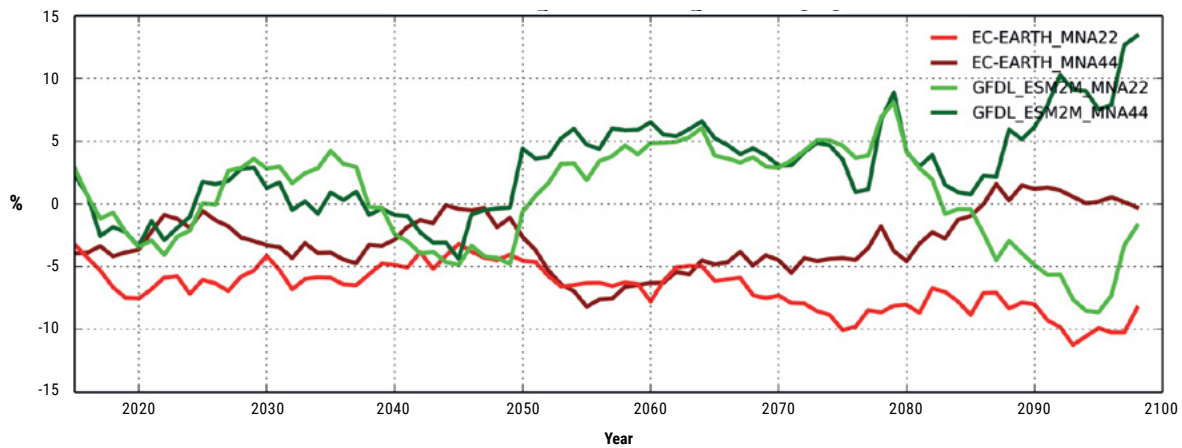
10.3. HYDROLOGICAL PARAMETERS – 10.3.4. COMPARISON 50 KM VS 25 KM RESOLUTION – 10.3.4.2. DISCHARGE

FIGURE 257

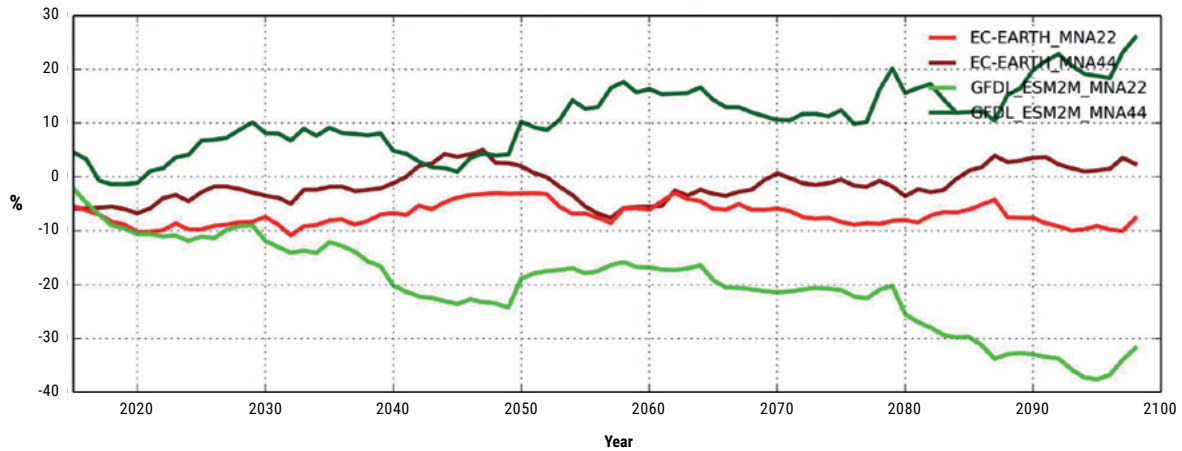
Comparison between 25km (MNA22) and 50km (MNA44) resolutions for mean change in annual discharge over time for two RCP 8.5 projections using HYPE model

**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

CONTENTS

Integrated Vulnerability Assessment Explanatory Note 125

CHAPTER 11

WATER SECTOR 127

11.1	Water availability	128
11.1.1	Impact chain	128
11.1.2	Reference period	129
11.1.2.1	Exposure	129
11.1.2.2	Sensitivity	129
11.1.2.3	Potential impact	130
11.1.2.4	Adaptive capacity	130
11.1.2.5	Vulnerability	131
11.1.3	Mid-century RCP 4.5	132
11.1.3.1	Exposure	132
11.1.3.2	Potential impact	132
11.1.3.3	Vulnerability	133
11.1.4	Mid-century RCP 8.5	134
11.1.4.1	Exposure	134
11.1.4.2	Potential impact	134
11.1.4.3	Vulnerability	135
11.1.5	End-century RCP 4.5	136
11.1.5.1	Exposure	136
11.1.5.2	Potential impact	136
11.1.5.3	Vulnerability	137
11.1.6	End-century RCP 8.5	138
11.1.6.1	Exposure	138
11.1.6.2	Potential impact	138
11.1.6.3	Vulnerability	139

CHAPTER 12

BIODIVERSITY AND ECOSYSTEMS SECTOR 141

12.1	Area covered by forests	142
12.1.1	Impact chain	142
12.1.2	Reference period	143
12.1.2.1	Exposure	143
12.1.2.2	Sensitivity	143
12.1.2.3	Potential impact	144
12.1.2.4	Adaptive capacity	144
12.1.2.5	Vulnerability	145
12.1.3	Mid-century RCP 4.5	146
12.1.3.1	Exposure	146
12.1.3.2	Potential impact	146
12.1.3.3	Vulnerability	147
12.1.4	Mid-century RCP 8.5	148
12.1.4.1	Exposure	148
12.1.4.2	Potential impact	148

12.1.4.3	Vulnerability	149
12.1.5	End-century RCP 4.5	150
12.1.5.1	Exposure	150
12.1.5.2	Potential impact	150
12.1.5.3	Vulnerability	151
12.1.6	End-century RCP 8.5	152
12.1.6.1	Exposure	152
12.1.6.2	Potential impact	152
12.1.6.3	Vulnerability	153
12.2	Area covered by wetlands	154
12.2.1	Impact chain	154
12.2.2	Reference period	155
12.2.2.1	Exposure	155
12.2.2.2	Sensitivity	155
12.2.2.3	Potential impact	156
12.2.2.4	Adaptive capacity	156
12.2.2.5	Vulnerability	157
12.2.3	Mid-century RCP 4.5	158
12.2.3.1	Exposure	158
12.2.3.2	Potential impact	158
12.2.3.3	Vulnerability	159
12.2.4	Mid-century RCP 8.5	160
12.2.4.1	Exposure	160
12.2.4.2	Potential impact	160
12.2.4.3	Vulnerability	161
12.2.5	End-century RCP 4.5	162
12.2.5.1	Exposure	162
12.2.5.2	Potential impact	162
12.2.5.3	Vulnerability	163
12.2.6	End-century RCP 8.5	164
12.2.6.1	Exposure	164
12.2.6.2	Potential impact	164
12.2.6.3	Vulnerability	165

12.3 Biodiversity and ecosystems sector: Vulnerability 166

12.3.1	Reference period	166
12.3.2	Mid-century RCP 4.5	167
12.3.3	Mid-century RCP 8.5	168
12.3.4	End-century RCP 4.5	169
12.3.5	End-century RCP 8.5	170

CHAPTER 13

AGRICULTURE SECTOR 171

13.1	Water available for crops	172
13.1.1	Impact chain	172
13.1.2	Reference period	173
13.1.2.1	Exposure	173
13.1.2.2	Sensitivity	173

13.1.2.3	Potential impact	174		
13.1.2.4	Adaptive capacity	174		
13.1.2.5	Vulnerability	175		
13.1.3	Mid-century RCP 4.5	176		
13.1.3.1	Exposure	176		
13.1.3.2	Potential impact	176		
13.1.3.3	Vulnerability	177		
13.1.4	Mid-century RCP 8.5	178		
13.1.4.1	Exposure	178		
13.1.4.2	Potential impact	178		
13.1.4.3	Vulnerability	179		
13.1.5	End-century RCP 4.5	180		
13.1.5.1	Exposure	180		
13.1.5.2	Potential impact	180		
13.1.5.3	Vulnerability	181		
13.1.6	End-century RCP 8.5	182		
13.1.6.1	Exposure	182		
13.1.6.2	Potential impact	182		
13.1.6.3	Vulnerability	183		
13.2	Water available for livestock	184		
13.2.1	Impact chain	184		
13.2.2	Reference period	185		
13.2.2.1	Exposure	185		
13.2.2.2	Sensitivity	185		
13.2.2.3	Potential impact	186		
13.2.2.4	Adaptive capacity	186		
13.2.2.5	Vulnerability	187		
13.2.3	Mid-century RCP 4.5	188		
13.2.3.1	Exposure	188		
13.2.3.2	Potential impact	188		
13.2.3.3	Vulnerability	189		
13.2.4	Mid-century RCP 8.5	190		
13.2.4.1	Exposure	190		
13.2.4.2	Potential impact	190		
13.2.4.3	Vulnerability	191		
13.2.5	End-century RCP 4.5	192		
13.2.5.1	Exposure	192		
13.2.5.2	Potential impact	192		
13.2.5.3	Vulnerability	193		
13.2.6	End-century RCP 8.5	194		
13.2.6.1	Exposure	194		
13.2.6.2	Potential impact	194		
13.2.6.3	Vulnerability	195		
13.3	Agriculture sector: Vulnerability	196		
13.3.1	Reference period	196		
13.3.2	Mid-century RCP 4.5	197		
13.3.3	Mid-century RCP 8.5	198		
13.3.4	End-century RCP 4.5	199		
13.3.5	End-century RCP 8.5	200		
			CHAPTER 14	
			INFRASTRUCTURE	
			AND HUMAN SETTLEMENTS SECTOR	201
			14.1 Inland flooding area	202
			14.1.1 Impact chain	202
			14.1.2 Reference period	203
			14.1.2.1 Exposure	203
			14.1.2.2 Sensitivity	203
			14.1.1.3 Potential impact	204
			14.1.1.4 Adaptive capacity	204
			14.1.1.5 Vulnerability	205
			14.1.3 Mid-century RCP 4.5	206
			14.1.3.1 Exposure	206
			14.1.3.2 Potential impact	206
			14.1.3.3 Vulnerability	207
			14.1.4 Mid-century RCP 8.5	208
			14.1.4.1 Exposure	208
			14.1.4.2 Potential impact	208
			14.1.4.3 Vulnerability	209
			14.1.5 End-century RCP 4.5	210
			14.1.5.1 Exposure	210
			14.1.5.2 Potential impact	210
			14.1.5.3 Vulnerability	211
			14.1.6 End-century RCP 8.5	212
			14.1.6.1 Exposure	212
			14.1.6.2 Potential impact	212
			14.1.6.3 Vulnerability	213
			CHAPTER 15	
			PEOPLE SECTOR	215
			15.1 Water available for drinking	216
			15.1.1 Impact chain	216
			15.1.2 Reference period	217
			15.1.2.1 Exposure	217
			15.1.2.2 Sensitivity	217
			15.1.2.3 Potential impact	218
			15.1.2.4 Adaptive capacity	218
			15.1.2.5 Vulnerability	219
			15.1.3 Mid-century RCP 4.5	220
			15.1.3.1 Exposure	220
			15.1.3.2 Potential impact	220
			15.1.3.3 Vulnerability	221
			15.1.4 Mid-century RCP 8.5	222
			15.1.4.1 Exposure	222
			15.1.4.2 Potential impact	222
			15.1.4.3 Vulnerability	223
			15.1.5 End-century RCP 4.5	224
			15.1.5.1 Exposure	224

15.1.5.2	Potential impact	224	15.3.5.2	Potential impact	248
15.1.5.3	Vulnerability	225	15.3.5.3	Vulnerability	249
15.1.6	End-century RCP 8.5	226	15.3.6	End-century RCP 8.5	250
15.1.6.1	Exposure	226	15.3.6.1	Exposure	250
15.1.6.2	Potential impact	226	15.3.6.2	Potential impact	250
15.1.6.3	Vulnerability	227	15.3.6.3	Vulnerability	251
15.2	Health conditions due to heat stress	228	15.4	People Sector: Vulnerability	252
15.2.1	Impact chain	228	15.4.1	Reference period	252
15.2.2	Reference period	229	15.4.2	Mid-century RCP 4.5	253
15.2.2.1	Exposure	229	15.4.3	Mid-century RCP 8.5	254
15.2.2.2	Sensitivity	229	15.4.4	End-century RCP 4.5	255
15.2.2.3	Potential impact	230	15.4.5	End-century RCP 8.5	256
15.2.2.4	Adaptive capacity	230			
15.2.2.5	Vulnerability	231			
15.2.3	Mid-century RCP 4.5	232			
15.2.3.1	Exposure	232			
15.2.3.2	Potential impact	232			
15.2.3.3	Vulnerability	233			
15.2.4	Mid-century RCP 8.5	234			
15.2.4.1	Exposure	234			
15.2.4.2	Potential impact	234			
15.2.4.3	Vulnerability	235			
15.2.5	End-century RCP 4.5	236			
15.2.5.1	Exposure	236			
15.2.5.2	Potential impact	236			
15.2.5.3	Vulnerability	237			
15.2.6	End-century RCP 8.5	238			
15.2.6.1	Exposure	238			
15.2.6.2	Potential impact	238			
15.2.6.3	Vulnerability	239			
15.3	Employment rate for the agricultural sector	240			
15.3.1	Impact chain	240			
15.3.2	Reference period	241			
15.3.2.1	Exposure	241			
15.3.2.2	Sensitivity	241			
15.3.2.3	Potential impact	242			
15.3.2.4	Adaptive capacity	242			
15.3.2.5	Vulnerability	243			
15.3.3	Mid-century RCP 4.5	244			
15.3.3.1	Exposure	244			
15.3.3.2	Potential impact	244			
15.3.3.3	Vulnerability	245			
15.3.4	Mid-century RCP 8.5	246			
15.3.4.1	Exposure	246			
15.3.4.2	Potential impact	246			
15.3.4.3	Vulnerability	247			
15.3.5	End-century RCP 4.5	248			
15.3.5.1	Exposure	248			

FIGURES

CHAPTER 11

WATER SECTOR

FIGURE 260 Water availability – Impact chain	FIGURE 269 Water availability – Mid-century RCP 8.5 – Exposure	FIGURE 278 Area covered by forests – Impact chain	FIGURE 289 Area covered by forests – Mid-century RCP 8.5 – Vulnerability
128	134	142	149
FIGURE 261 Water availability – Reference period – Exposure	FIGURE 270 Water availability – Mid-century RCP 8.5 – Potential impact	FIGURE 279 Area covered by forests – Reference period – Exposure	FIGURE 290 Area covered by forests – End-century RCP 4.5 – Exposure
129	134	143	150
FIGURE 262 Water availability – Sensitivity	FIGURE 271 Water availability – Mid-century RCP 8.5 – Vulnerability	FIGURE 280 Area covered by forests – Sensitivity	FIGURE 291 Area covered by forests – End-century RCP 4.5 – Potential impact
129	135	143	150
FIGURE 263 Water availability – Reference period – Potential impact	FIGURE 272 Water availability – End-century RCP 4.5 – Exposure	FIGURE 281 Area covered by forests – Reference period – Potential impact	FIGURE 292 Area covered by forests – End-century RCP 4.5 – Vulnerability
130	136	144	151
FIGURE 264 Water availability – Adaptive capacity	FIGURE 273 Water availability – End-century RCP 4.5 – Potential impact	FIGURE 282 Area covered by forests – Adaptive capacity	FIGURE 293 Area covered by forests – End-century RCP 8.5 – Exposure
130	136	144	152
FIGURE 265 Water availability – Reference period – Vulnerability	FIGURE 274 Water availability – End-century RCP 4.5 – Vulnerability	FIGURE 283 Area covered by forests – Reference period – Vulnerability	FIGURE 294 Area covered by forests – End-century RCP 8.5 – Potential impact
131	137	145	152
FIGURE 266 Water availability – Mid-century RCP 4.5 – Exposure	FIGURE 275 Water availability – End-century RCP 8.5 – Exposure	FIGURE 284 Area covered by forests – Mid-century RCP 4.5 – Exposure	FIGURE 295 Area covered by forests – End-century RCP 8.5 – Vulnerability
132	138	146	153
FIGURE 267 Water availability – Mid-century RCP 4.5 – Potential impact	FIGURE 276 Water availability – End-century RCP 8.5 – Potential impact	FIGURE 285 Area covered by forests – Mid-century RCP 4.5 – Potential impact	FIGURE 296 Area covered by wetlands – Impact chain
132	138	146	154
FIGURE 268 Water availability – Mid-century RCP 4.5 – Vulnerability	FIGURE 277 Water availability – End-century RCP 8.5 – Vulnerability	FIGURE 286 Area covered by forests – Mid-century RCP 4.5 – Vulnerability	FIGURE 297 Area covered by wetlands – Reference period – Exposure
133	139	147	155
		FIGURE 287 Area covered by forests – Mid-century RCP 8.5 – Exposure	FIGURE 298 Area covered by wetlands – Sensitivity
		148	155
		FIGURE 288 Area covered by forests – Mid-century RCP 8.5 – Potential impact	FIGURE 299 Area covered by wetlands – Reference period – Potential impact
		148	156

CHAPTER 12

BIODIVERSITY AND ECOSYSTEMS SECTOR

FIGURE 300 Area covered by wetlands – Adaptive capacity	FIGURE 311 Area covered by wetlands – End-century RCP 8.5 – Exposure	FIGURE 320 Water available for crops – Reference period – Exposure	FIGURE 331 Water available for crops – End-century RCP 4.5 – Exposure
_____ 156	_____ 164	_____ 173	_____ 180
FIGURE 301 Area covered by wetlands – Reference period – Vulnerability	FIGURE 312 Area covered by wetlands – End-century RCP 8.5 – Potential impact	FIGURE 321 Water available for crops – Sensitivity	FIGURE 332 Water available for crops – End-century RCP 4.5 – Potential impact
_____ 157	_____ 164	_____ 173	_____ 180
FIGURE 302 Area covered by wetlands – Mid-century RCP 4.5 – Exposure	FIGURE 313 Area covered by wetlands – End-century RCP 8.5 – Vulnerability	FIGURE 322 Water available for crops – Reference period – Potential impact	FIGURE 333 Water available for crops – End-century RCP 4.5 – Vulnerability
_____ 158	_____ 165	_____ 174	_____ 181
FIGURE 303 Area covered by wetlands – Mid-century RCP 4.5 – Potential impact	FIGURE 314 Biodiversity and ecosystems sector: Vulnerability – Reference period	FIGURE 323 Water available for crops – Adaptive capacity	FIGURE 334 Water available for crops – End-century RCP 8.5 – Exposure
_____ 158	_____ 166	_____ 174	_____ 182
FIGURE 304 Area covered by wetlands – Mid-century RCP 4.5 – Vulnerability	FIGURE 315 Biodiversity and ecosystems sector: Vulnerability – Mid-century RCP 4.5	FIGURE 324 Water available for crops – Reference period – Vulnerability	FIGURE 335 Water available for crops – End-century RCP 8.5 – Potential impact
_____ 159	_____ 167	_____ 175	_____ 182
FIGURE 305 Area covered by wetlands – Mid-century RCP 8.5 – Exposure	FIGURE 316 Biodiversity and ecosystems sector: Vulnerability – Mid-century RCP 8.5	FIGURE 325 Water available for crops – Mid-century RCP 4.5 – Exposure	FIGURE 336 Water available for crops – End-century RCP 8.5 – Vulnerability
_____ 160	_____ 168	_____ 176	_____ 183
FIGURE 306 Area covered by wetlands – Mid-century RCP 8.5 – Potential impact	FIGURE 317 Biodiversity and ecosystems sector: Vulnerability – End-century RCP 4.5	FIGURE 326 Water available for crops – Mid-century RCP 4.5 – Potential impact	FIGURE 337 Water available for livestock – Impact chain
_____ 160	_____ 169	_____ 176	_____ 184
FIGURE 307 Area covered by wetlands – Mid-century RCP 8.5 – Vulnerability	FIGURE 318 Biodiversity and ecosystems sector: Vulnerability – End-century RCP 8.5	FIGURE 327 Water available for crops – Mid-century RCP 4.5 – Vulnerability	FIGURE 338 Water available for livestock – Reference period – Exposure
_____ 161	_____ 170	_____ 177	_____ 185
FIGURE 308 Area covered by wetlands – End-century RCP 4.5 – Exposure		FIGURE 328 Water available for crops – Mid-century RCP 8.5 – Exposure	FIGURE 339 Water available for livestock – Sensitivity
_____ 162		_____ 178	_____ 185
FIGURE 309 Area covered by wetlands – End-century RCP 4.5 – Potential impact		FIGURE 329 Water available for crops – Mid-century RCP 8.5 – Potential impact	FIGURE 340 Water available for livestock – Reference period – Potential impact
_____ 162		_____ 178	_____ 186
FIGURE 310 Area covered by wetlands – End-century RCP 4.5 – Vulnerability	FIGURE 319 Water available for crops – Impact chain	FIGURE 330 Water available for crops – Mid-century RCP 8.5 – Vulnerability	FIGURE 341 Water available for livestock – Adaptive capacity
_____ 163	_____ 172	_____ 179	_____ 186

CHAPTER 13

AGRICULTURE SECTOR

FIGURE 342
Water available for livestock –
Reference period –
Vulnerability
_____ 187

FIGURE 343
Water available for livestock –
Mid-century RCP 4.5 –
Exposure
_____ 188

FIGURE 344
Water available for livestock –
Mid-century RCP 4.5 –
Potential impact
_____ 188

FIGURE 345
Water available for livestock –
Mid-century RCP 4.5 –
Vulnerability
_____ 189

FIGURE 346
Water available for livestock –
Mid-century RCP 8.5 –
Exposure
_____ 190

FIGURE 347
Water available for livestock –
Mid-century RCP 8.5 –
Potential impact
_____ 190

FIGURE 348
Water available for livestock –
Mid-century RCP 8.5 –
Vulnerability
_____ 191

FIGURE 349
Water available for livestock –
End-century RCP 4.5 –
Exposure
_____ 192

FIGURE 350
Water available for livestock –
End-century RCP 4.5 –
Potential impact
_____ 192

FIGURE 351
Water available for livestock –
End-century RCP 4.5 –
Vulnerability
_____ 193

FIGURE 352
Water available for livestock –
End-century RCP 8.5 –
Exposure
_____ 194

FIGURE 353
Water available for livestock –
End-century RCP 8.5 –
Potential impact
_____ 194

FIGURE 354
Water available for livestock –
End-century RCP 8.5 –
Vulnerability
_____ 195

FIGURE 355
Agriculture sector: Vulnerability –
Reference period
_____ 196

FIGURE 356
Agriculture sector: Vulnerability –
Mid-century RCP 4.5
_____ 197

FIGURE 357
Agriculture sector: Vulnerability –
Mid-century RCP 8.5
_____ 198

FIGURE 358
Agriculture sector: Vulnerability –
End-century RCP 4.5
_____ 199

FIGURE 359
Agriculture sector: Vulnerability –
End-century RCP 8.5
_____ 200

CHAPTER 14

INFRASTRUCTURE AND HUMAN SETTLEMENTS SECTOR

FIGURE 360
Inland flooding area –
Impact chain
_____ 202

FIGURE 361
Inland flooding area –
Reference period –
Exposure
_____ 203

FIGURE 362
Inland flooding area –
Sensitivity
_____ 203

FIGURE 363
Inland flooding area –
Reference period –
Potential impact
_____ 204

FIGURE 364
Inland flooding area –
Adaptive capacity
_____ 204

FIGURE 365
Inland flooding area –
Reference period –
Vulnerability
_____ 205

FIGURE 366
Inland flooding area –
Mid-century RCP 4.5 –
Exposure
_____ 206

FIGURE 367
Inland flooding area –
Mid-century RCP 4.5 –
Potential impact
_____ 206

FIGURE 368
Inland flooding area –
Mid-century RCP 4.5 –
Vulnerability
_____ 207

FIGURE 369
Inland flooding area –
Mid-century RCP 8.5 –
Exposure
_____ 208

FIGURE 370
Inland flooding area –
Mid-century RCP 8.5 –
Potential impact
_____ 208

FIGURE 371
Inland flooding area –
Mid-century RCP 8.5 –
Vulnerability
_____ 209

FIGURE 372
Inland flooding area –
End-century RCP 4.5 –
Exposure
_____ 210

FIGURE 373
Inland flooding area –
End-century RCP 4.5 –
Potential impact
_____ 210

FIGURE 374
Inland flooding area –
End-century RCP 4.5 –
Vulnerability
_____ 211

FIGURE 375
Inland flooding area –
End-century RCP 8.5 –
Exposure
_____ 212

FIGURE 376
Inland flooding area –
End-century RCP 8.5 –
Potential impact
_____ 212

FIGURE 377
Inland flooding area –
End-century RCP 8.5 –
Vulnerability
_____ 213

CHAPTER 15

PEOPLE SECTOR

FIGURE 378
Water available for drinking –
Impact chain
_____ 216

FIGURE 379
Water available for drinking –
Reference period –
Exposure
_____ 217

FIGURE 380
Water available for drinking –
Sensitivity
_____ 217

FIGURE 381
Water available for drinking –
Reference period –
Potential impact
_____ 218

FIGURE 382 Water available for drinking – Adaptive capacity _____ 218	FIGURE 393 Water available for drinking – End-century RCP 8.5 – Exposure _____ 226	FIGURE 404 Health conditions due to heat stress – Mid-century RCP 4.5 – Vulnerability _____ 233	FIGURE 415 Employment rate for the agricultural sector – Reference period – Exposure _____ 241
FIGURE 383 Water available for drinking – Reference period – Vulnerability _____ 219	FIGURE 394 Water available for drinking – End-century RCP 8.5 – Potential impact _____ 226	FIGURE 405 Health conditions due to heat stress – Mid-century RCP 8.5 – Exposure _____ 234	FIGURE 416 Employment rate for the agricultural sector – Sensitivity _____ 241
FIGURE 384 Water available for drinking – Mid-century RCP 4.5 – Exposure _____ 220	FIGURE 395 Water available for drinking – End-century RCP 8.5 – Vulnerability _____ 227	FIGURE 406 Health conditions due to heat stress – Mid-century RCP 8.5 – Potential impact _____ 234	FIGURE 417 Employment rate for the agricultural sector – Reference period – Potential impact _____ 242
FIGURE 385 Water available for drinking – Mid-century RCP 4.5 – Potential impact _____ 220	FIGURE 396 Health conditions due to heat stress – Impact chain _____ 228	FIGURE 407 Health conditions due to heat stress – Mid-century RCP 8.5 – Vulnerability _____ 235	FIGURE 418 Employment rate for the agricultural sector – Adaptive capacity _____ 242
FIGURE 386 Water available for drinking – Mid-century RCP 4.5 – Vulnerability _____ 221	FIGURE 397 Health conditions due to heat stress – Reference period – Exposure _____ 229	FIGURE 408 Health conditions due to heat stress – End-century RCP 4.5 – Exposure _____ 236	FIGURE 419 Employment rate for the agricultural sector – Reference period – Vulnerability _____ 243
FIGURE 387 Water available for drinking – Mid-century RCP 8.5 – Exposure _____ 222	FIGURE 398 Health conditions due to heat stress – Sensitivity _____ 229	FIGURE 409 Health conditions due to heat stress – End-century RCP 4.5 – Potential impact _____ 236	FIGURE 420 Employment rate for the agricultural sector – Mid-century RCP 4.5 – Exposure _____ 244
FIGURE 388 Water available for drinking – Mid-century RCP 8.5 – Potential impact _____ 222	FIGURE 399 Health conditions due to heat stress – Reference period – Potential impact _____ 230	FIGURE 410 Health conditions due to heat stress – End-century RCP 4.5 – Vulnerability _____ 237	FIGURE 421 Employment rate for the agricultural sector – Mid-century RCP 4.5 – Potential impact _____ 244
FIGURE 389 Water available for drinking – Mid-century RCP 8.5 – Vulnerability _____ 223	FIGURE 400 Health conditions due to heat stress – Adaptive capacity _____ 230	FIGURE 411 Health conditions due to heat stress – End-century RCP 8.5 – Exposure _____ 238	FIGURE 422 Employment rate for the agricultural sector – Mid-century RCP 4.5 – Vulnerability _____ 245
FIGURE 390 Water available for drinking – End-century RCP 4.5 – Exposure _____ 224	FIGURE 401 Health conditions due to heat stress – Reference period – Vulnerability _____ 231	FIGURE 412 Health conditions due to heat stress – End-century RCP 8.5 – Potential impact _____ 238	FIGURE 423 Employment rate for the agricultural sector – Mid-century RCP 8.5 – Exposure _____ 246
FIGURE 391 Water available for drinking – End-century RCP 4.5 – Potential impact _____ 224	FIGURE 402 Health conditions due to heat stress – Mid-century RCP 4.5 – Exposure _____ 232	FIGURE 413 Health conditions due to heat stress – End-century RCP 8.5 – Vulnerability _____ 239	FIGURE 424 Employment rate for the agricultural sector – Mid-century RCP 8.5 – Potential impact _____ 246
FIGURE 392 Water available for drinking – End-century RCP 4.5 – Vulnerability _____ 225	FIGURE 403 Health conditions due to heat stress – Mid-century RCP 4.5 – Potential impact _____ 232	FIGURE 414 Employment rate for the agricultural sector – Impact chain _____ 240	FIGURE 425 Employment rate for the agricultural sector – Mid-century RCP 8.5 – Vulnerability _____ 247

FIGURE 426 Employment rate for the agricultural sector – End-century RCP 4.5 – Exposure	248
FIGURE 427 Employment rate for the agricultural sector – End-century RCP 4.5 – Potential impact	248
FIGURE 428 Employment rate for the agricultural sector – End-century RCP 4.5 – Vulnerability	249
FIGURE 429 Employment rate for the agricultural sector – End-century RCP 8.5 – Exposure	250
FIGURE 430 Employment rate for the agricultural sector – End-century RCP 8.5 – Potential impact	250
FIGURE 431 Employment rate for the agricultural sector – End-century RCP 8.5 – Vulnerability	251
FIGURE 432 People Sector: Vulnerability – Reference period	252
FIGURE 433 People Sector: Vulnerability – Mid-century RCP 4.5	253
FIGURE 434 People Sector: Vulnerability – Mid-century RCP 8.5	254
FIGURE 435 People Sector: Vulnerability – End-century RCP 4.5	255
FIGURE 436 People Sector: Vulnerability – End-century RCP 8.5	256

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.

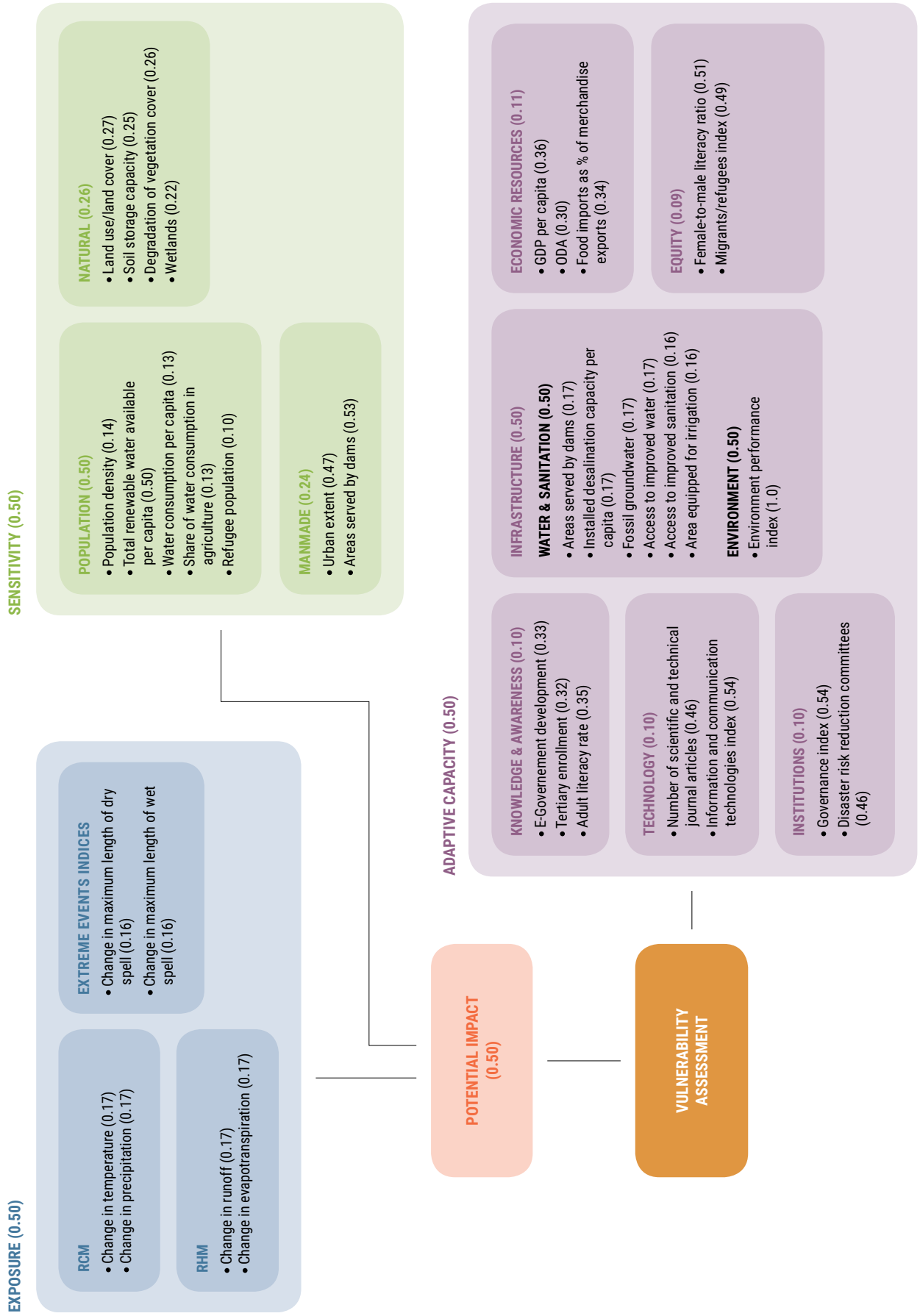
CHAPTER 11



WATER SECTOR

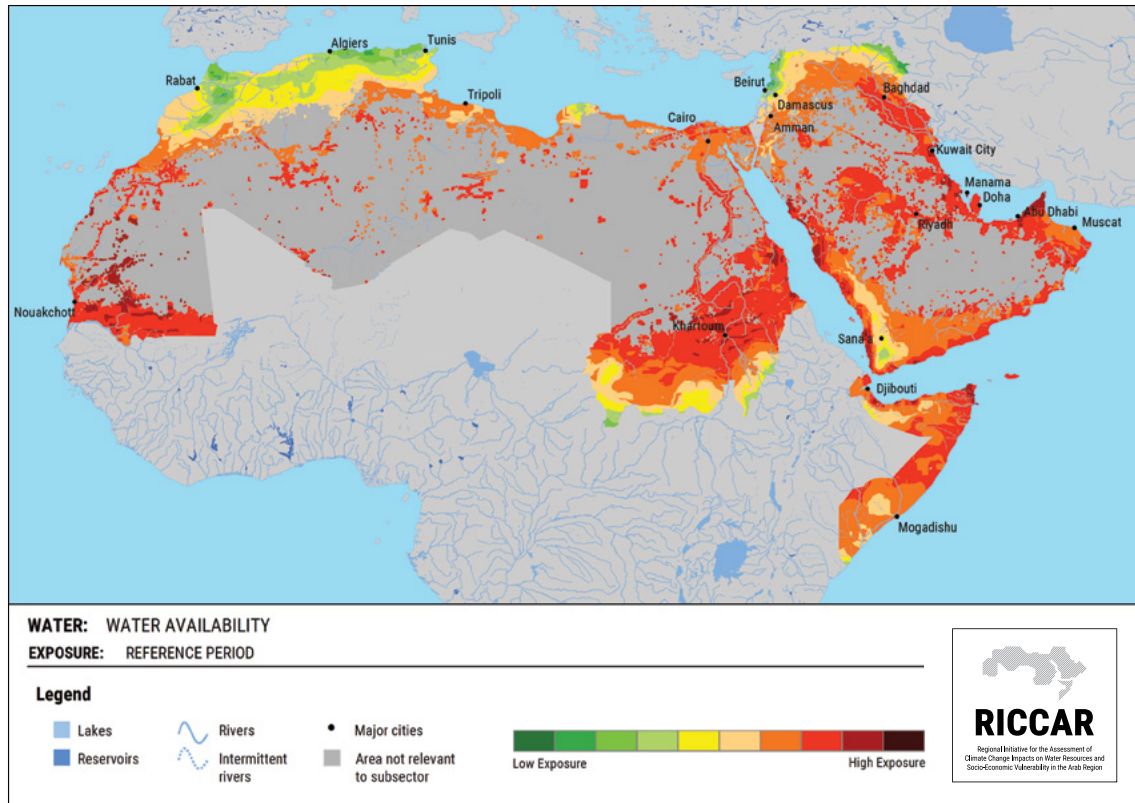
11.1. WATER AVAILABILITY – 11.1.1. IMPACT CHAIN

FIGURE 260



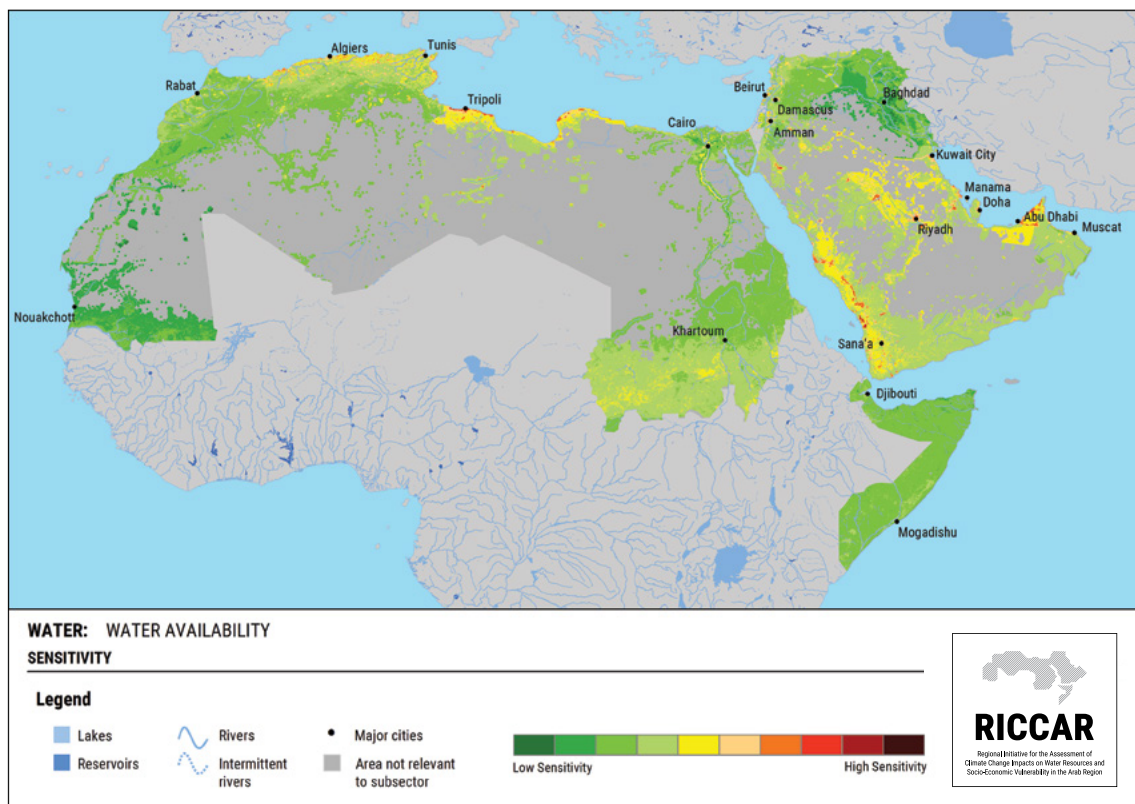
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – 11.1.2.1. EXPOSURE

FIGURE 261



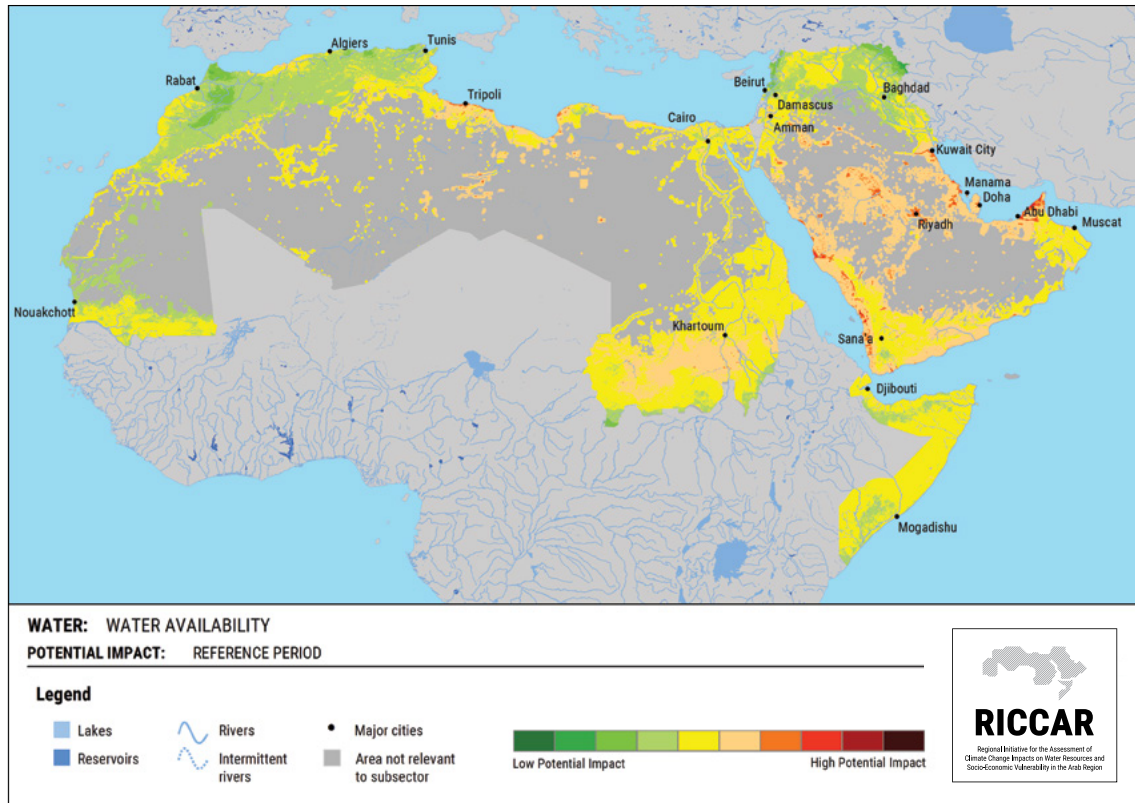
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – 11.1.2.2. SENSITIVITY

FIGURE 262



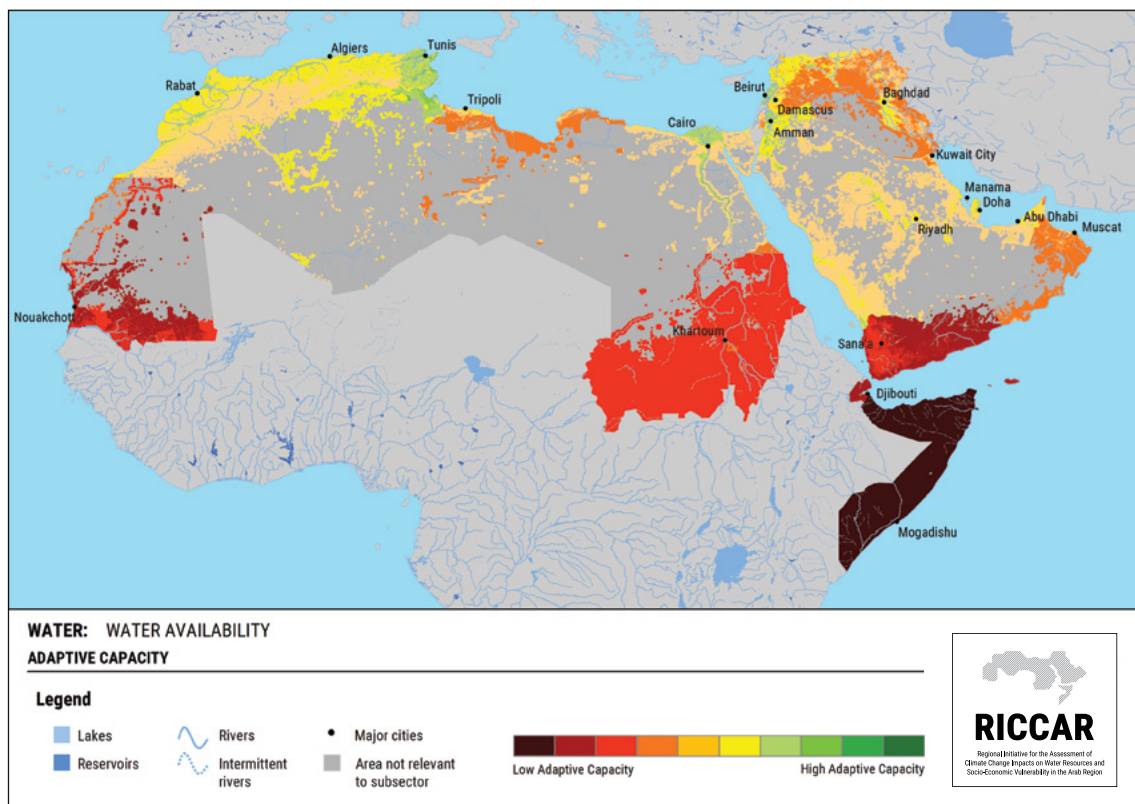
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – 11.1.2.3. POTENTIAL IMPACT

FIGURE 263



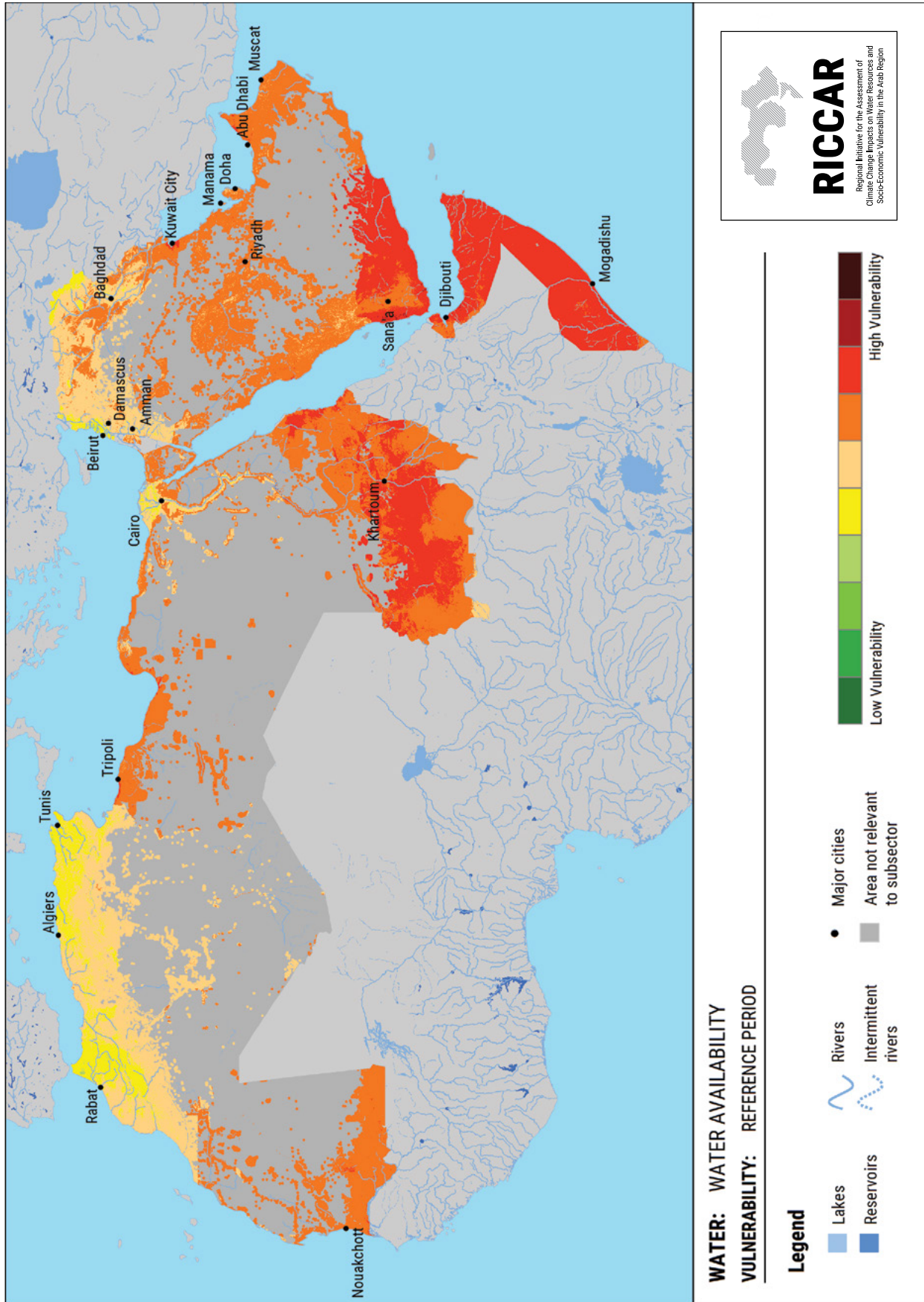
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – 11.1.2.4. ADAPTIVE CAPACITY

FIGURE 264



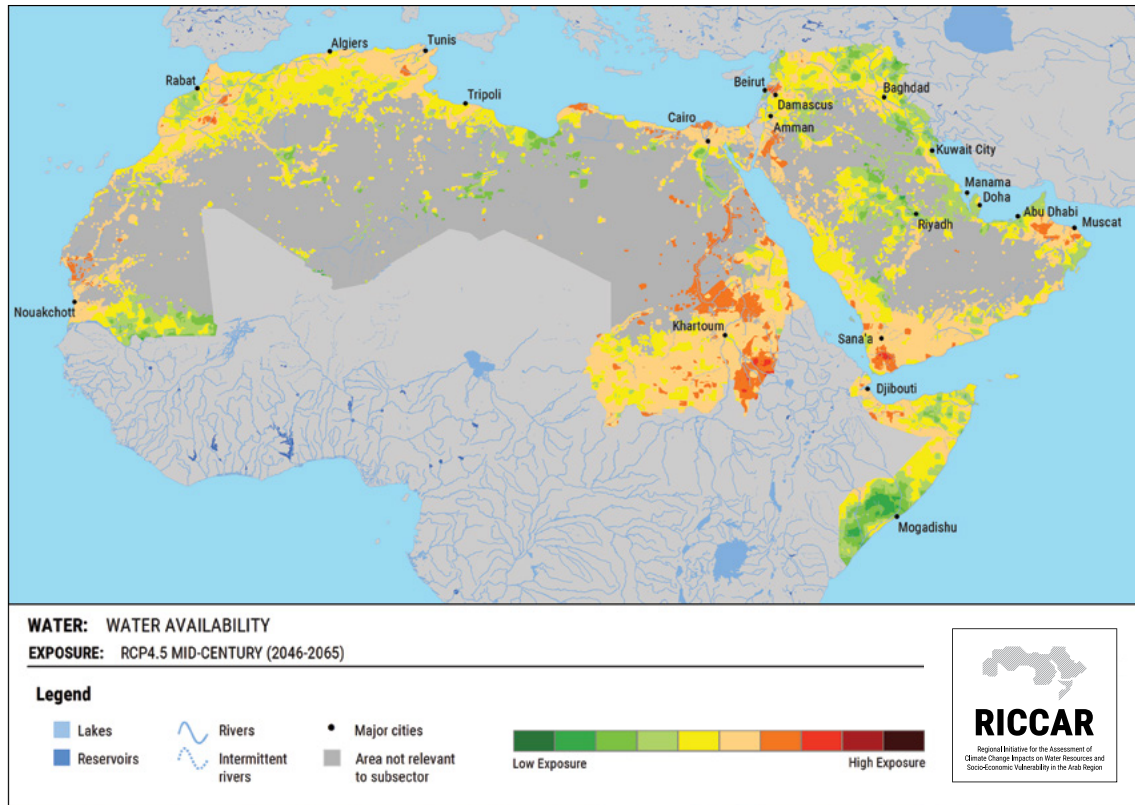
11.1. WATER AVAILABILITY – 11.1.2. REFERENCE PERIOD – 11.1.2.5. VULNERABILITY

FIGURE 265



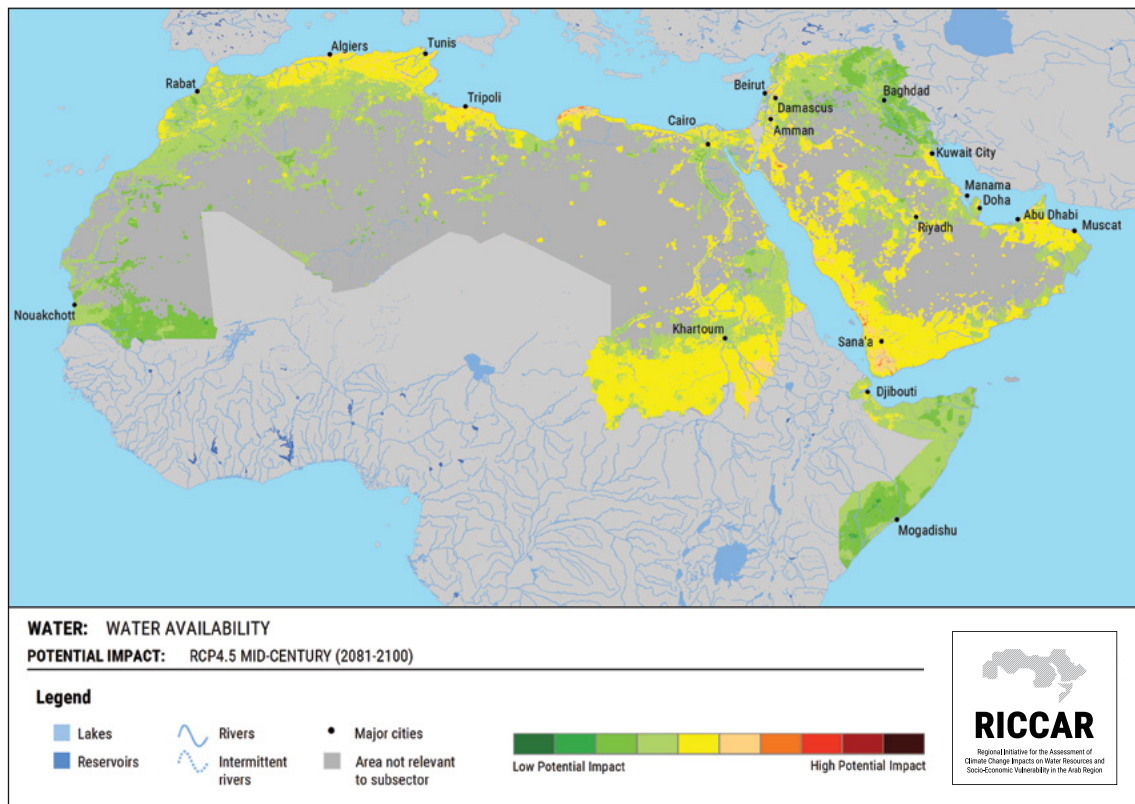
11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – 11.1.3.1. EXPOSURE

FIGURE 266



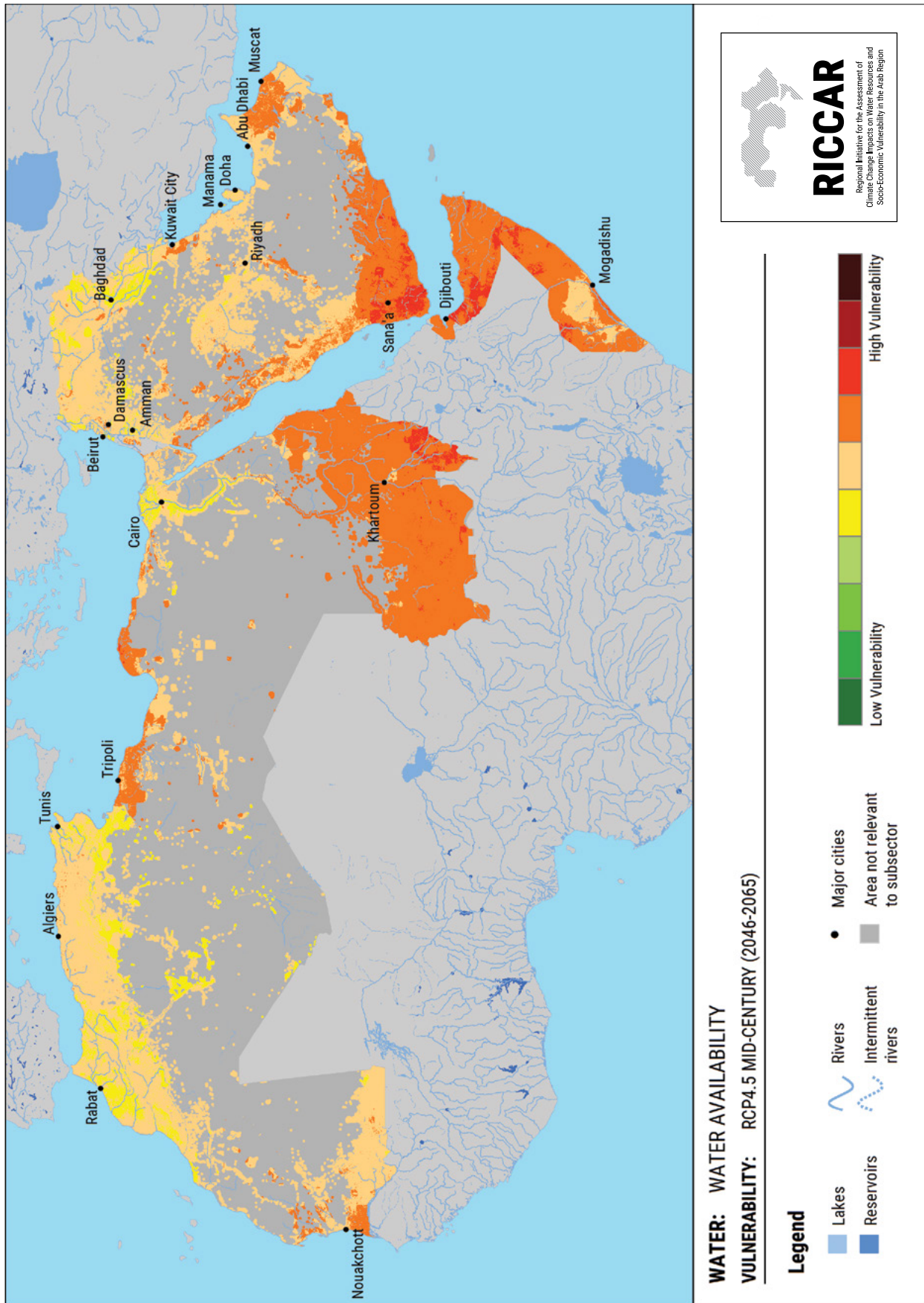
11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – 11.1.3.2. POTENTIAL IMPACT

FIGURE 267



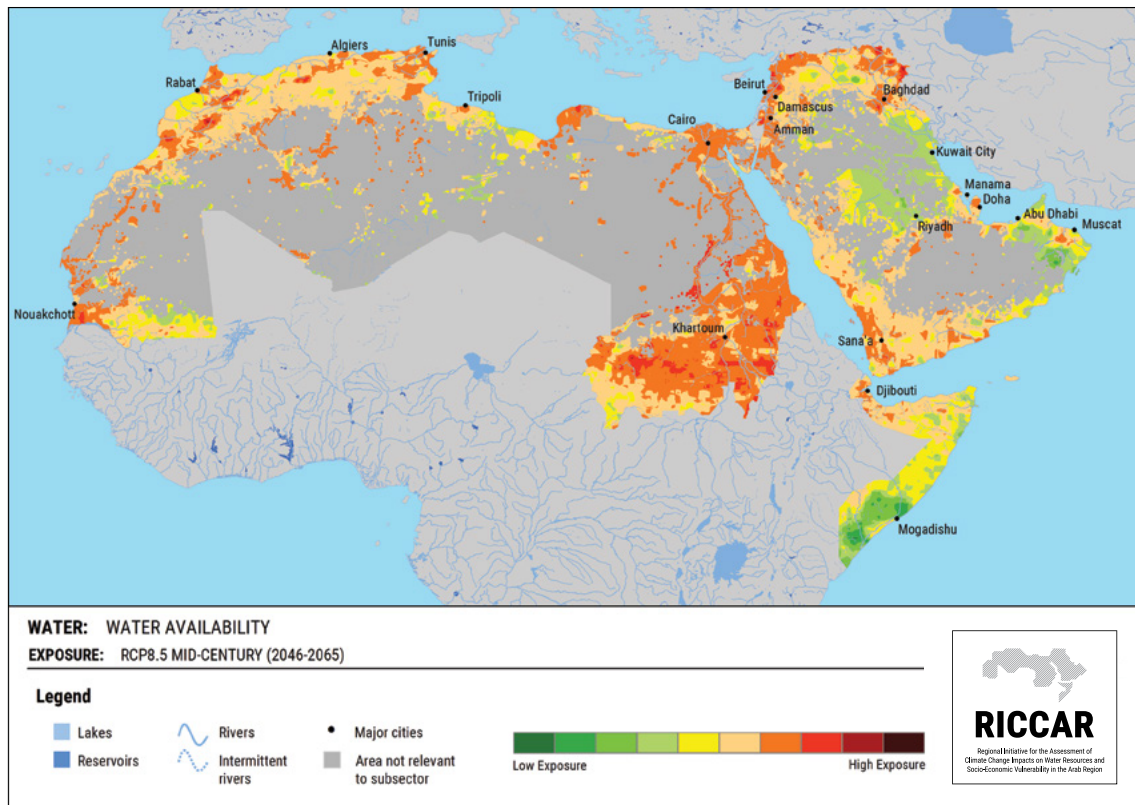
11.1. WATER AVAILABILITY – 11.1.3. MID-CENTURY RCP 4.5 – 11.1.3.3. VULNERABILITY

FIGURE 268



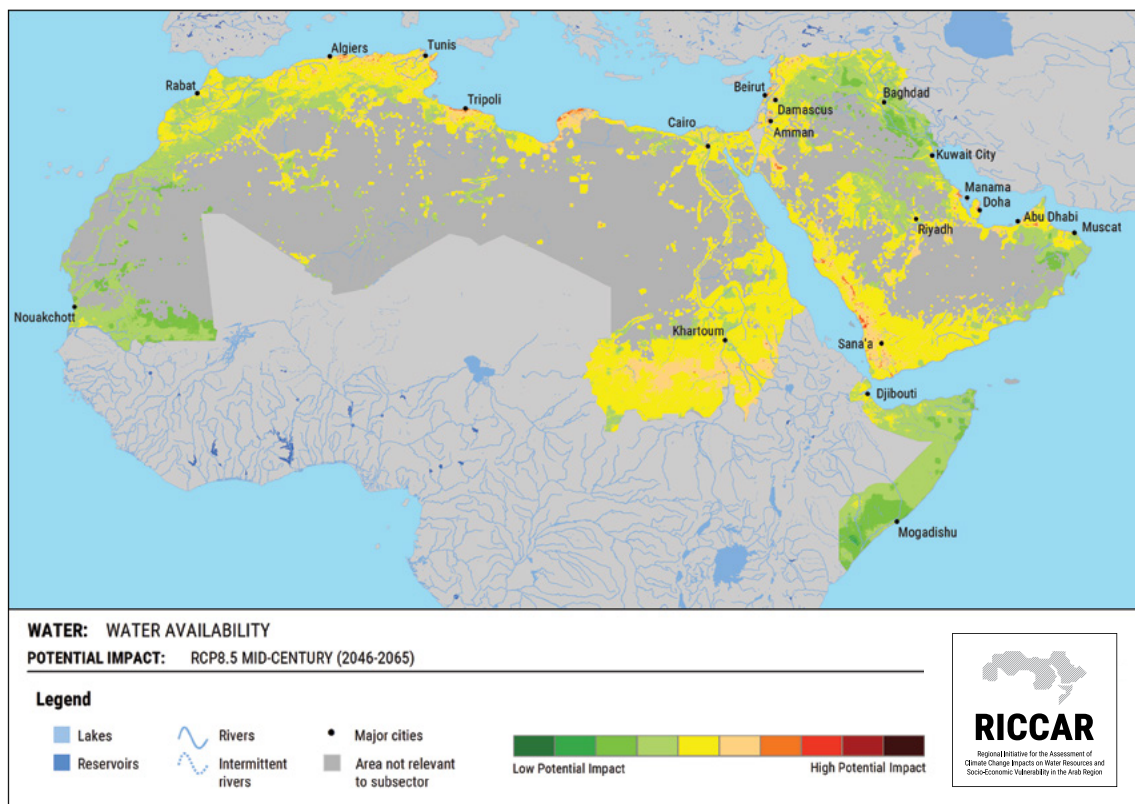
11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – 11.1.4.1. EXPOSURE

FIGURE 269



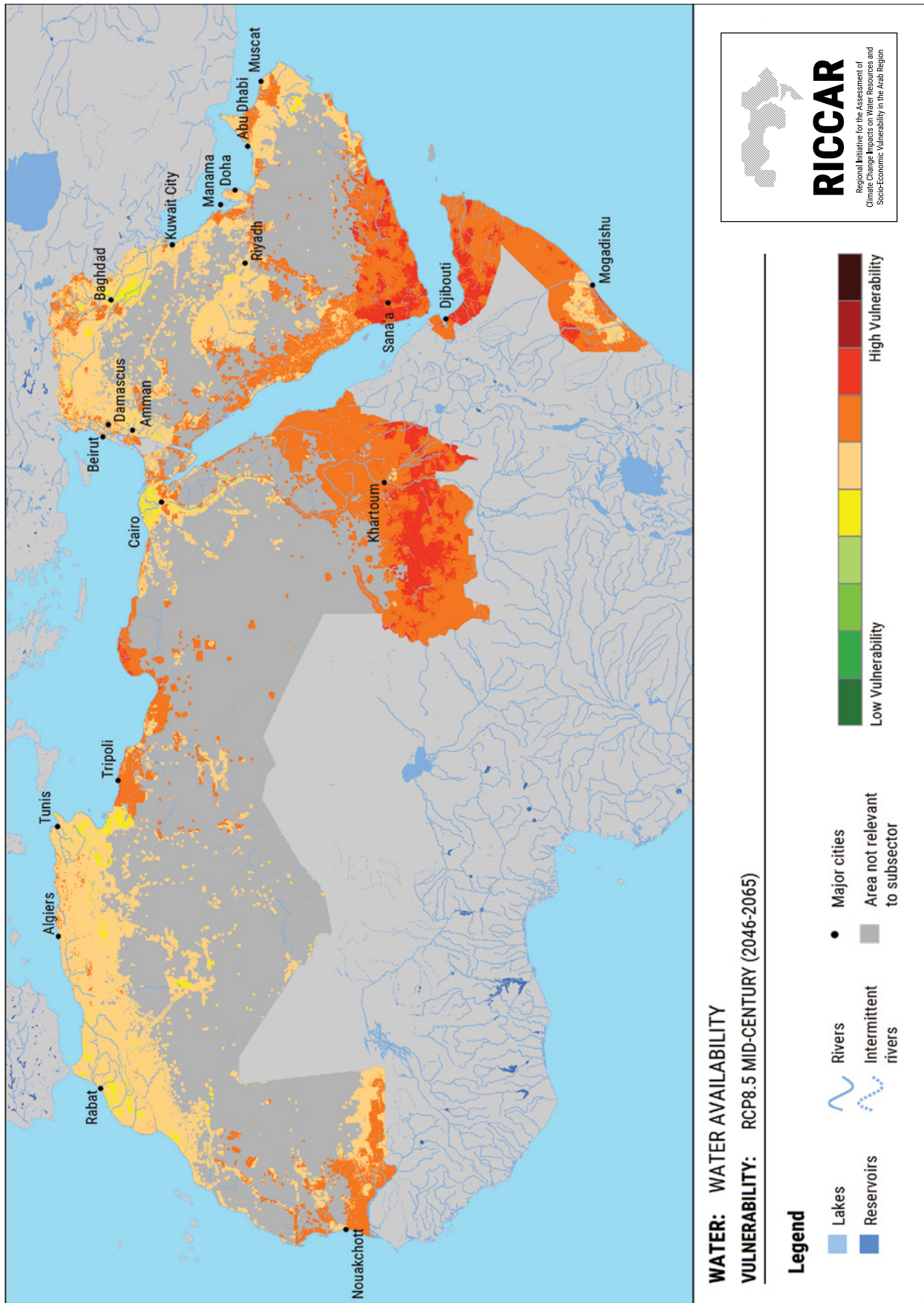
11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – 11.1.4.2. POTENTIAL IMPACT

FIGURE 270



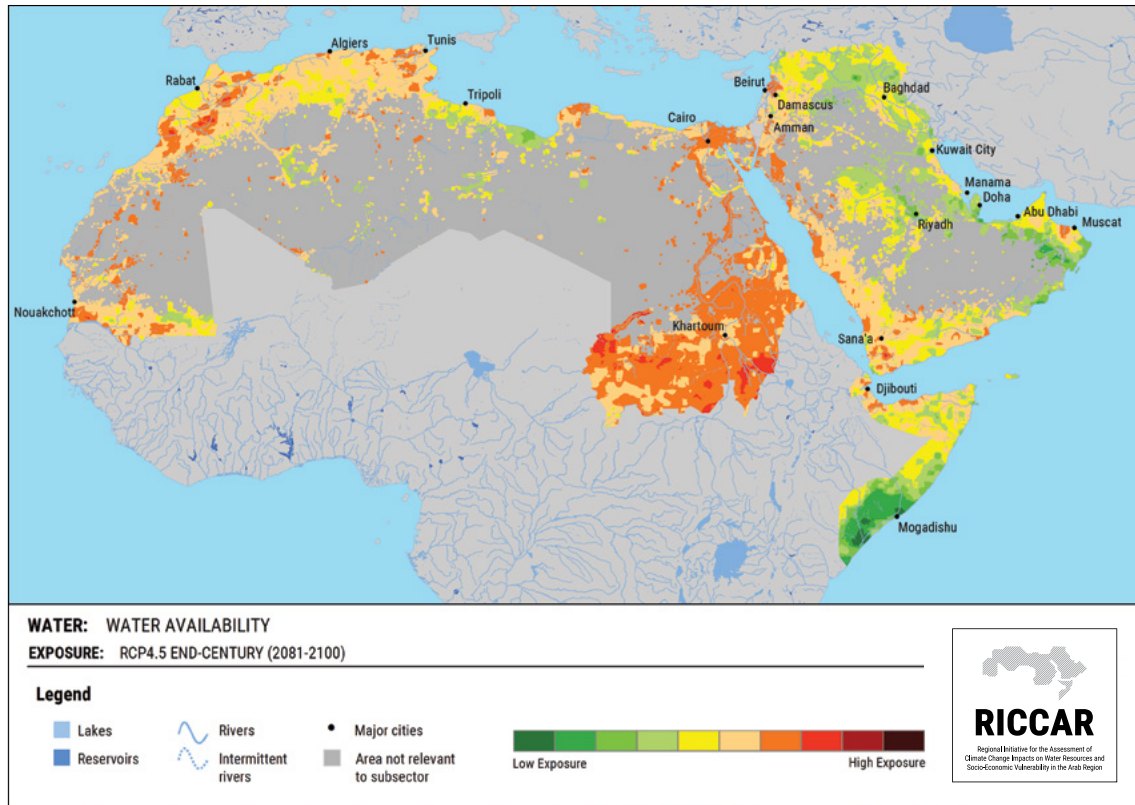
11.1. WATER AVAILABILITY – 11.1.4. MID-CENTURY RCP 8.5 – 11.1.4.3. VULNERABILITY

FIGURE 271



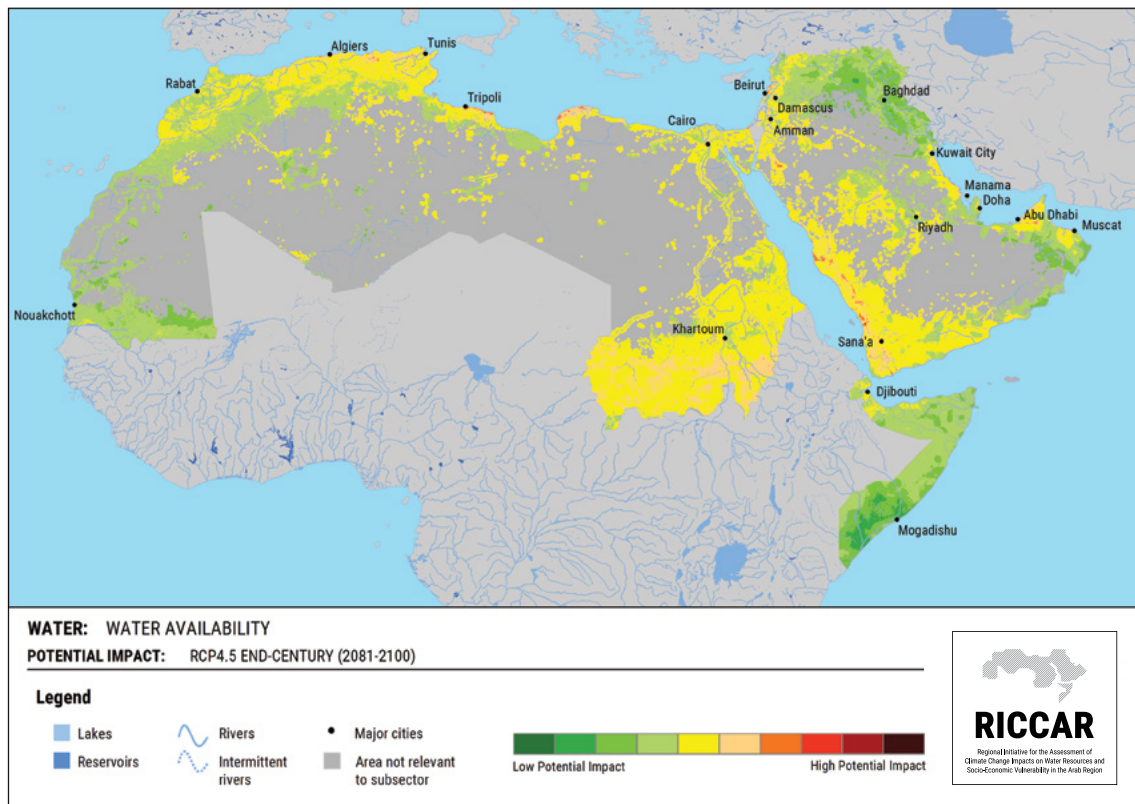
11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – 11.1.5.1. EXPOSURE

FIGURE 272



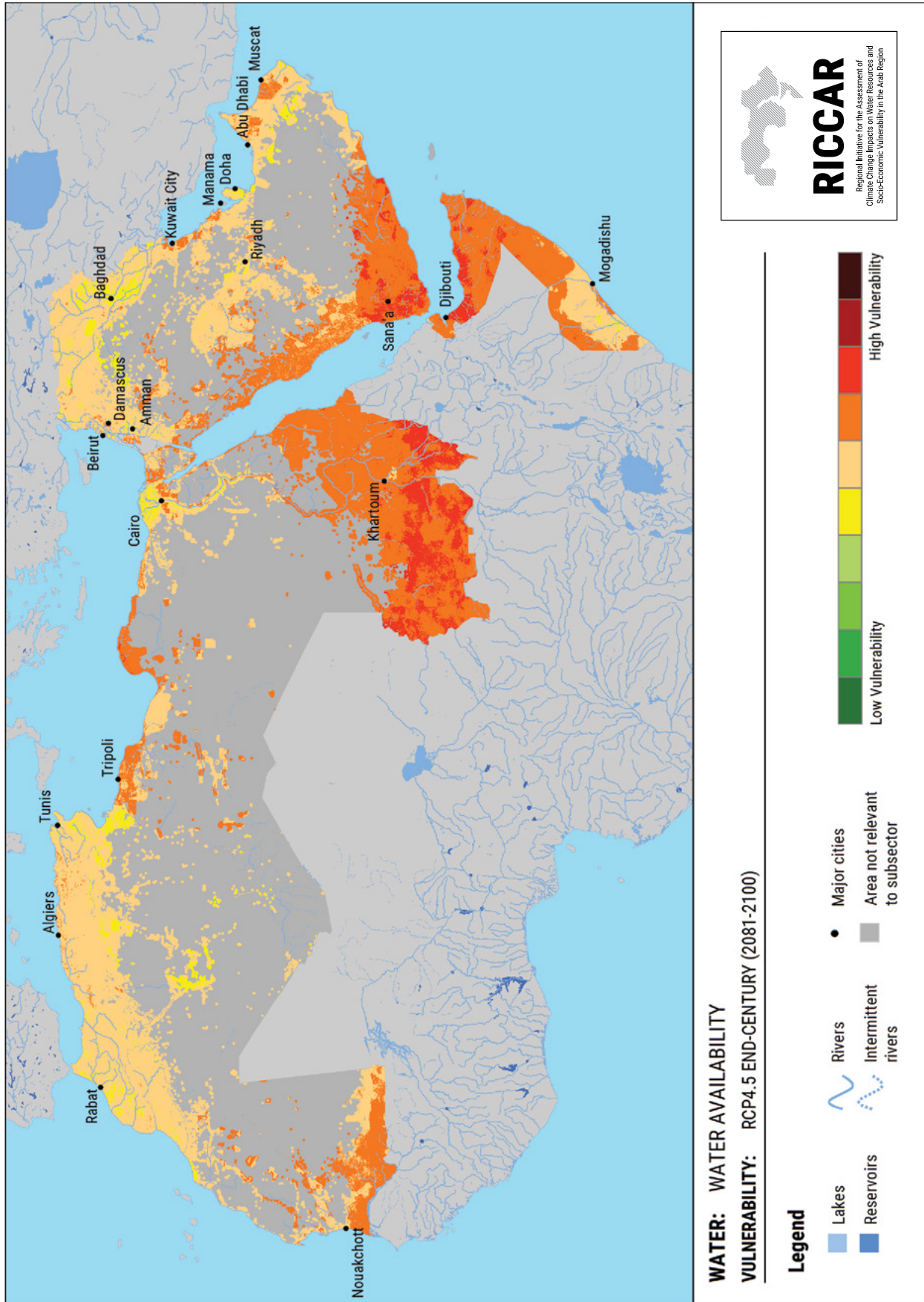
11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – 11.1.5.2. POTENTIAL IMPACT

FIGURE 273



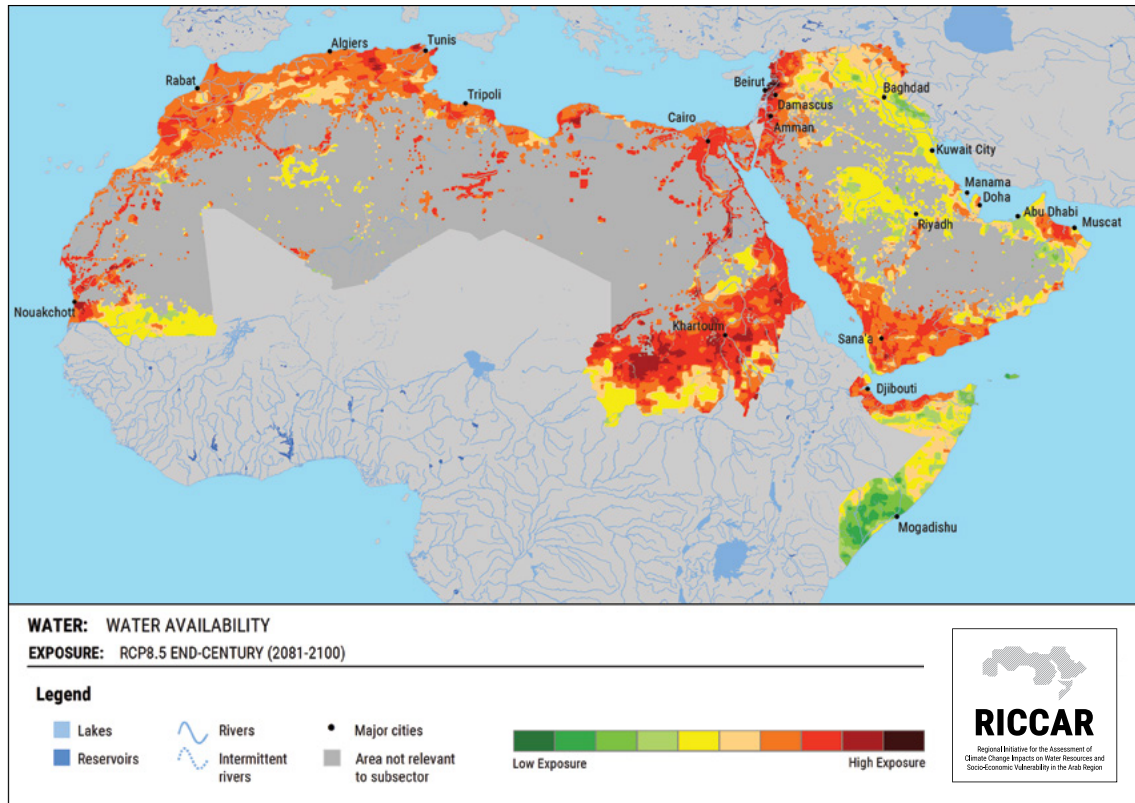
11.1. WATER AVAILABILITY – 11.1.5. END-CENTURY RCP 4.5 – 11.1.5.3. VULNERABILITY

FIGURE 274



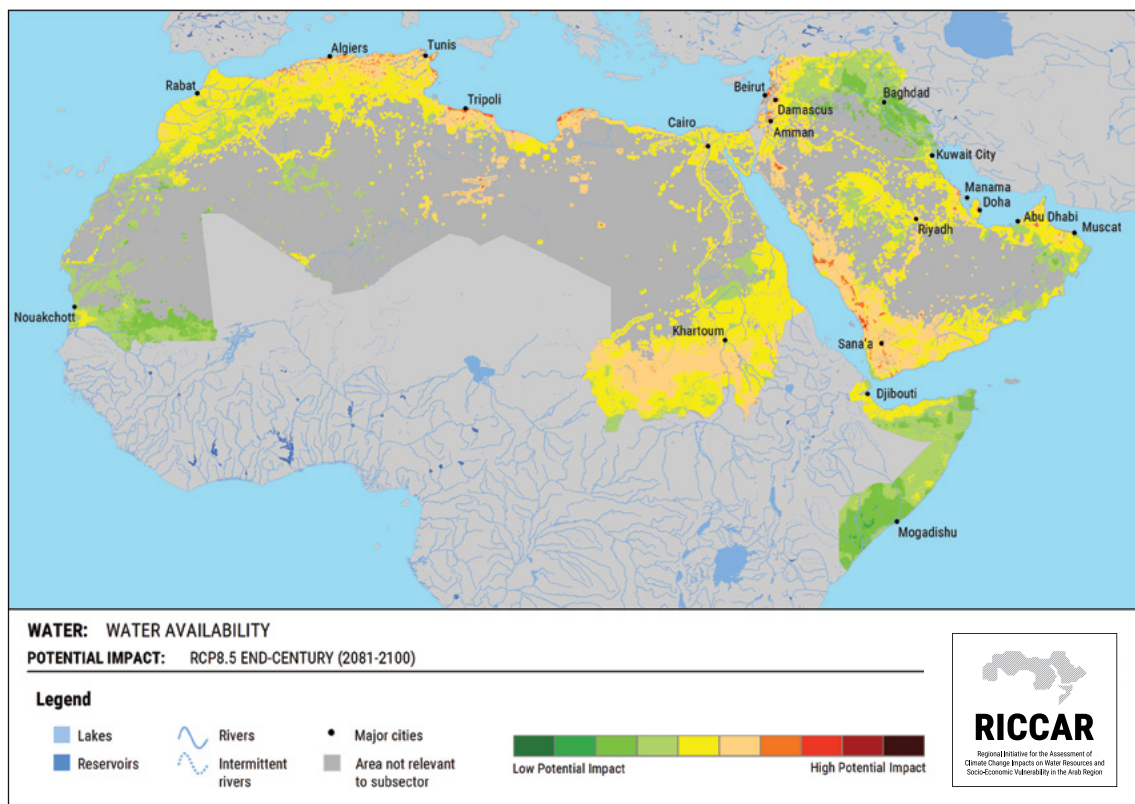
11.1. WATER AVAILABILITY – 11.1.6. END-CENTURY RCP 8.5 – 11.1.6.1. EXPOSURE

FIGURE 275



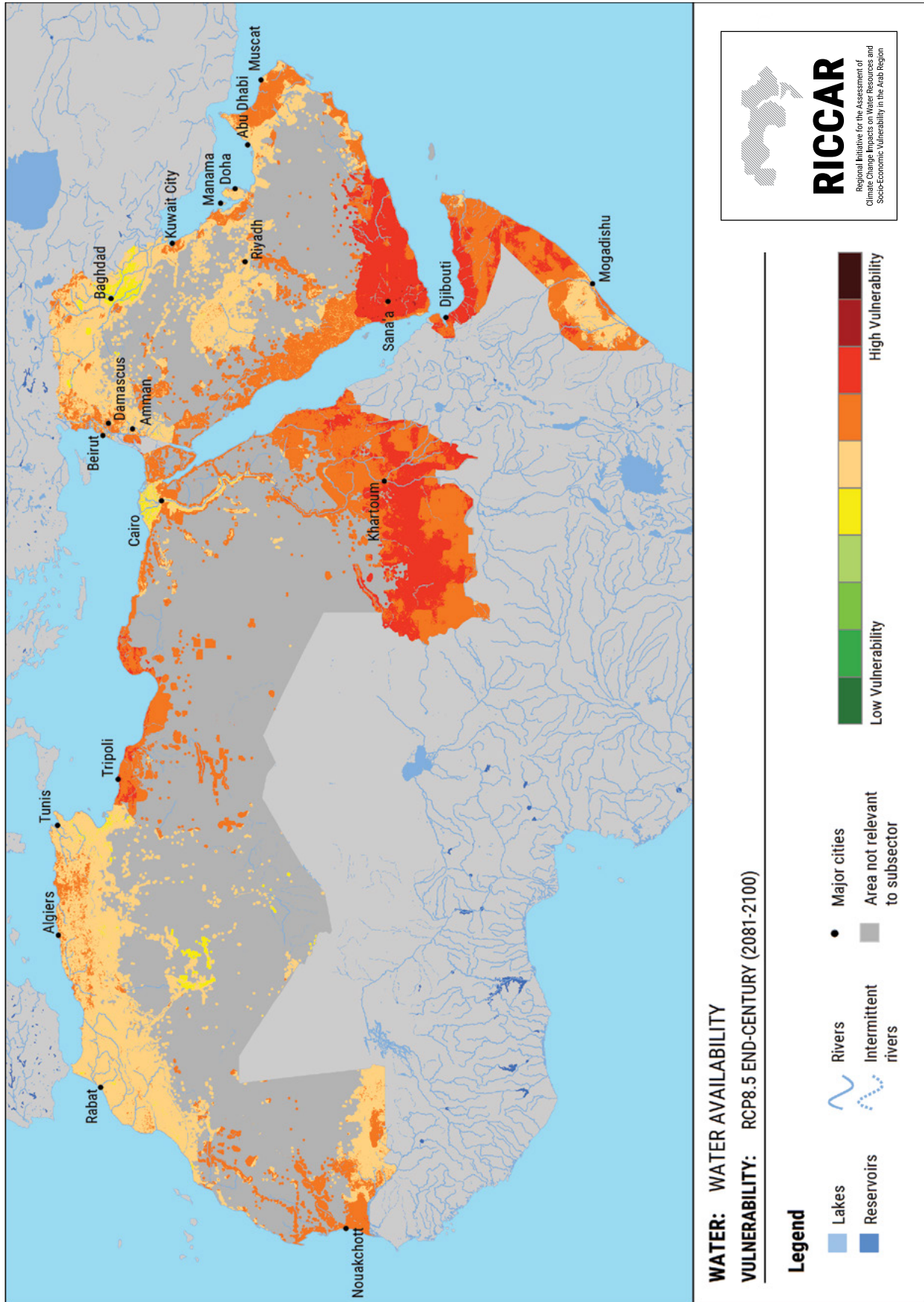
11.1. WATER AVAILABILITY – 11.1.6. END-CENTURY RCP 8.5 – 11.1.6.2. POTENTIAL IMPACT

FIGURE 276



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

FIGURE 277



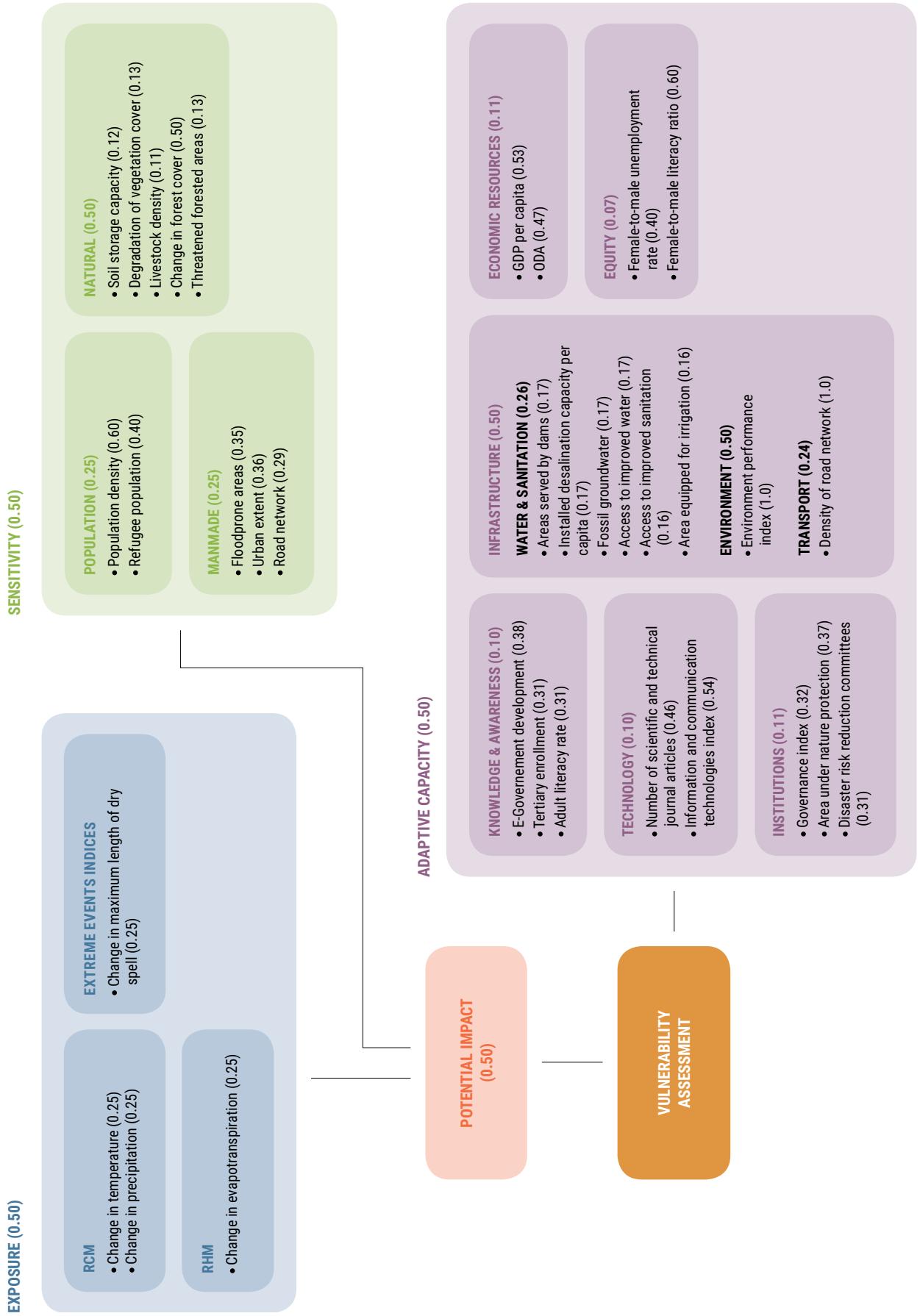
CHAPTER 12



BIODIVERSITY AND ECOSYSTEMS SECTOR

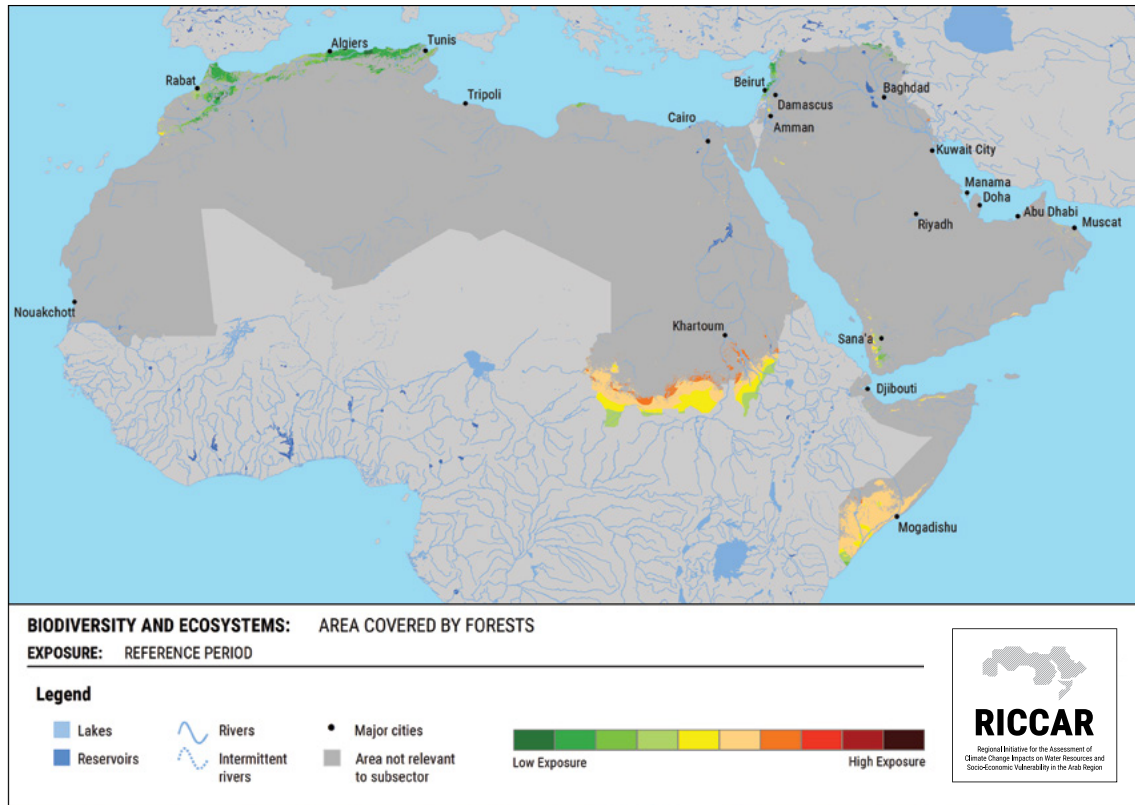
12.1. AREA COVERED BY FORESTS – 12.1.1. IMPACT CHAIN

FIGURE 278



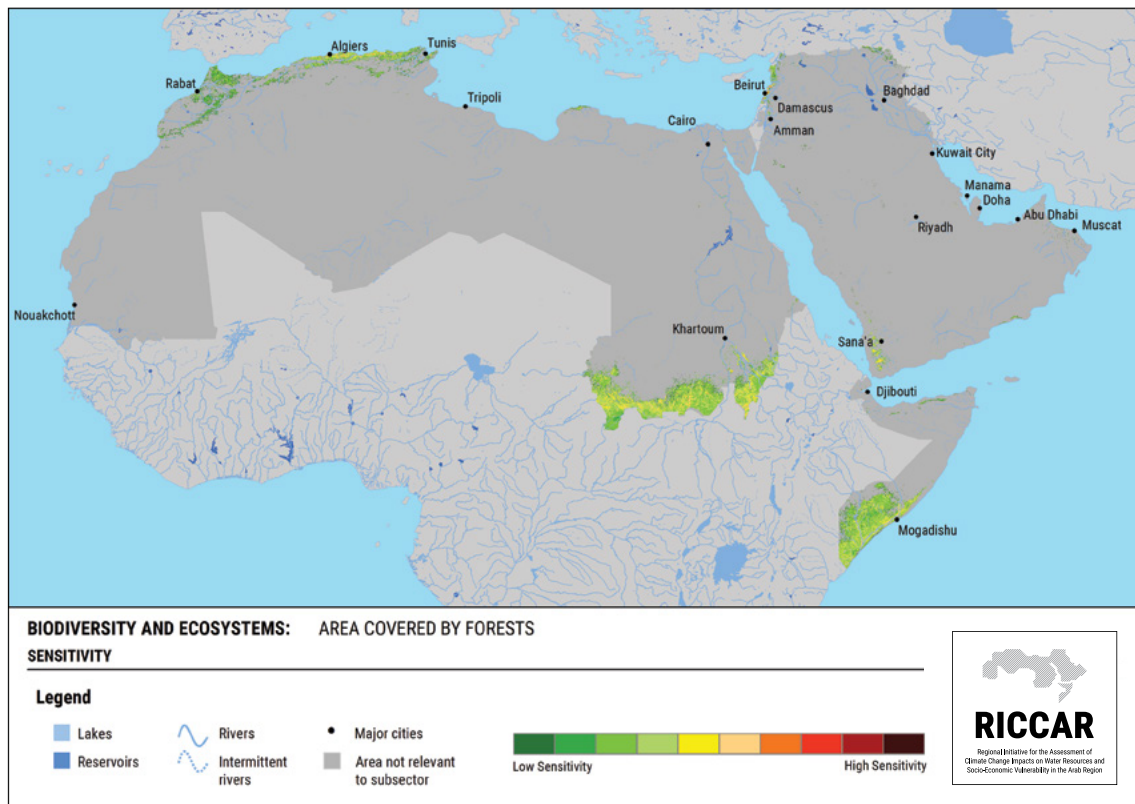
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – 12.1.2.1. EXPOSURE

FIGURE 279



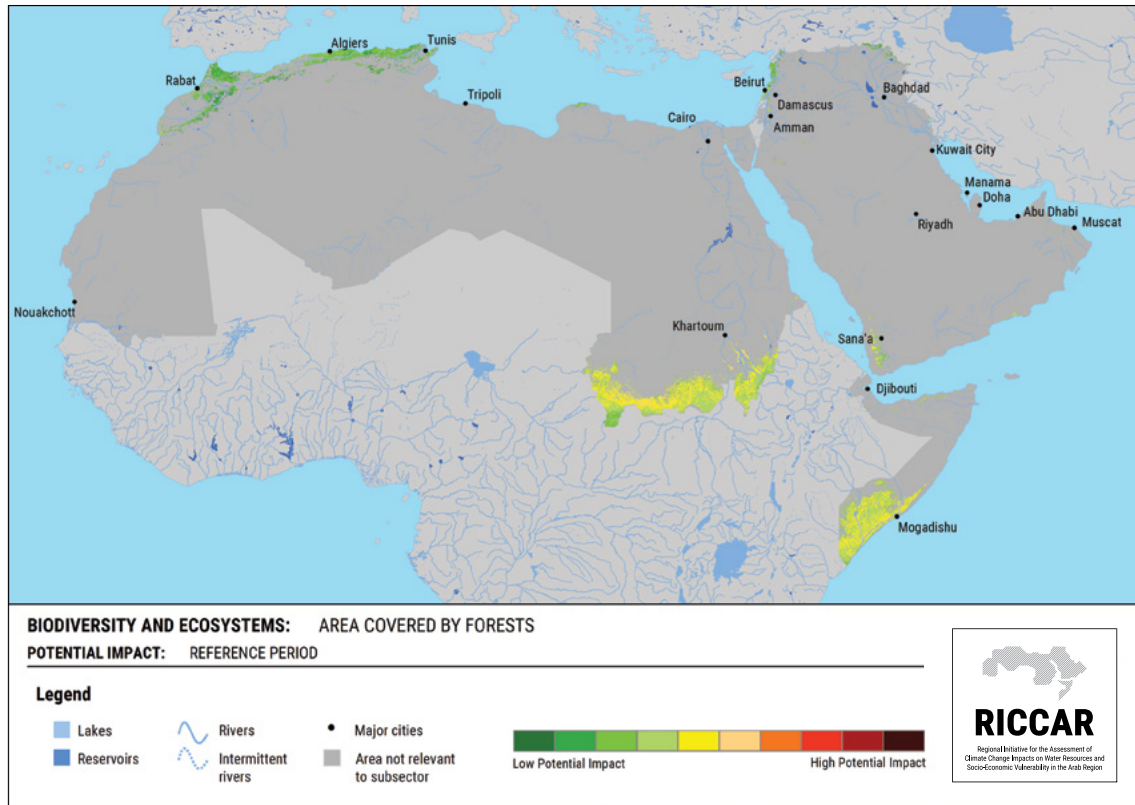
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – 12.1.2.2. SENSITIVITY

FIGURE 280



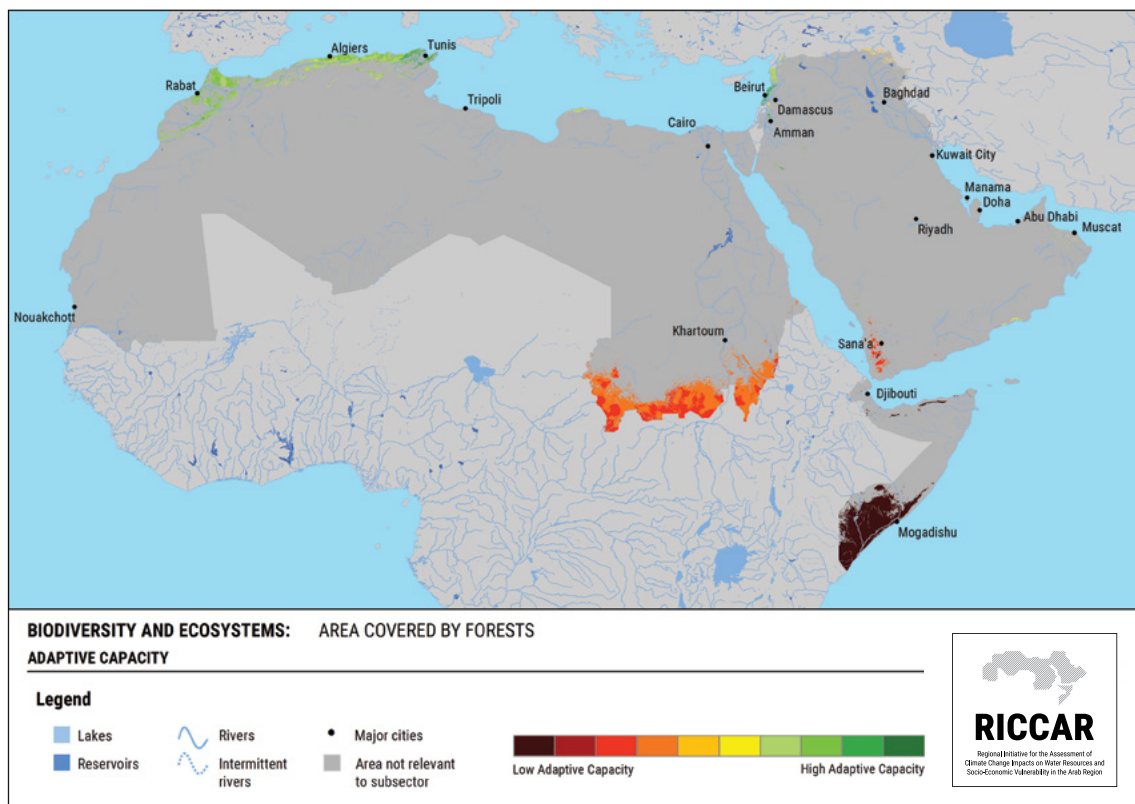
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – 12.1.2.3. POTENTIAL IMPACT

FIGURE 281



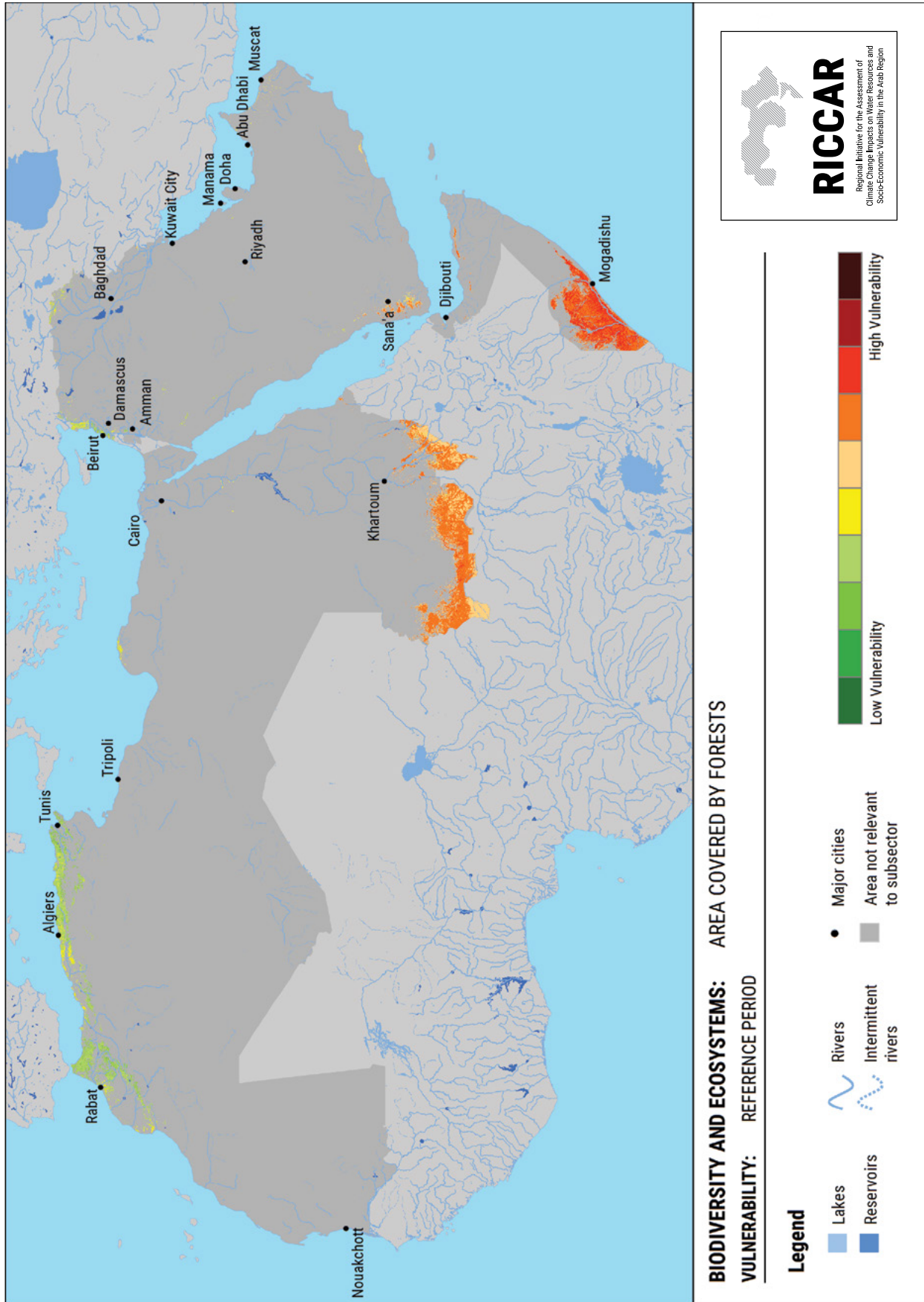
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – 12.1.2.4. ADAPTIVE CAPACITY

FIGURE 282



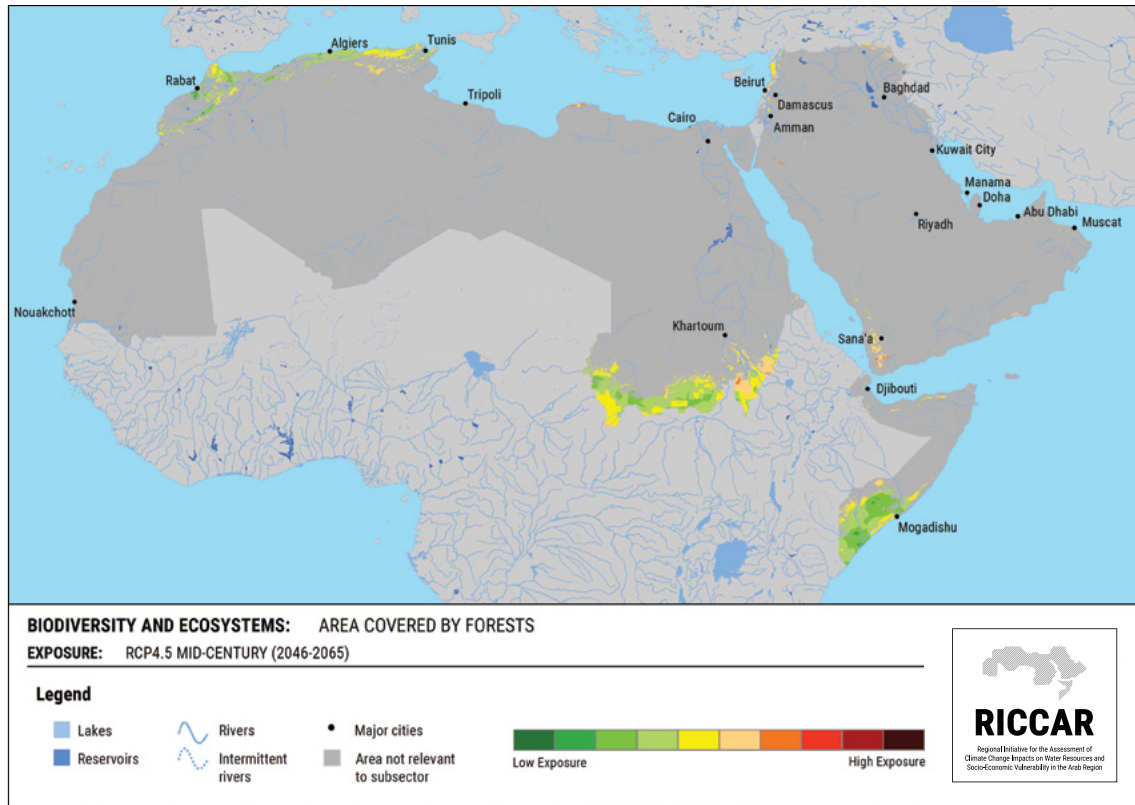
12.1. AREA COVERED BY FORESTS – 12.1.2. REFERENCE PERIOD – 12.1.2.5. VULNERABILITY

FIGURE 283



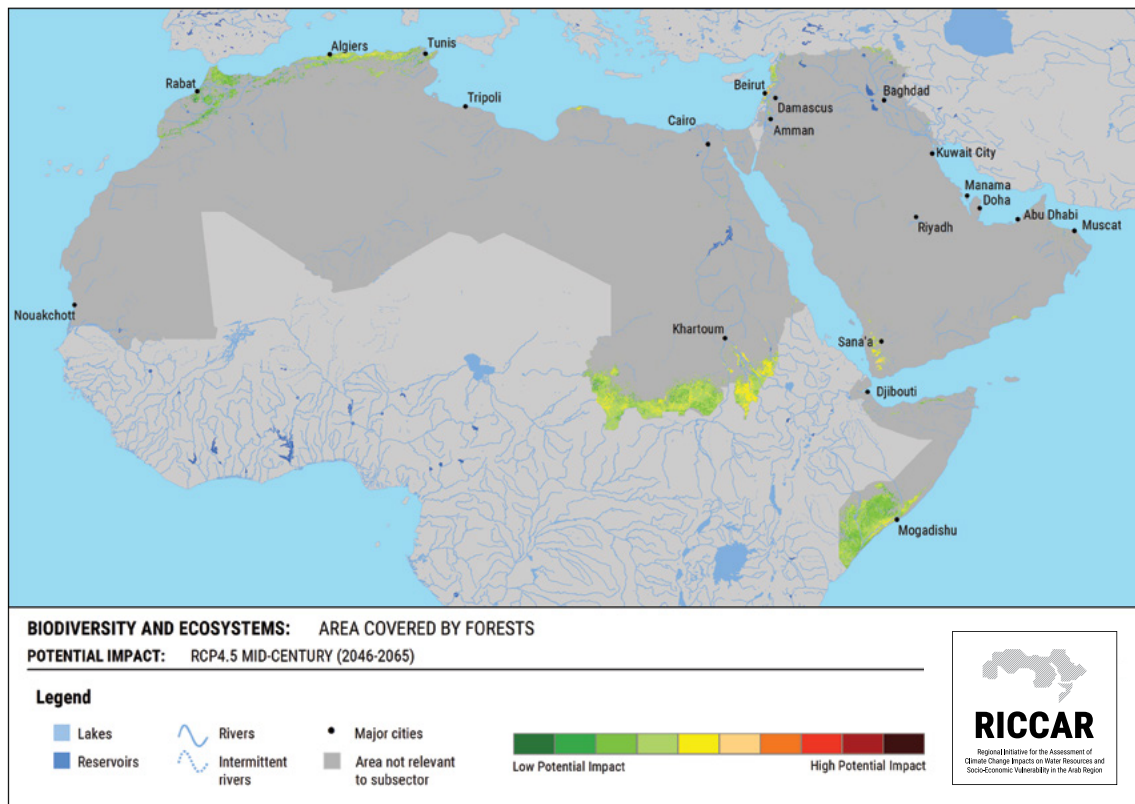
12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – 12.1.3.1. EXPOSURE

FIGURE 284



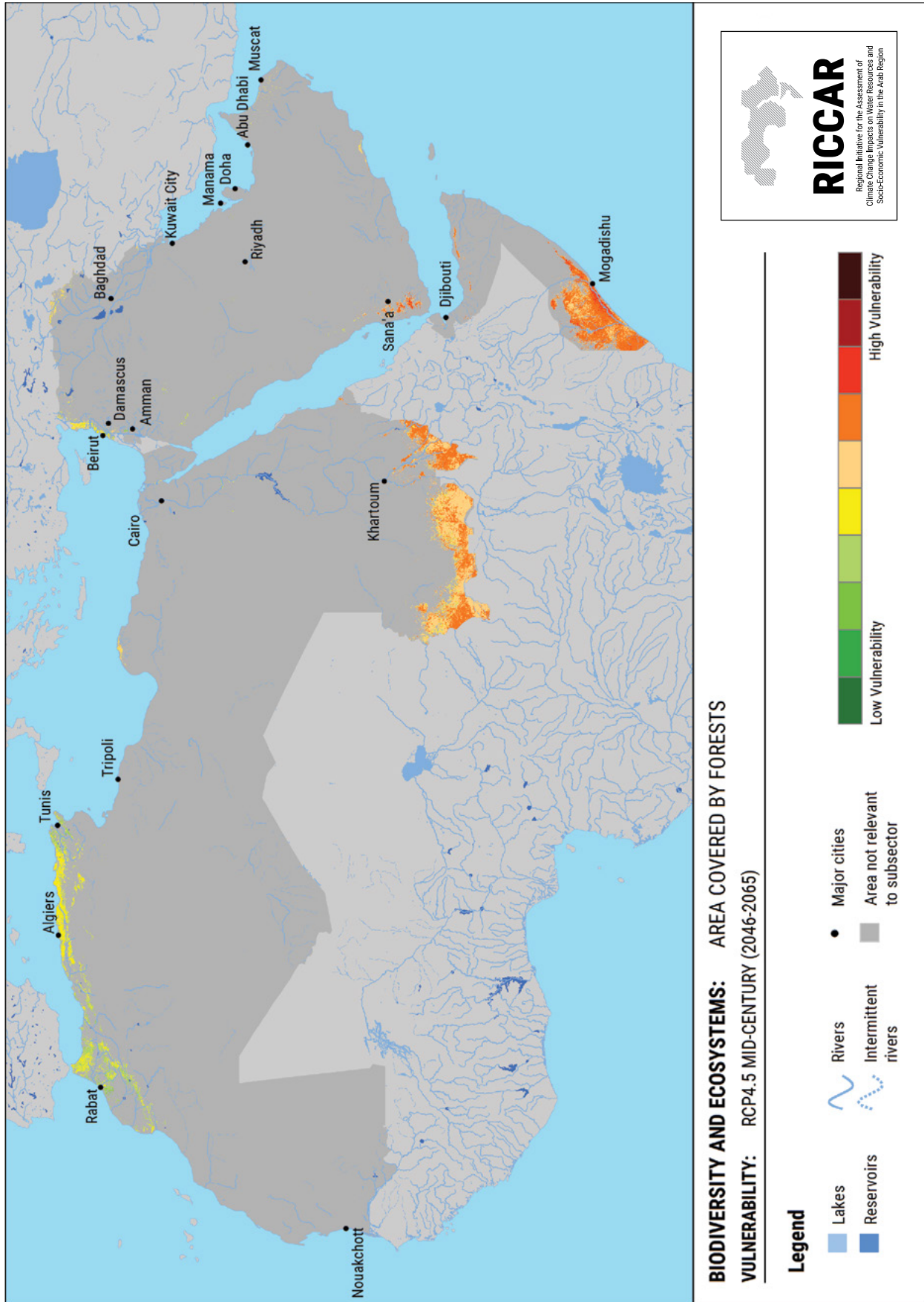
12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – 12.1.3.2. POTENTIAL IMPACT

FIGURE 285



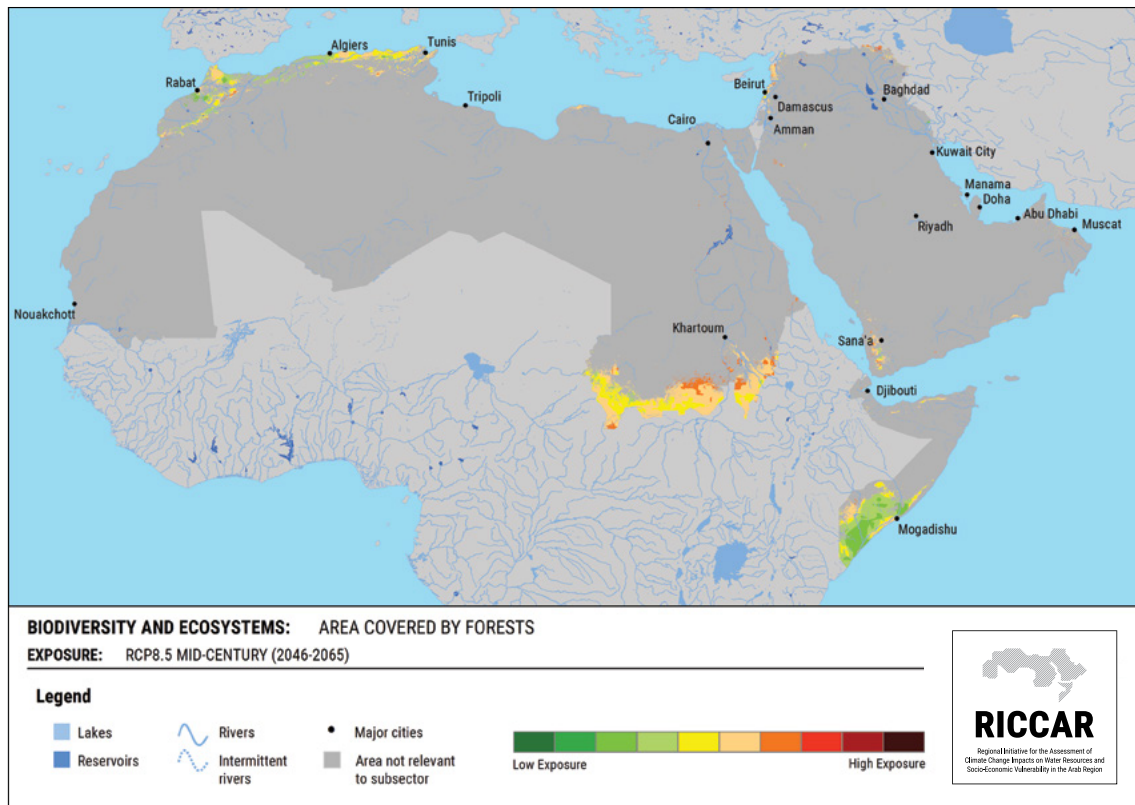
12.1. AREA COVERED BY FORESTS – 12.1.3. MID-CENTURY RCP 4.5 – 12.1.3.3. VULNERABILITY

FIGURE 286



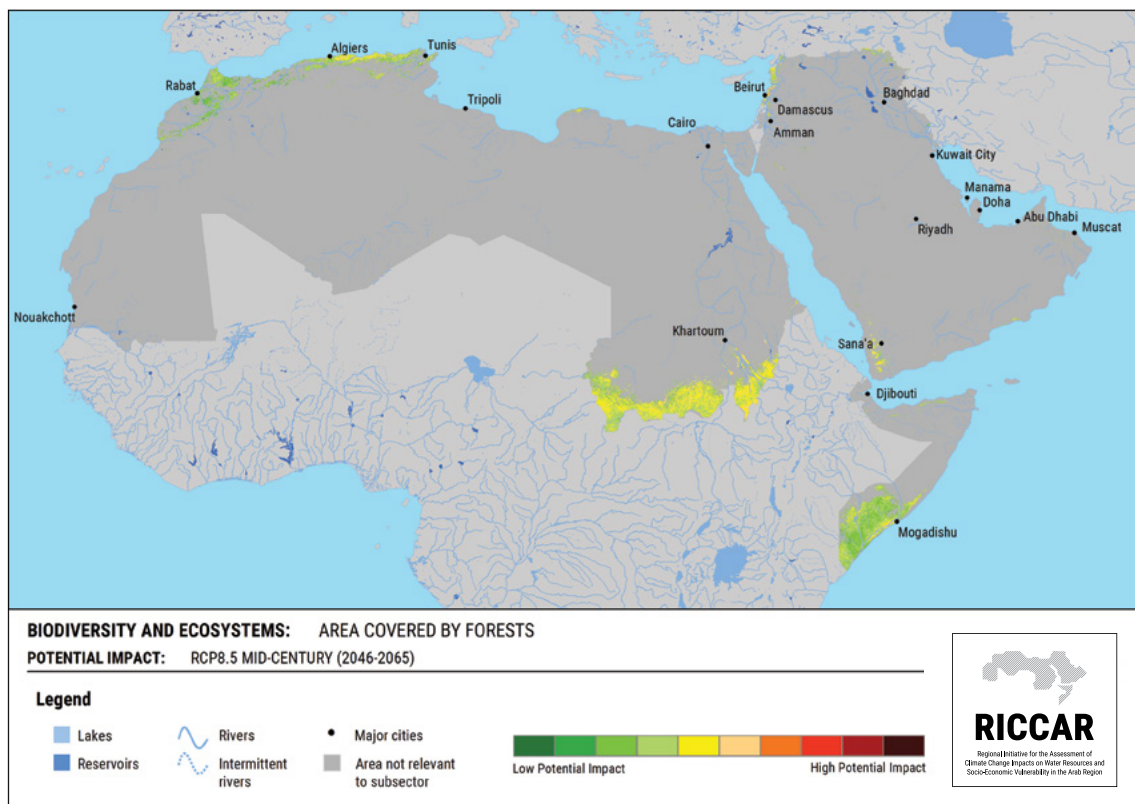
12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – 12.1.4.1. EXPOSURE

FIGURE 287



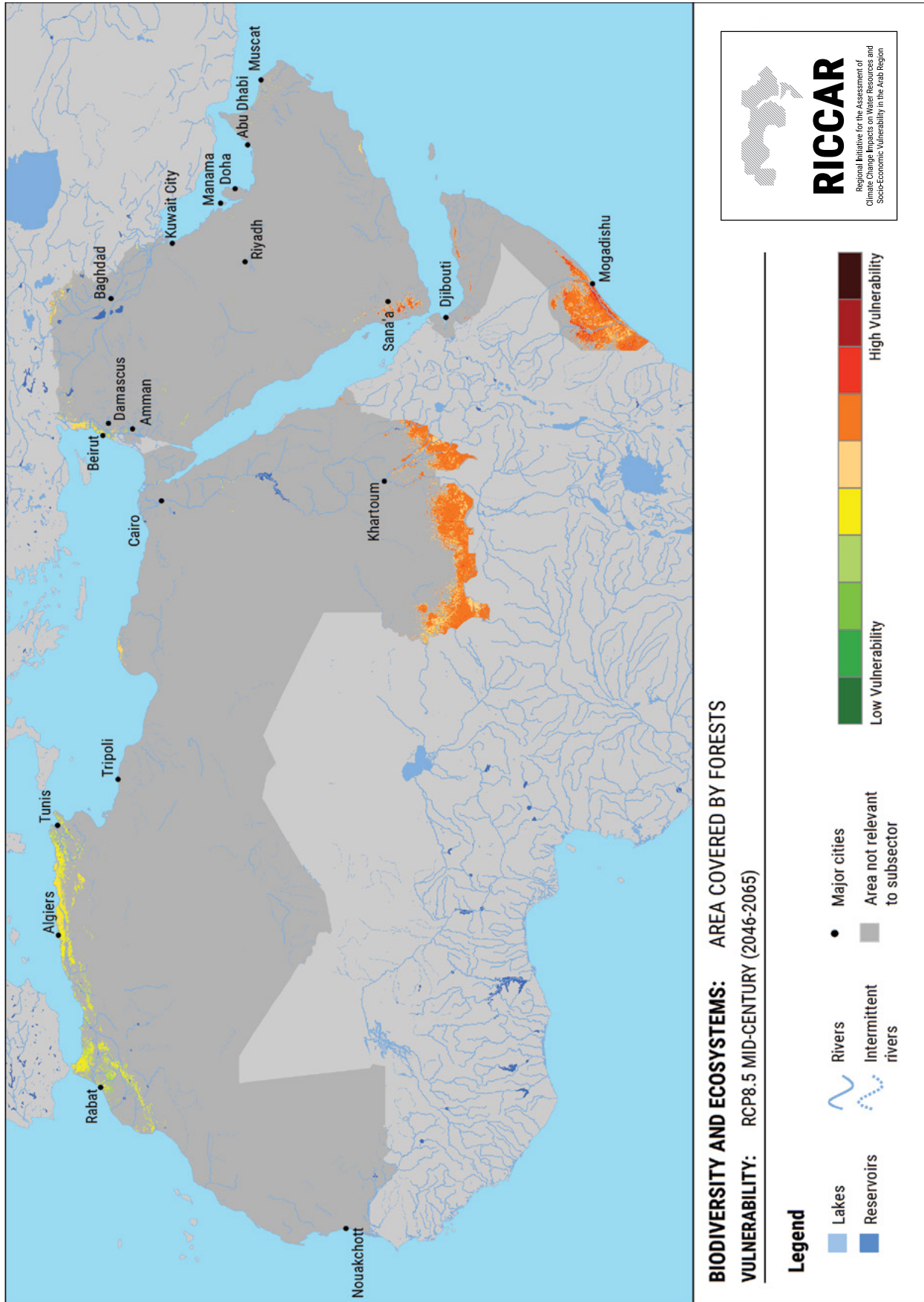
12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – 12.1.4.2. POTENTIAL IMPACT

FIGURE 288



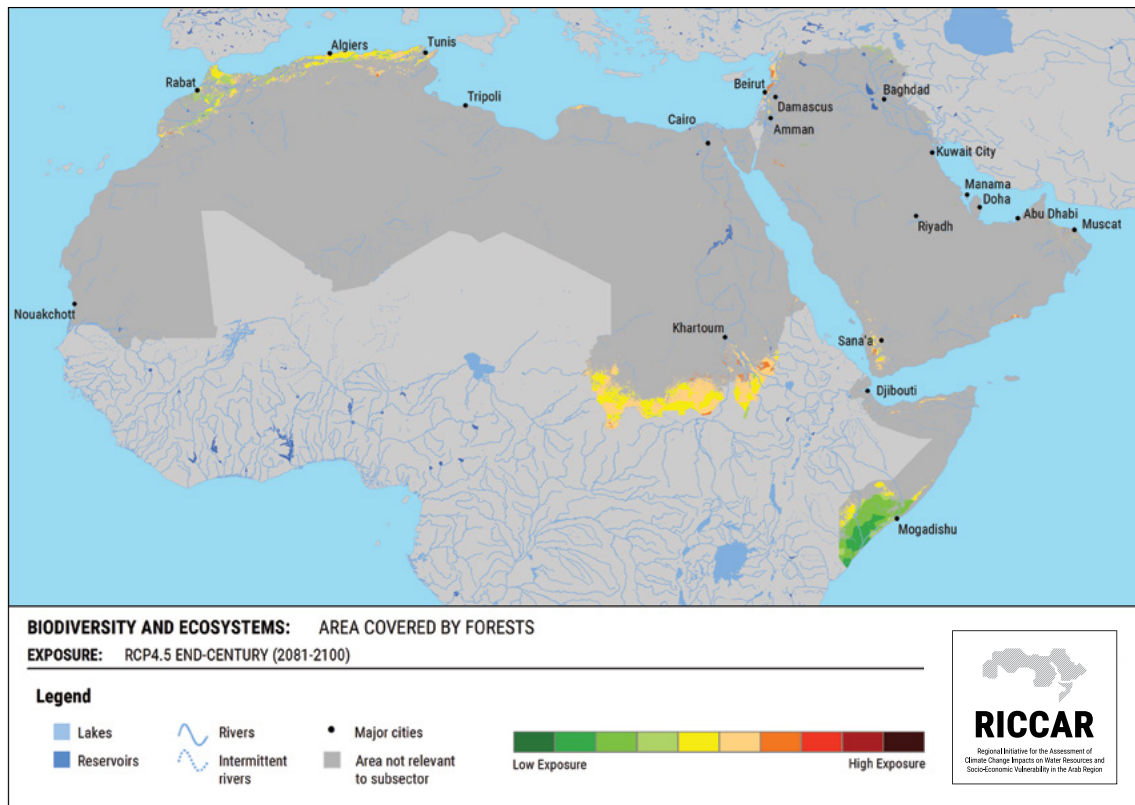
12.1. AREA COVERED BY FORESTS – 12.1.4. MID-CENTURY RCP 8.5 – 12.1.4.3. VULNERABILITY

FIGURE 289



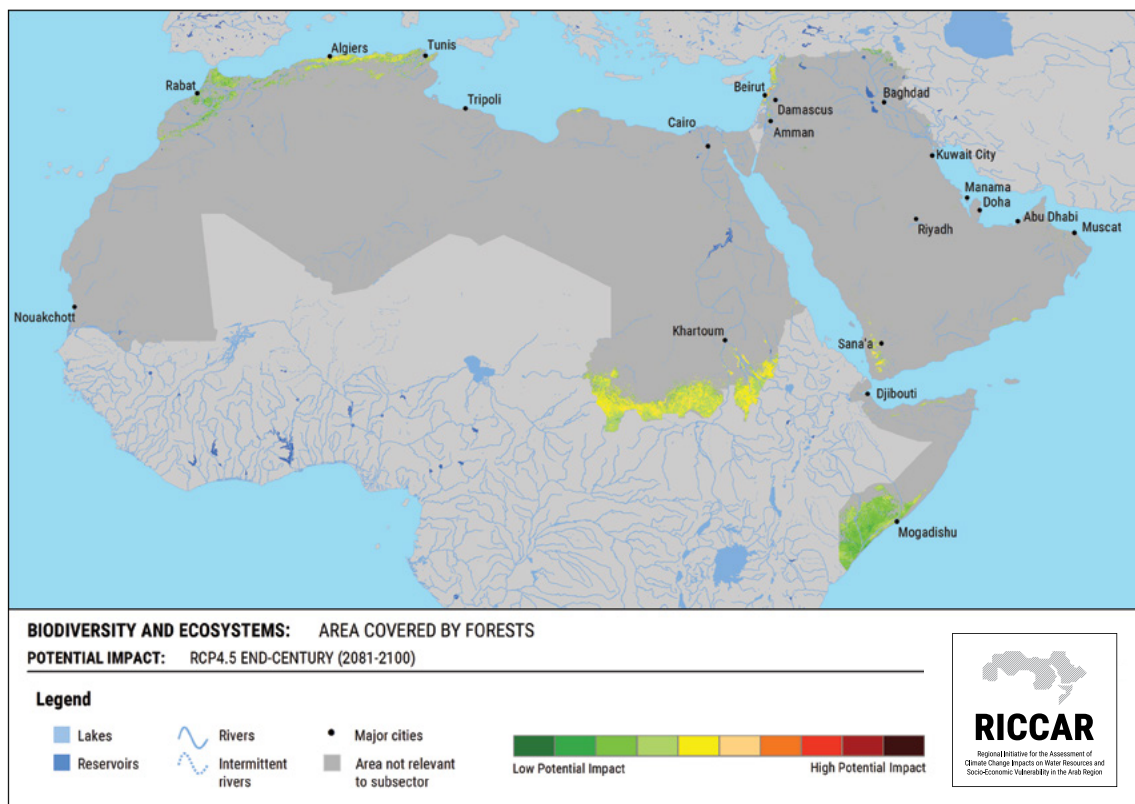
12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – 12.1.5.1. EXPOSURE

FIGURE 290



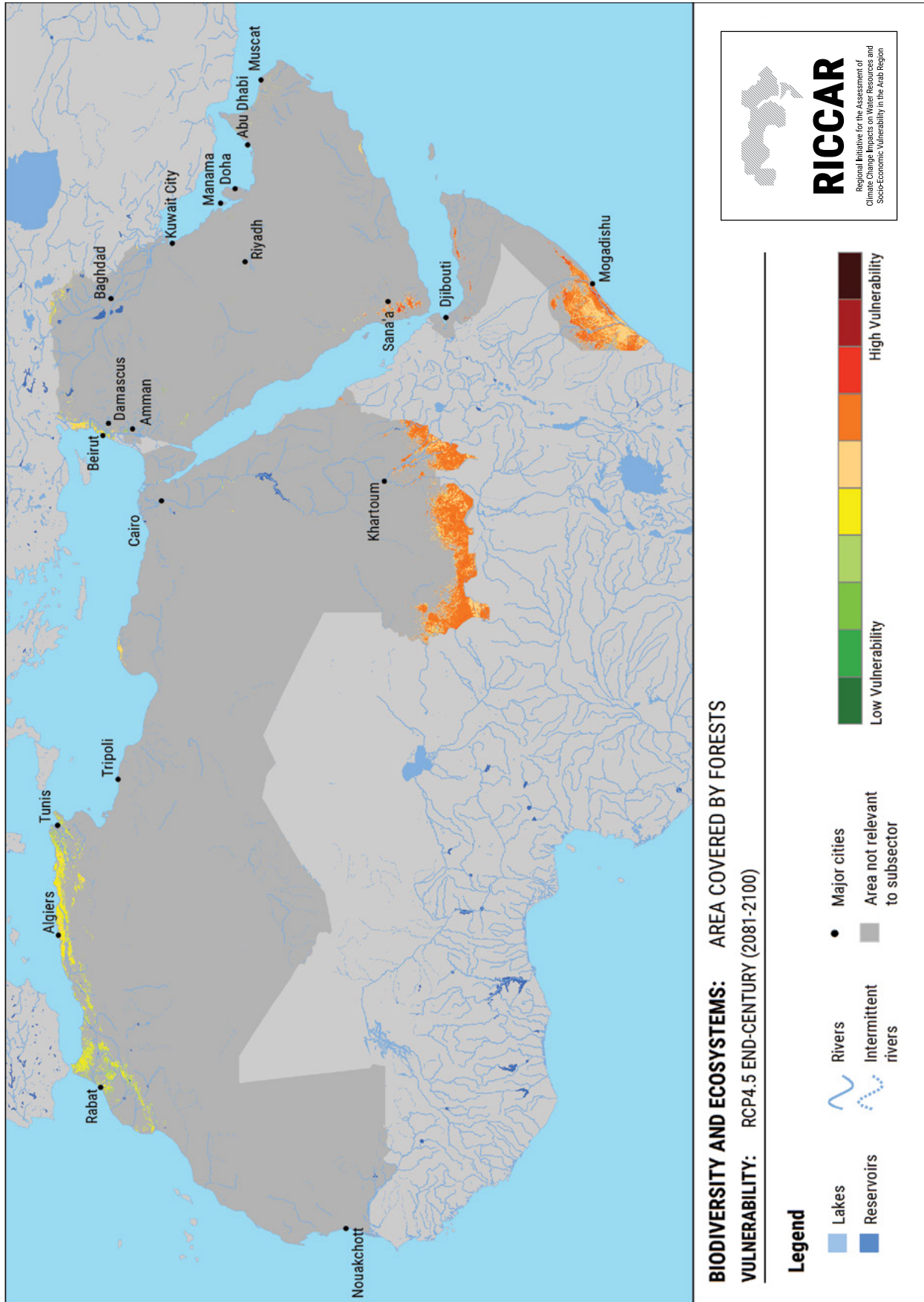
12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – 12.1.5.2. POTENTIAL IMPACT

FIGURE 291



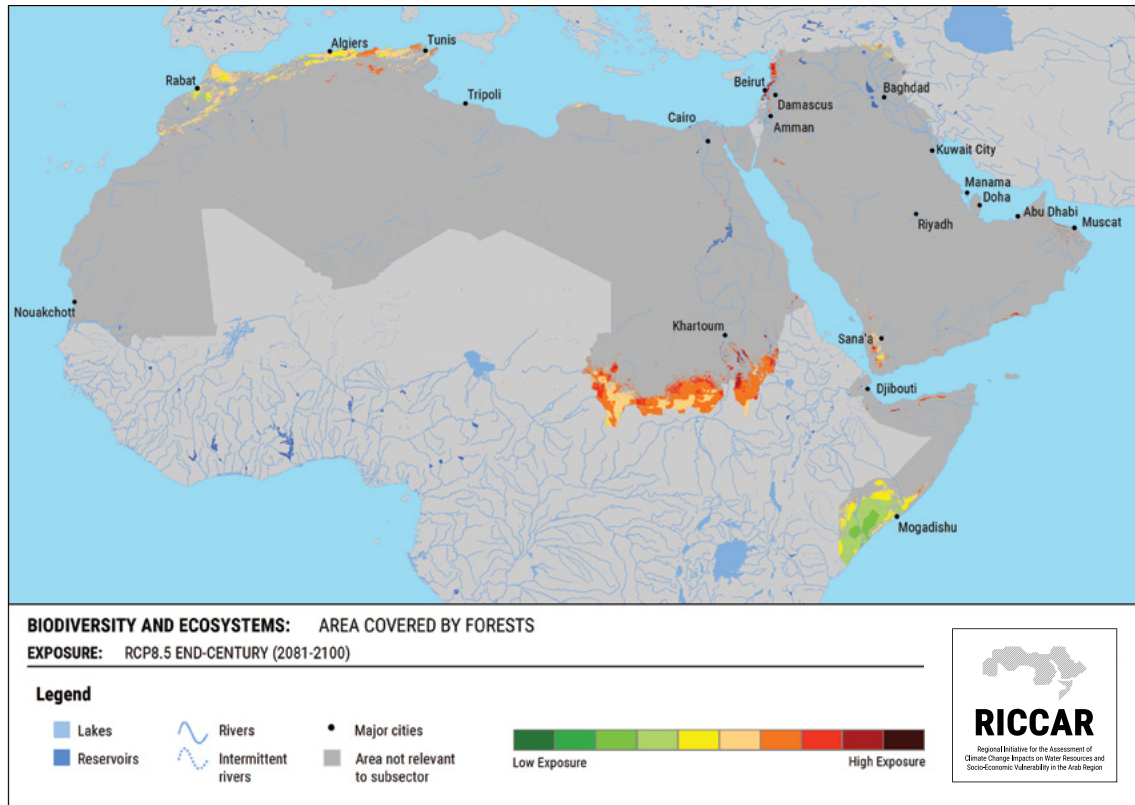
12.1. AREA COVERED BY FORESTS – 12.1.5. END-CENTURY RCP 4.5 – 12.1.5.3. VULNERABILITY

FIGURE 292



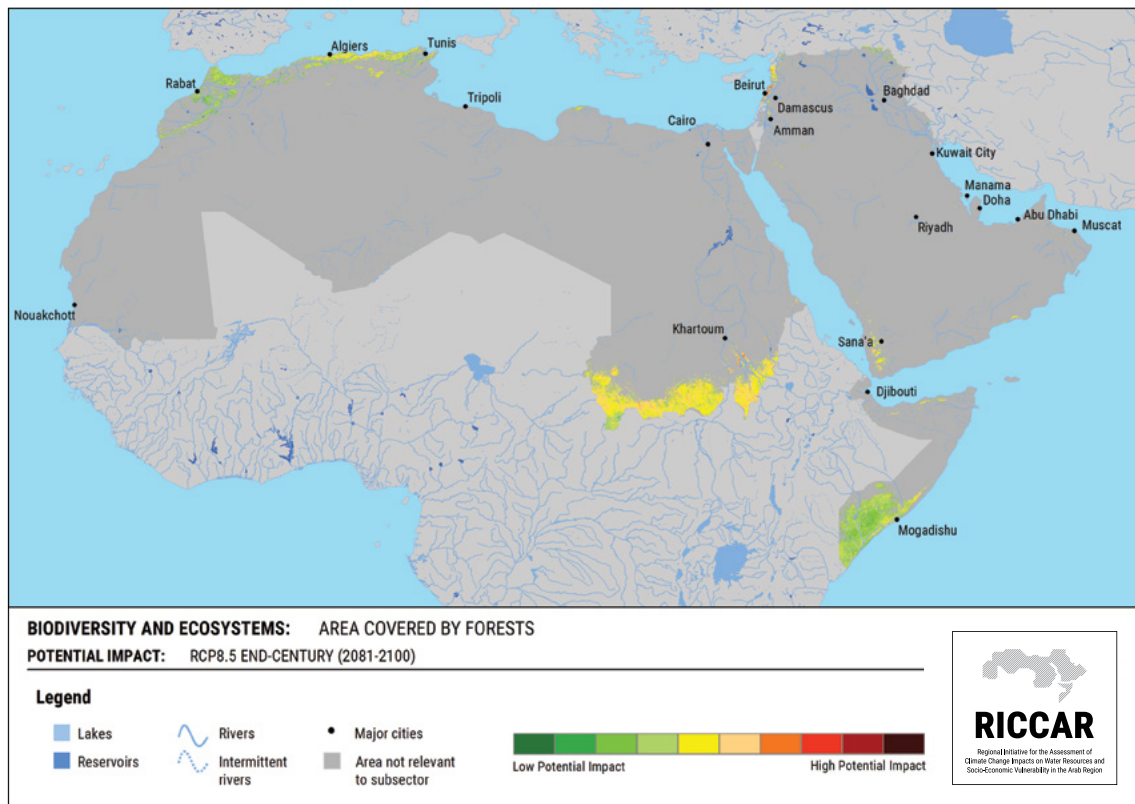
12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – 12.1.6.1. EXPOSURE

FIGURE 293



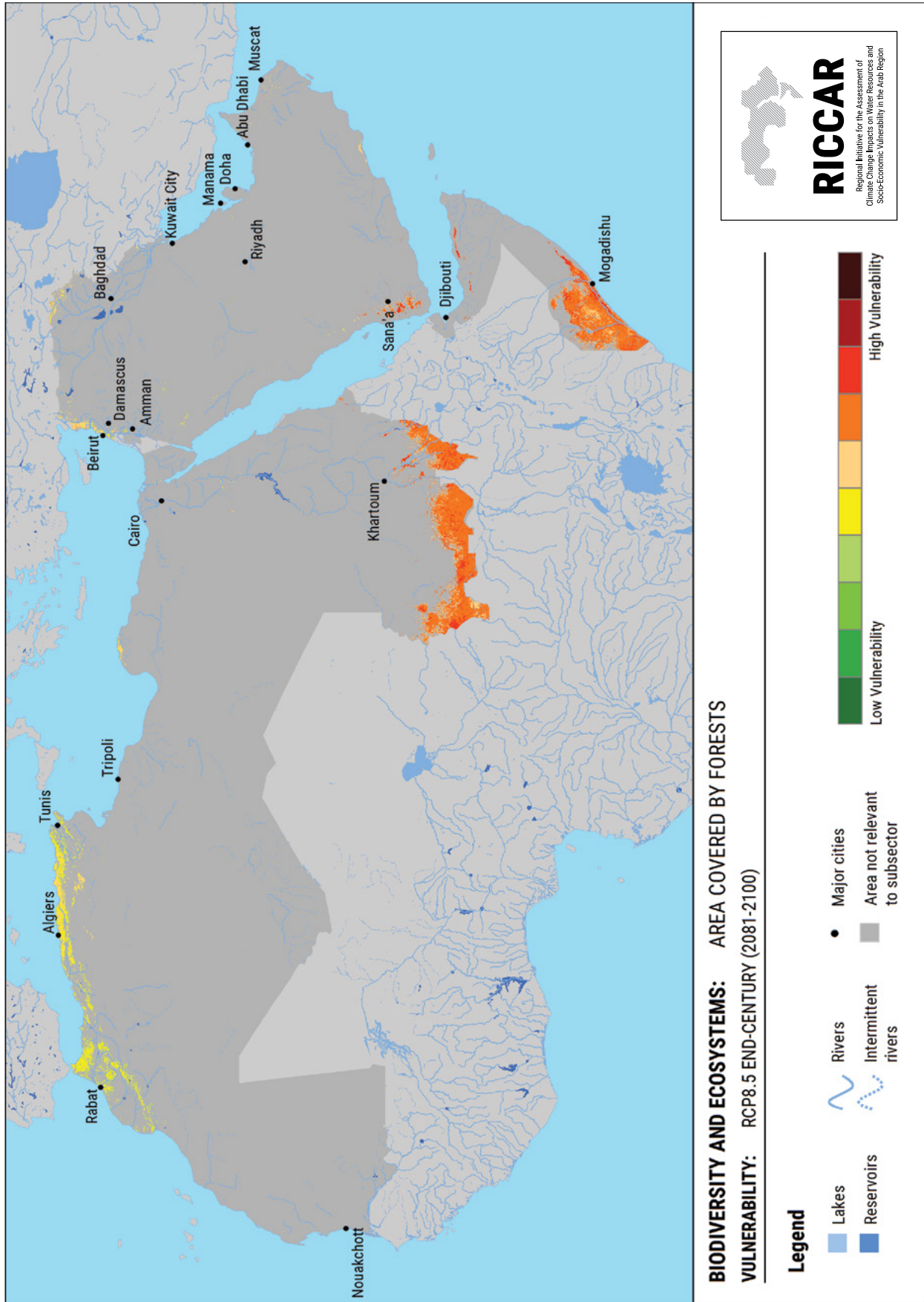
12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – 12.1.6.2. POTENTIAL IMPACT

FIGURE 294



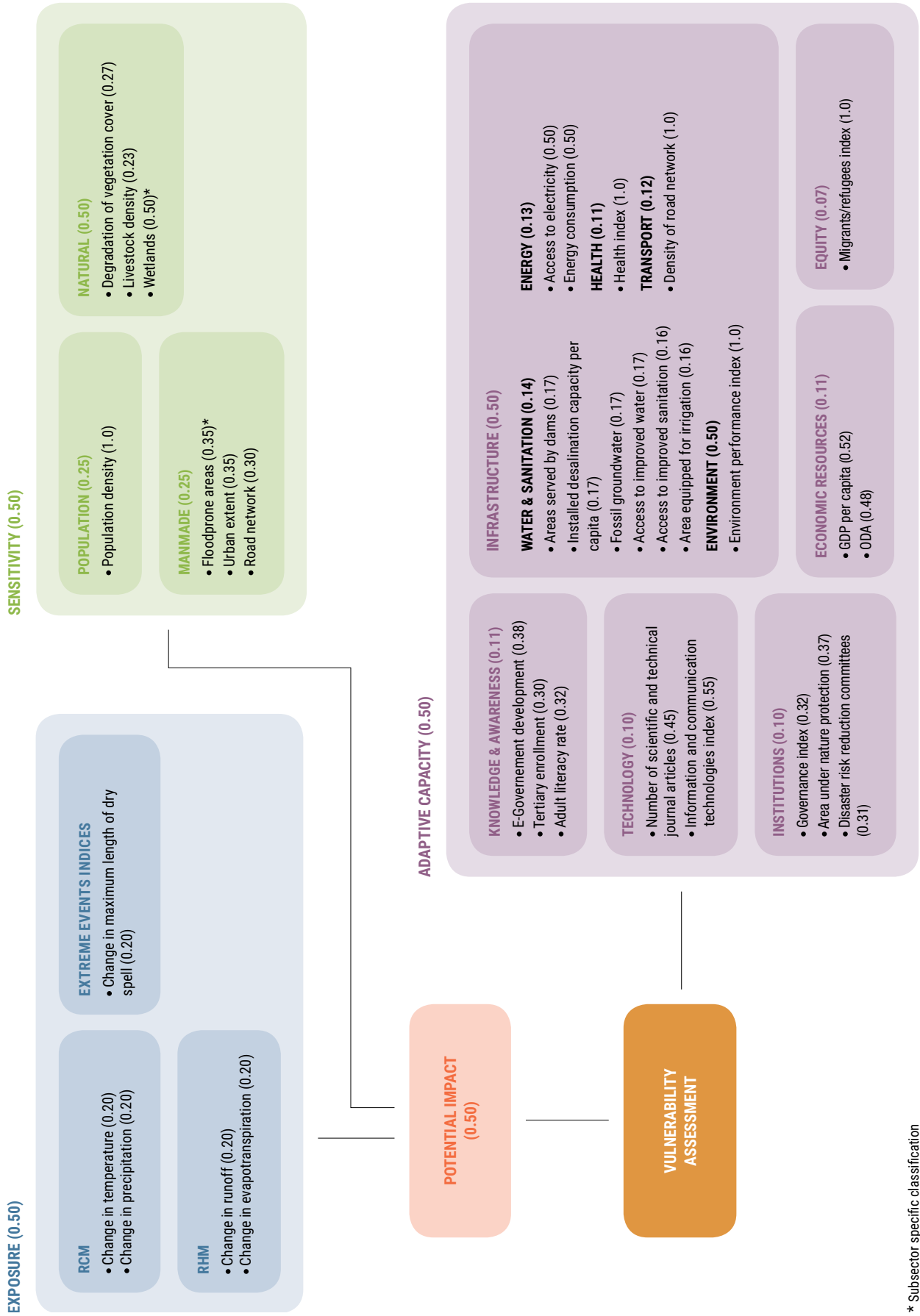
12.1. AREA COVERED BY FORESTS – 12.1.6. END-CENTURY RCP 8.5 – 12.1.6.3. VULNERABILITY

FIGURE 295



12.2. AREA COVERED BY WETLANDS – 12.2.1. IMPACT CHAIN

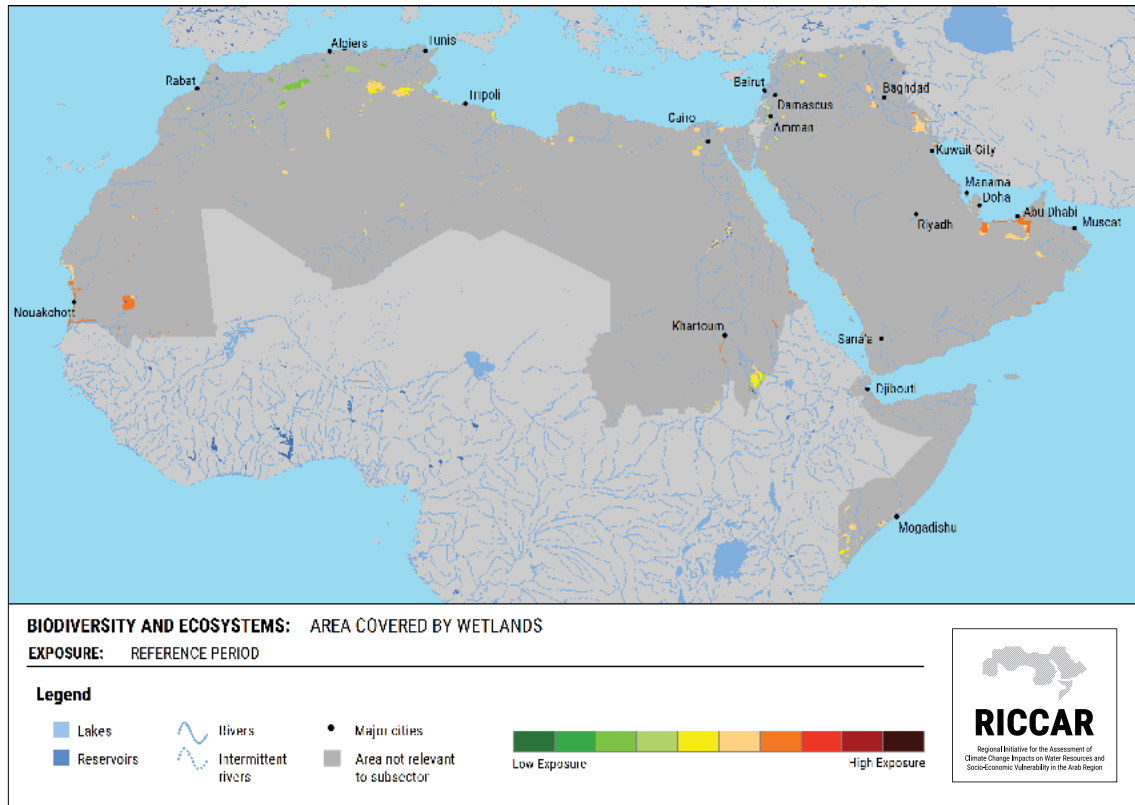
FIGURE 296



* Subsector specific classification

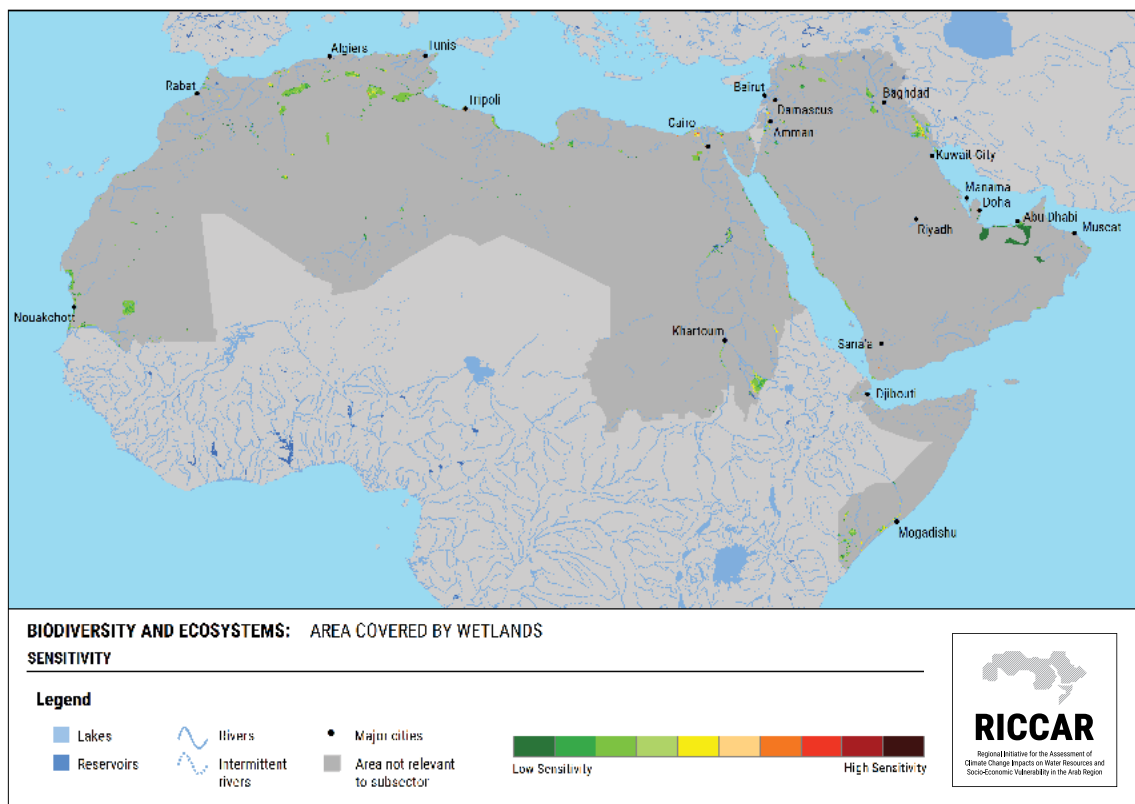
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.1. EXPOSURE

FIGURE 297



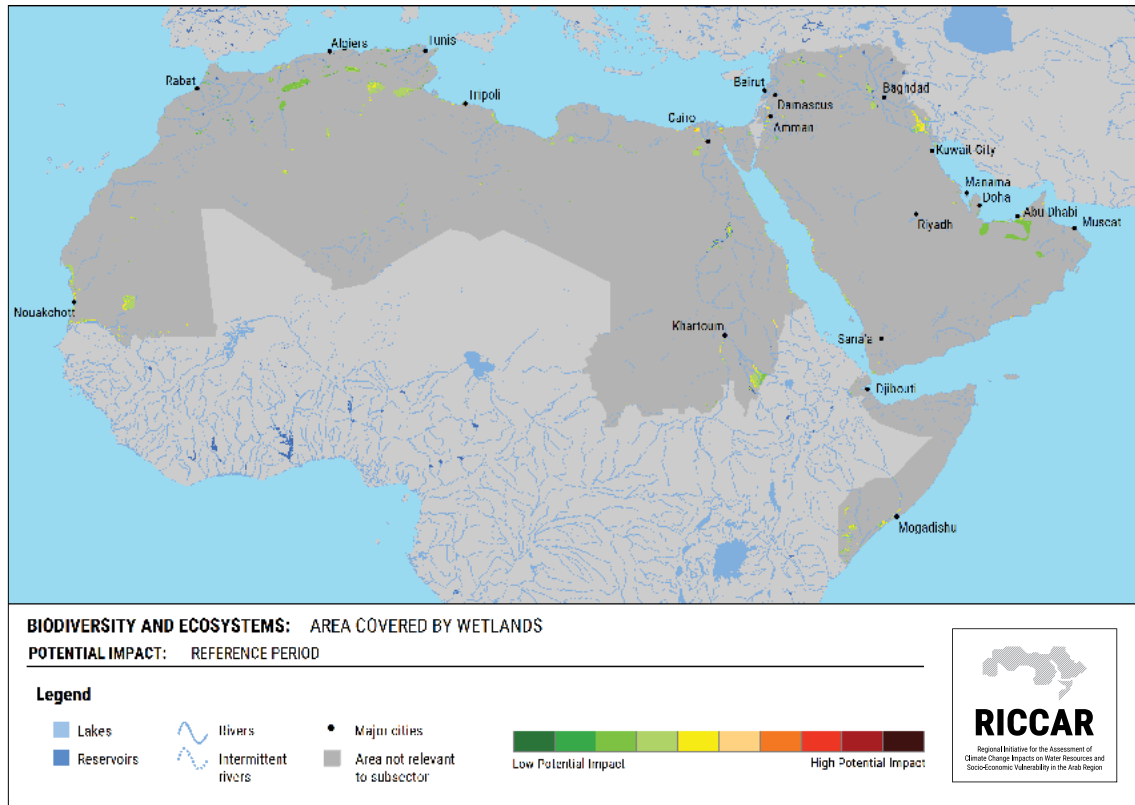
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.2. SENSITIVITY

FIGURE 298



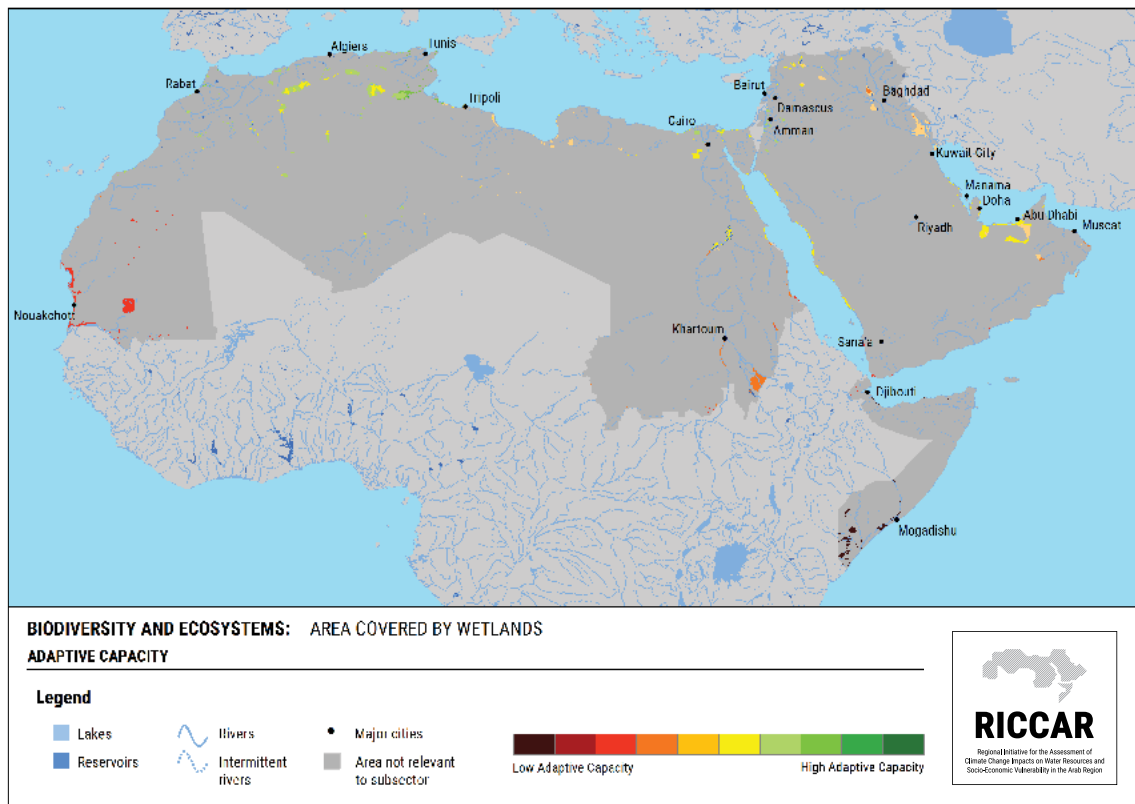
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.3. POTENTIAL IMPACT

FIGURE 299



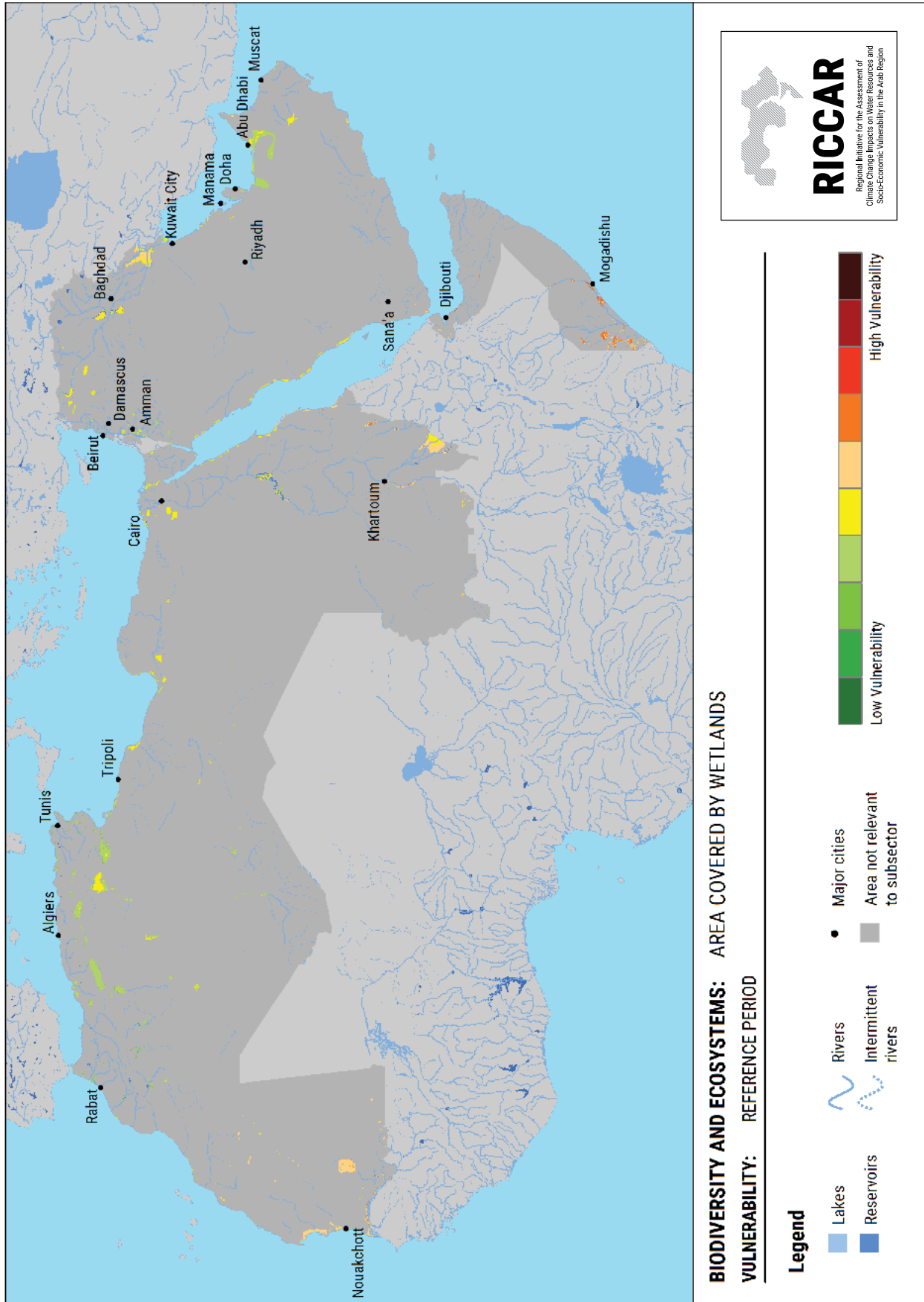
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.4. ADAPTIVE CAPACITY

FIGURE 300



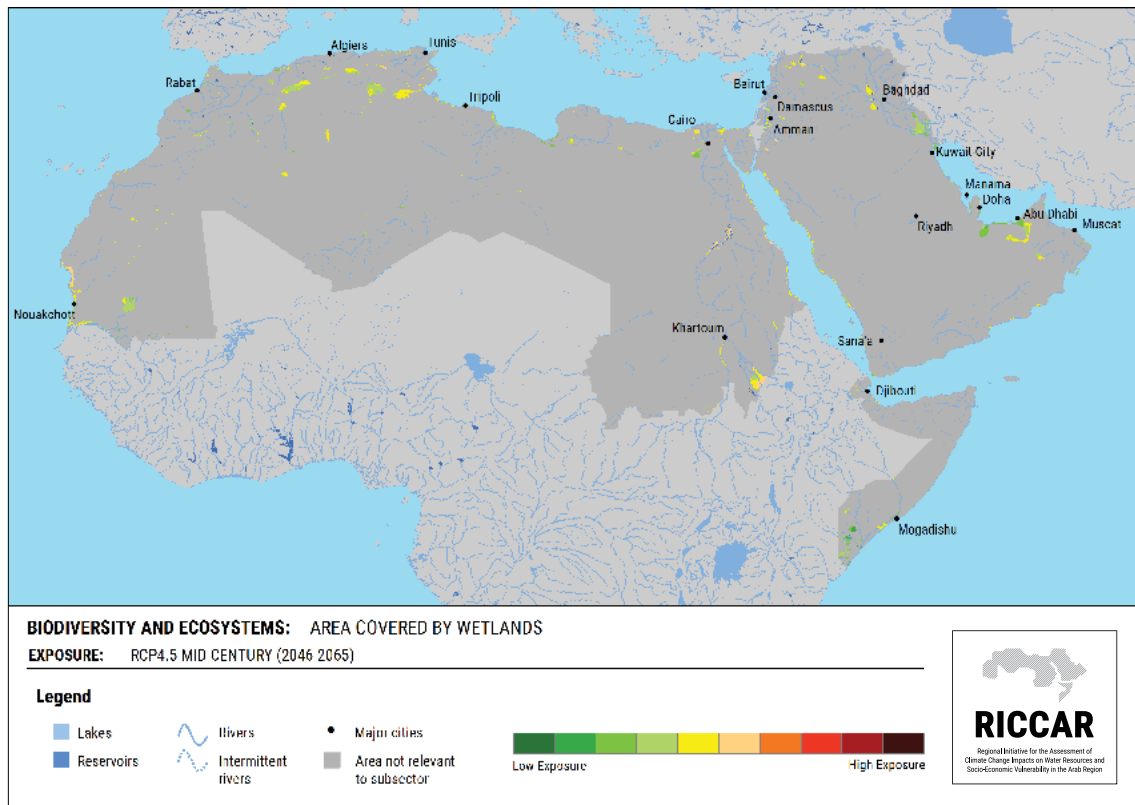
12.2. AREA COVERED BY WETLANDS – 12.2.2. REFERENCE PERIOD – 12.2.2.5. VULNERABILITY

FIGURE 301



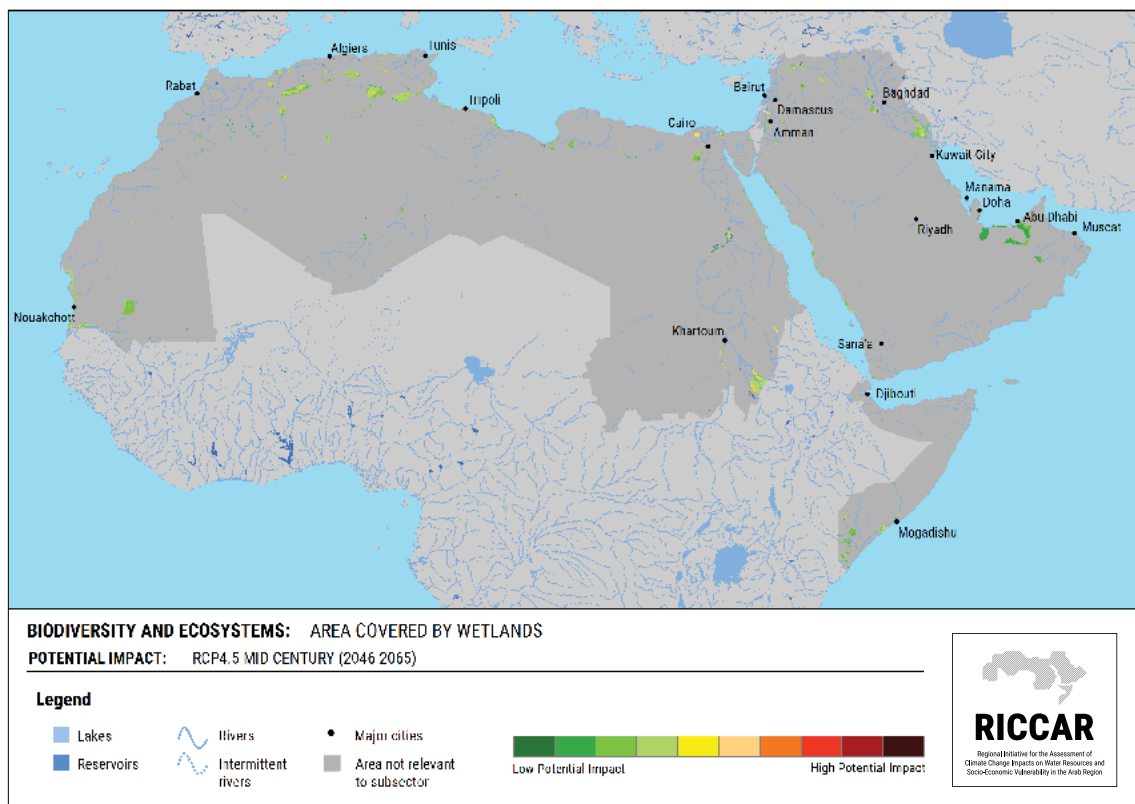
12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – 12.2.3.1. EXPOSURE

FIGURE 302



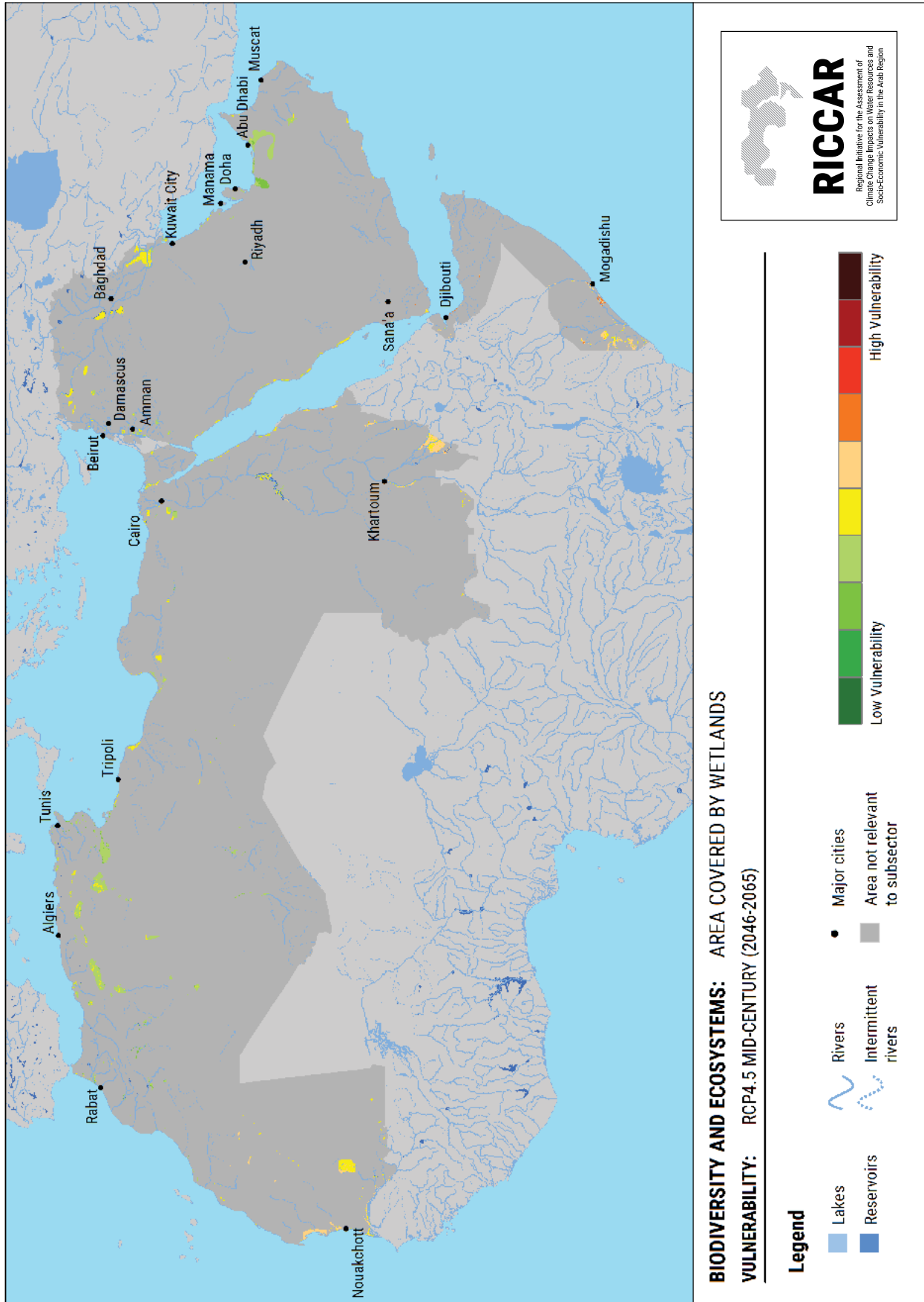
12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – 12.2.3.2. POTENTIAL IMPACT

FIGURE 303



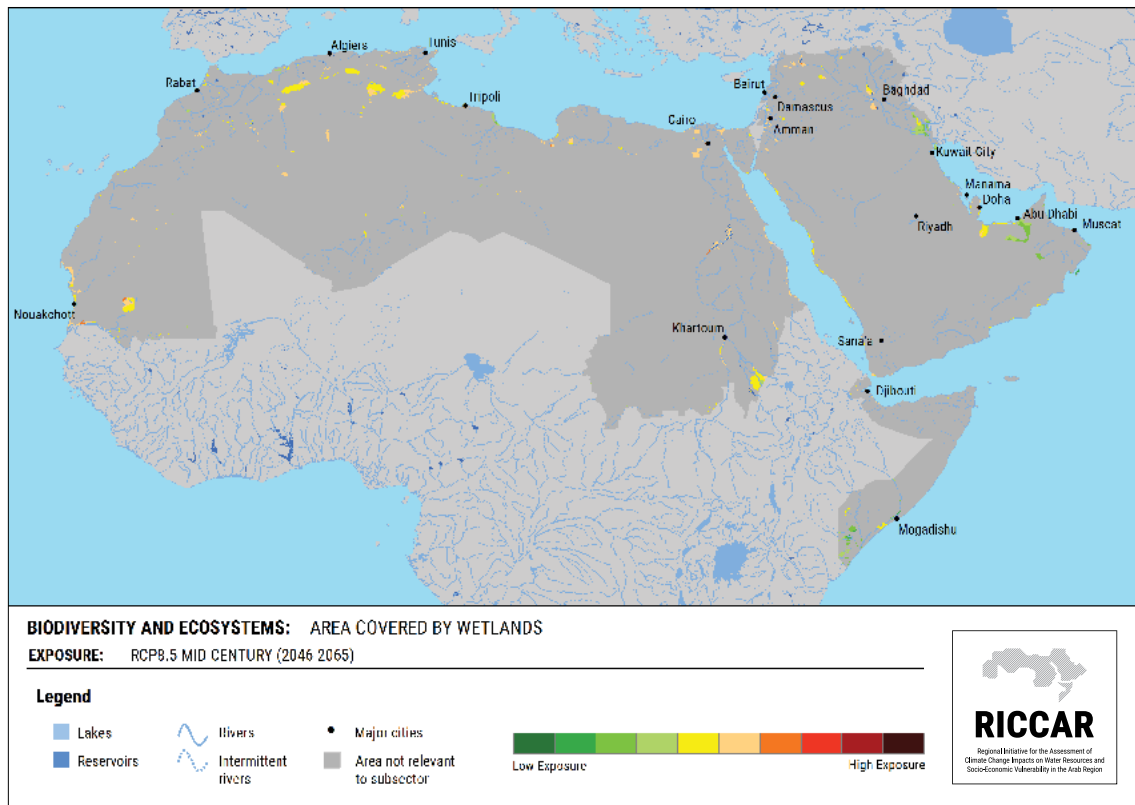
12.2. AREA COVERED BY WETLANDS – 12.2.3. MID-CENTURY RCP 4.5 – 12.2.3.3. VULNERABILITY

FIGURE 304



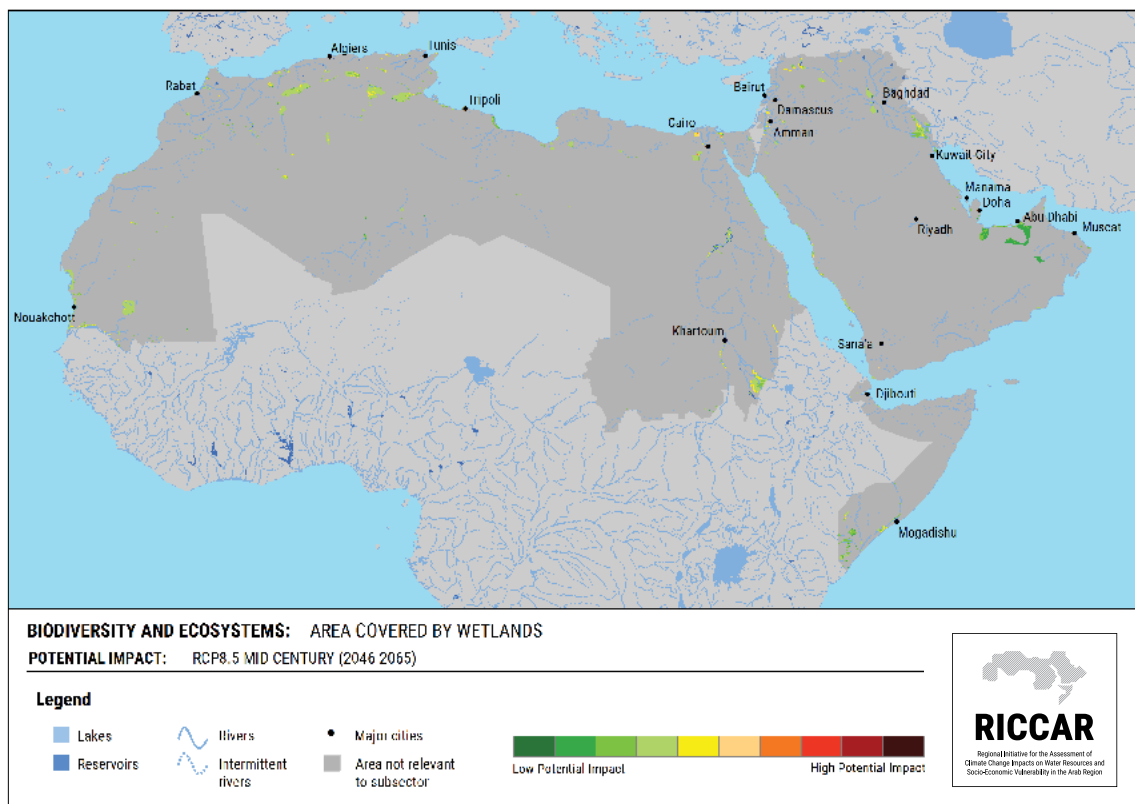
12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – 12.2.4.1. EXPOSURE

FIGURE 305



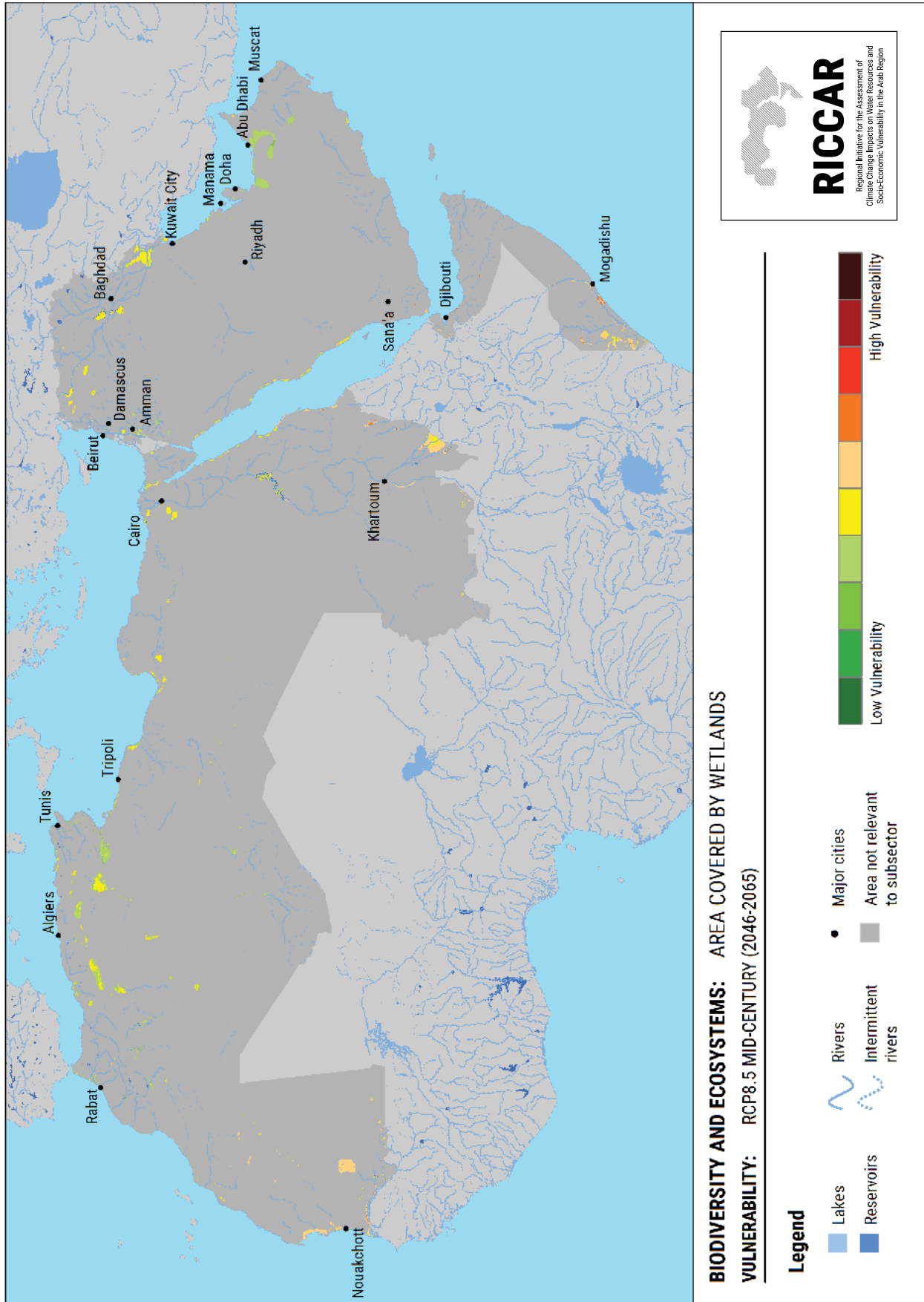
12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – 12.2.4.2. POTENTIAL IMPACT

FIGURE 306



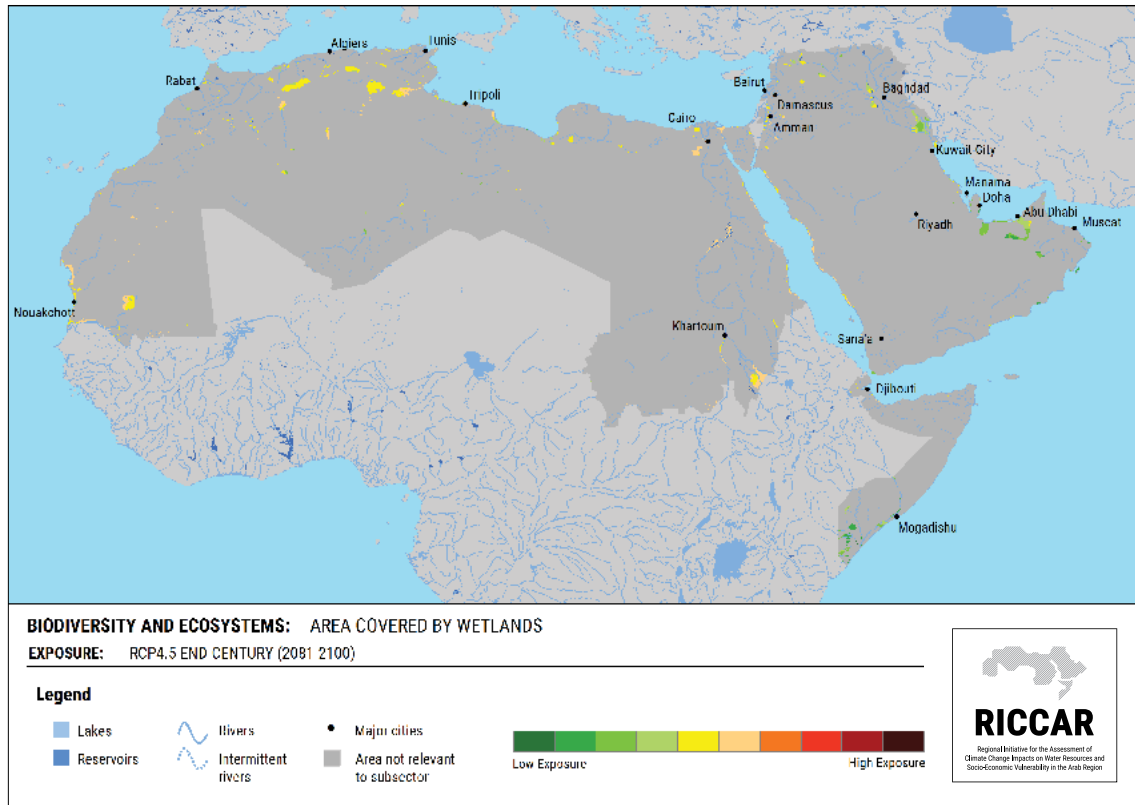
12.2. AREA COVERED BY WETLANDS – 12.2.4. MID-CENTURY RCP 8.5 – 12.2.4.3. VULNERABILITY

FIGURE 307



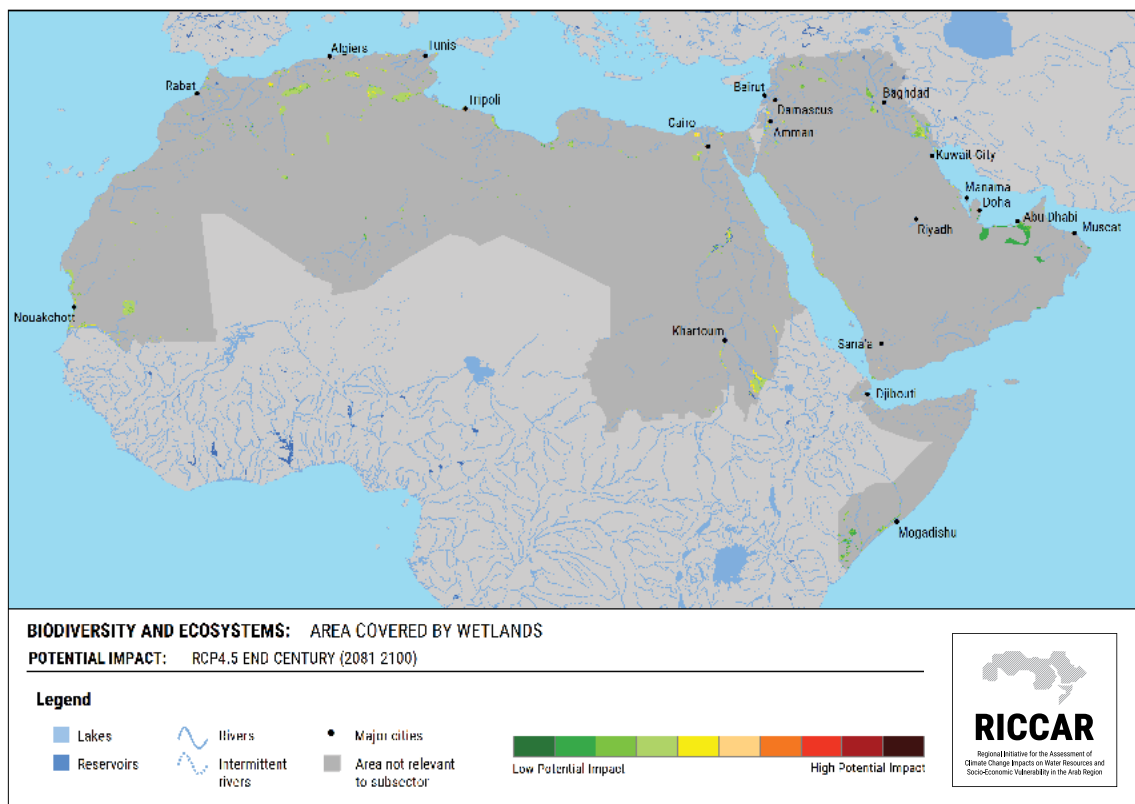
12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – 12.2.5.1. EXPOSURE

FIGURE 308



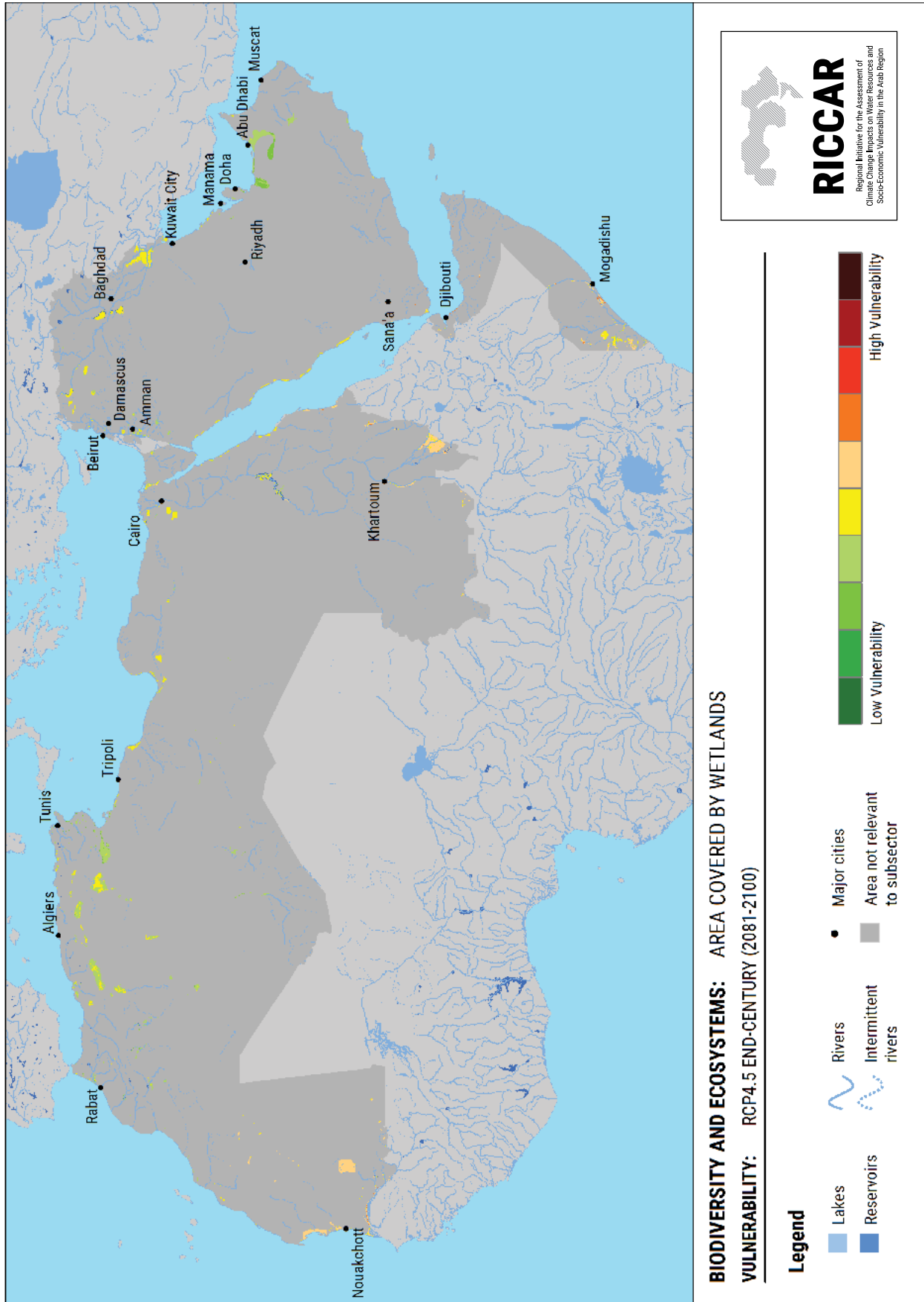
12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – 12.2.5.2. POTENTIAL IMPACT

FIGURE 309



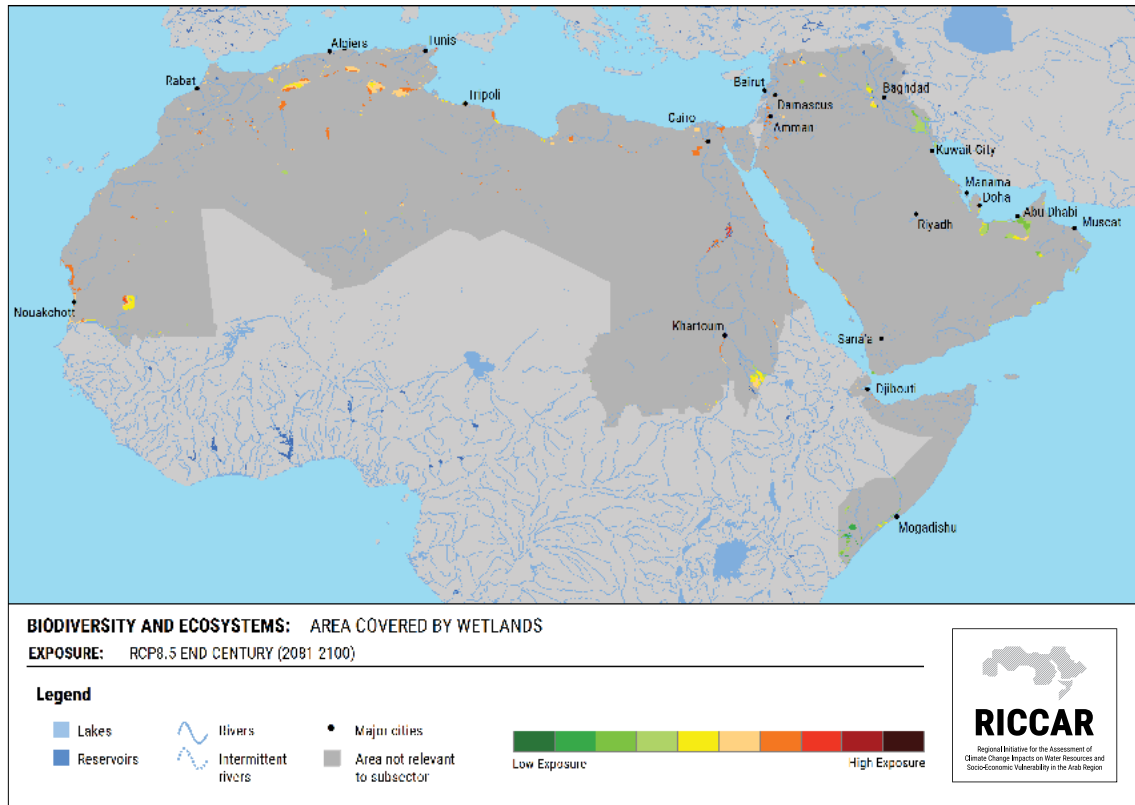
12.2. AREA COVERED BY WETLANDS – 12.2.5. END-CENTURY RCP 4.5 – 12.2.5.3. VULNERABILITY

FIGURE 310



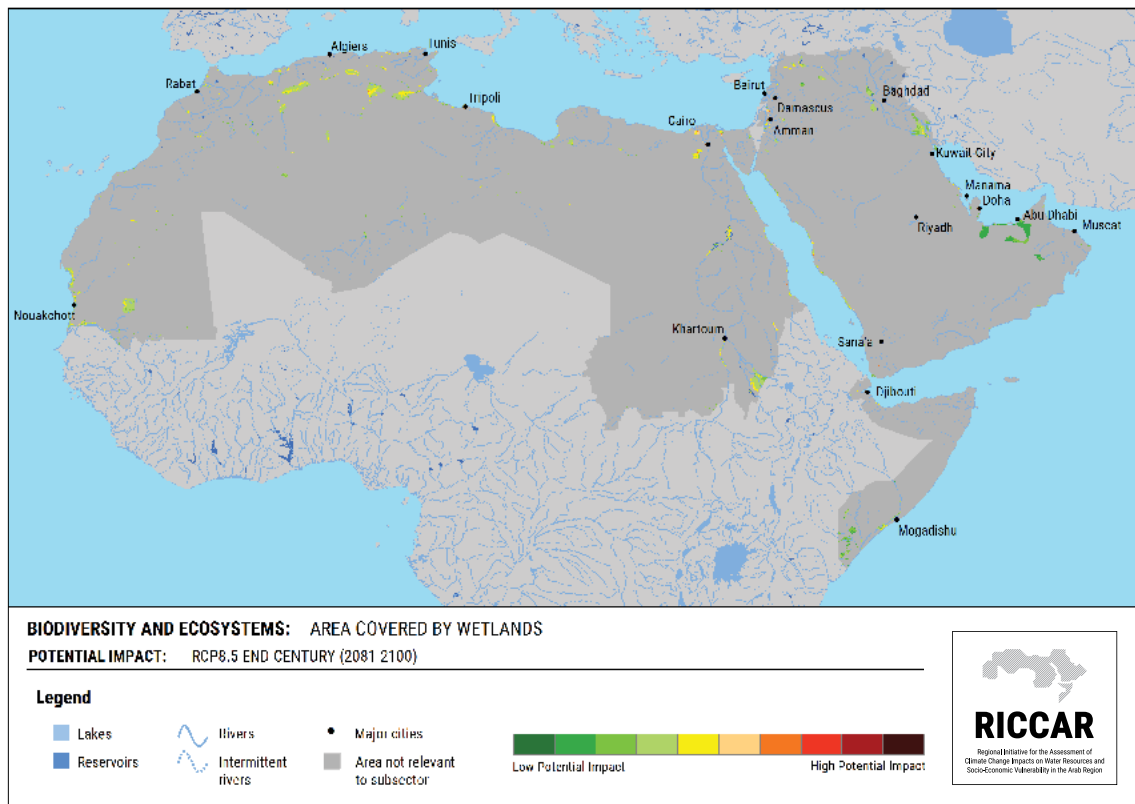
12.2. AREA COVERED BY WETLANDS – 12.2.6. END-CENTURY RCP 8.5 – 12.2.6.1. EXPOSURE

FIGURE 311



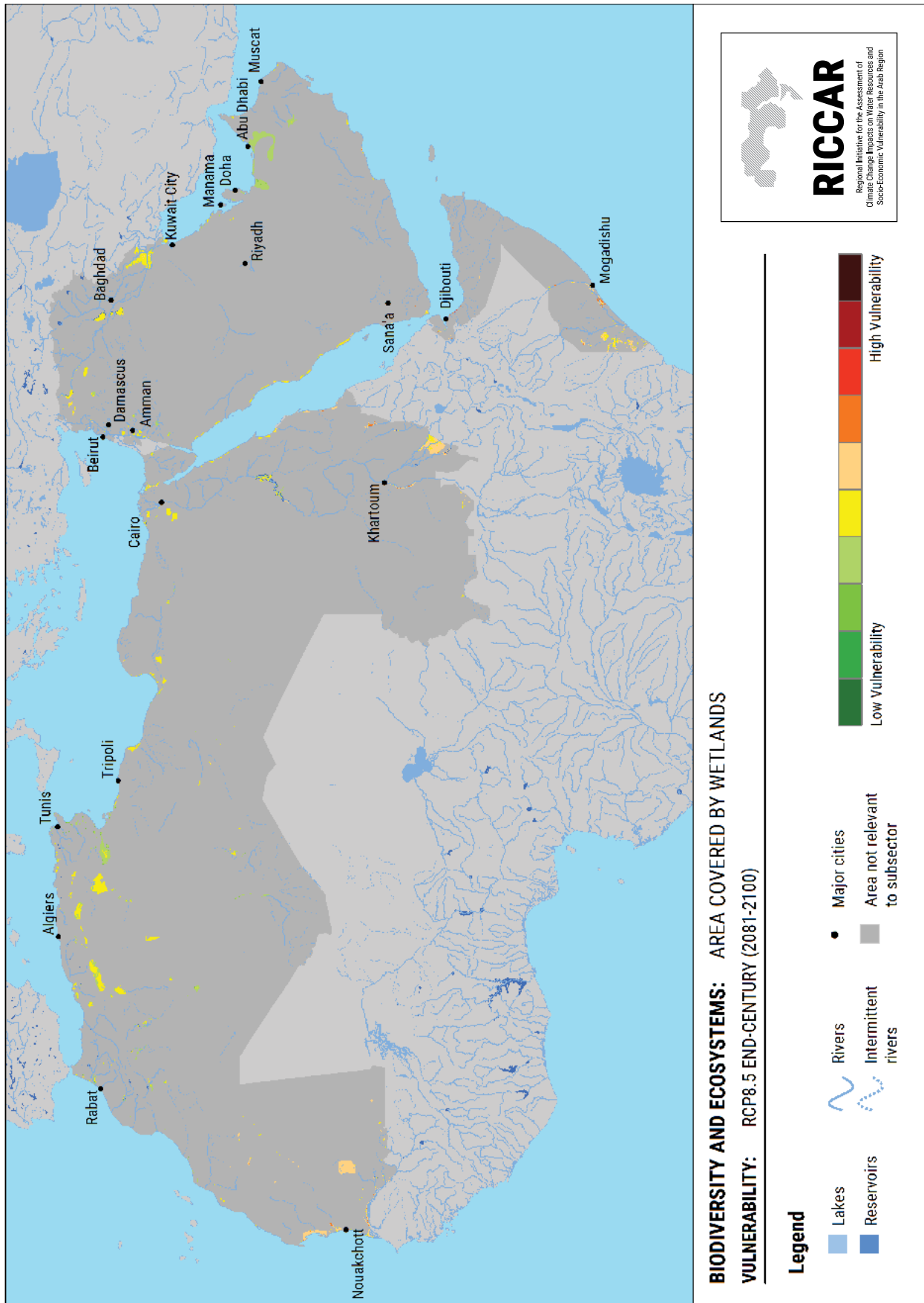
12.2. AREA COVERED BY WETLANDS – 12.2.6. END-CENTURY RCP 8.5 – 12.2.6.2. POTENTIAL IMPACT

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

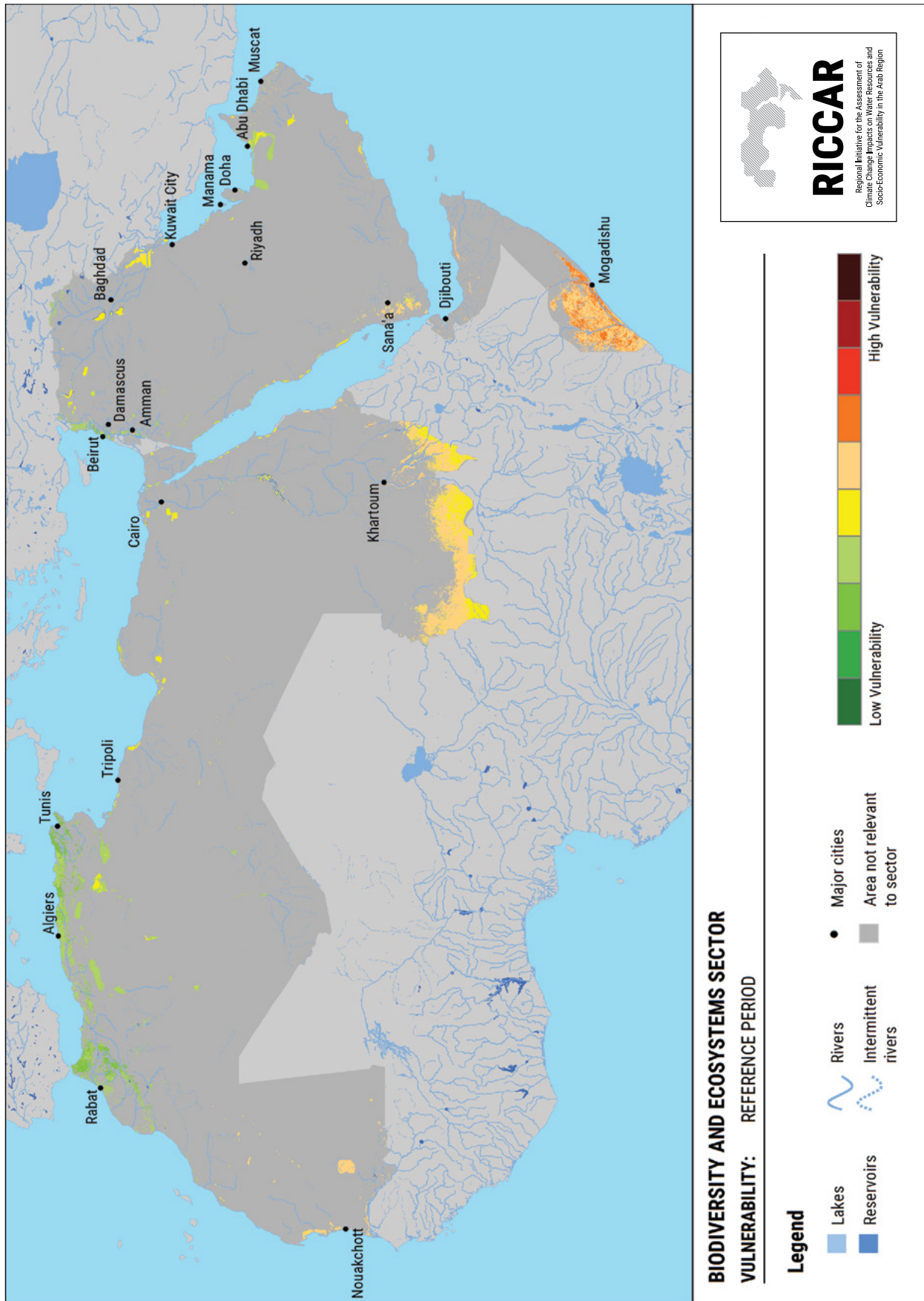
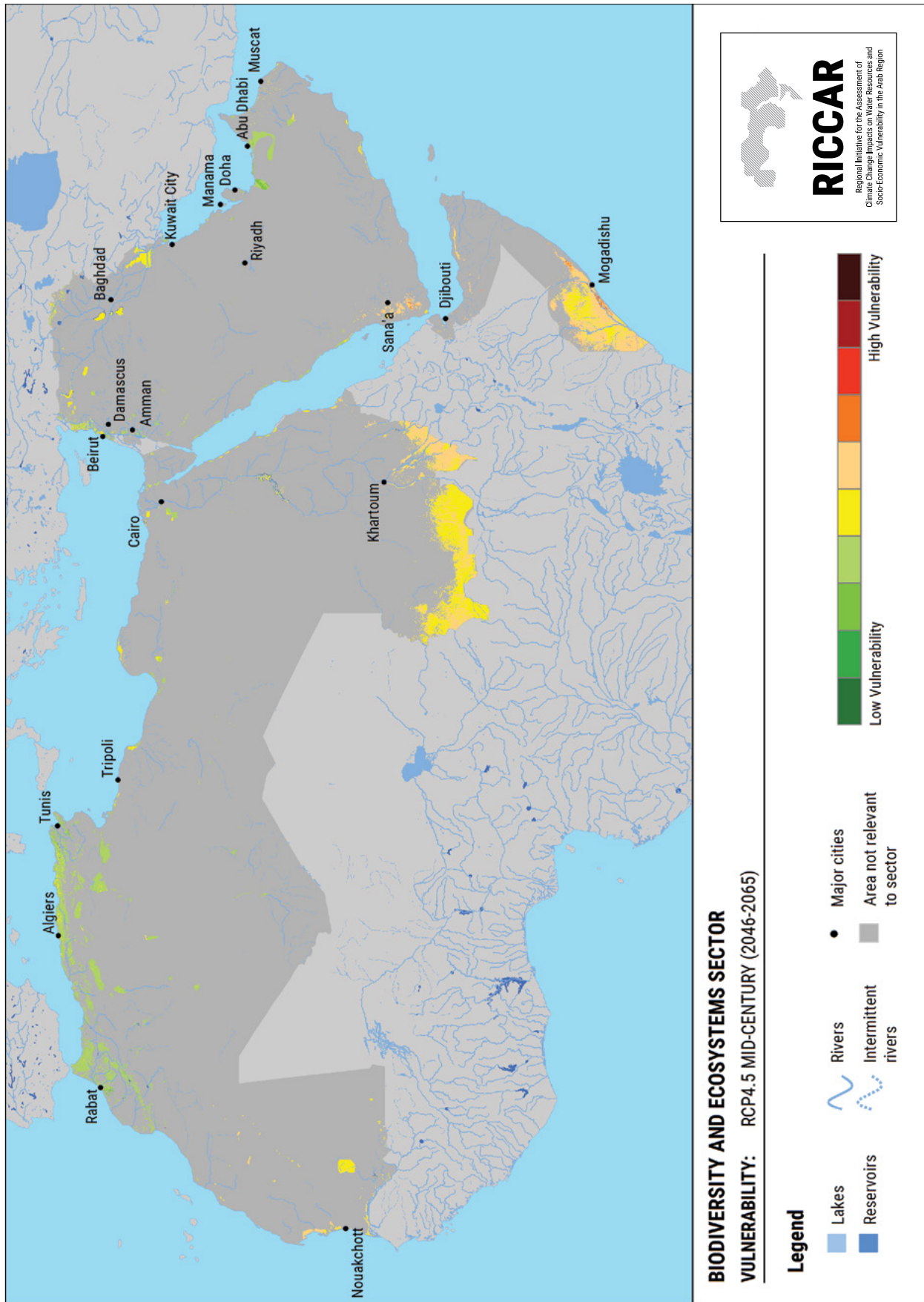


FIGURE 314

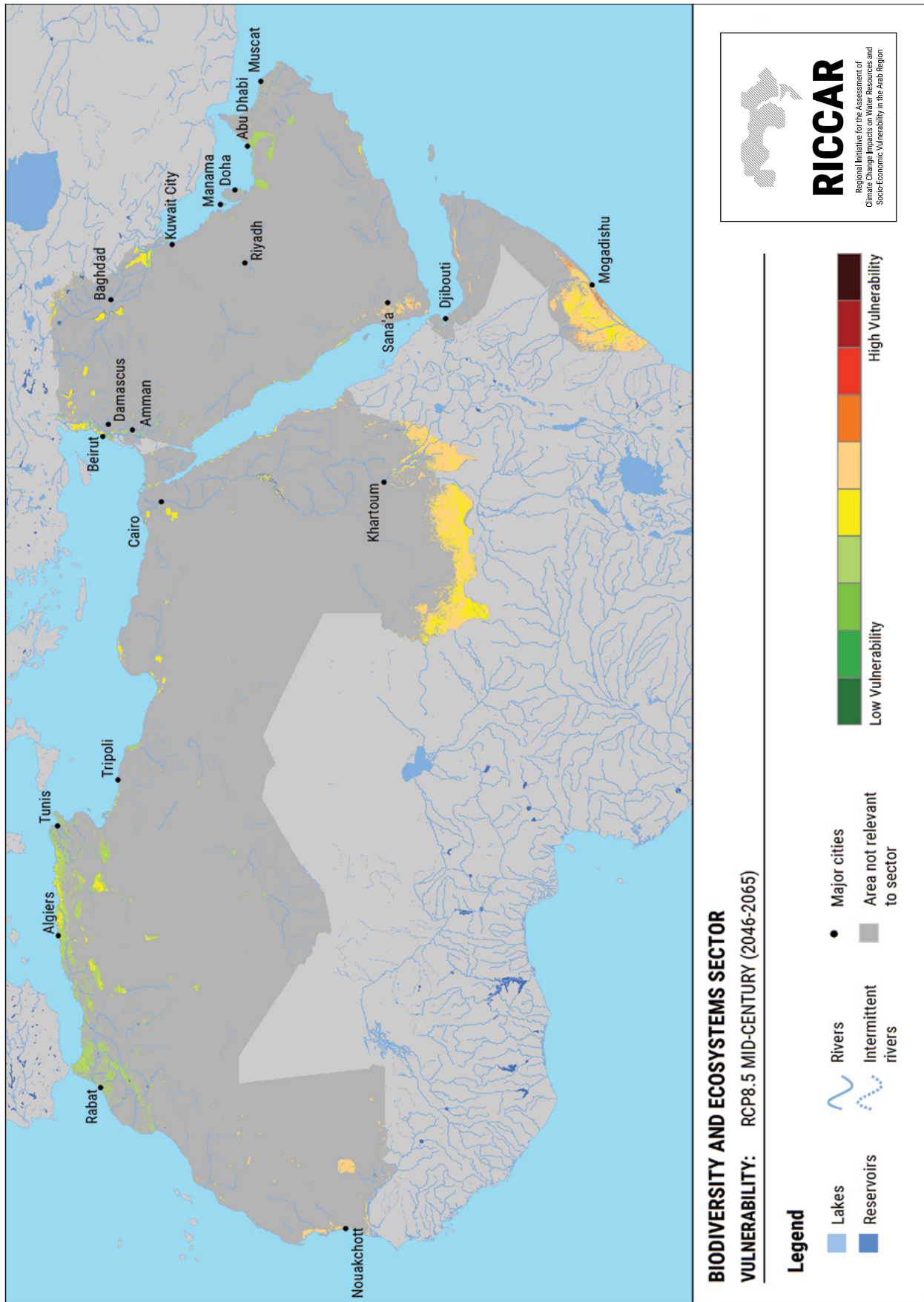
12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.2. MID-CENTURY RCP 4.5

FIGURE 315



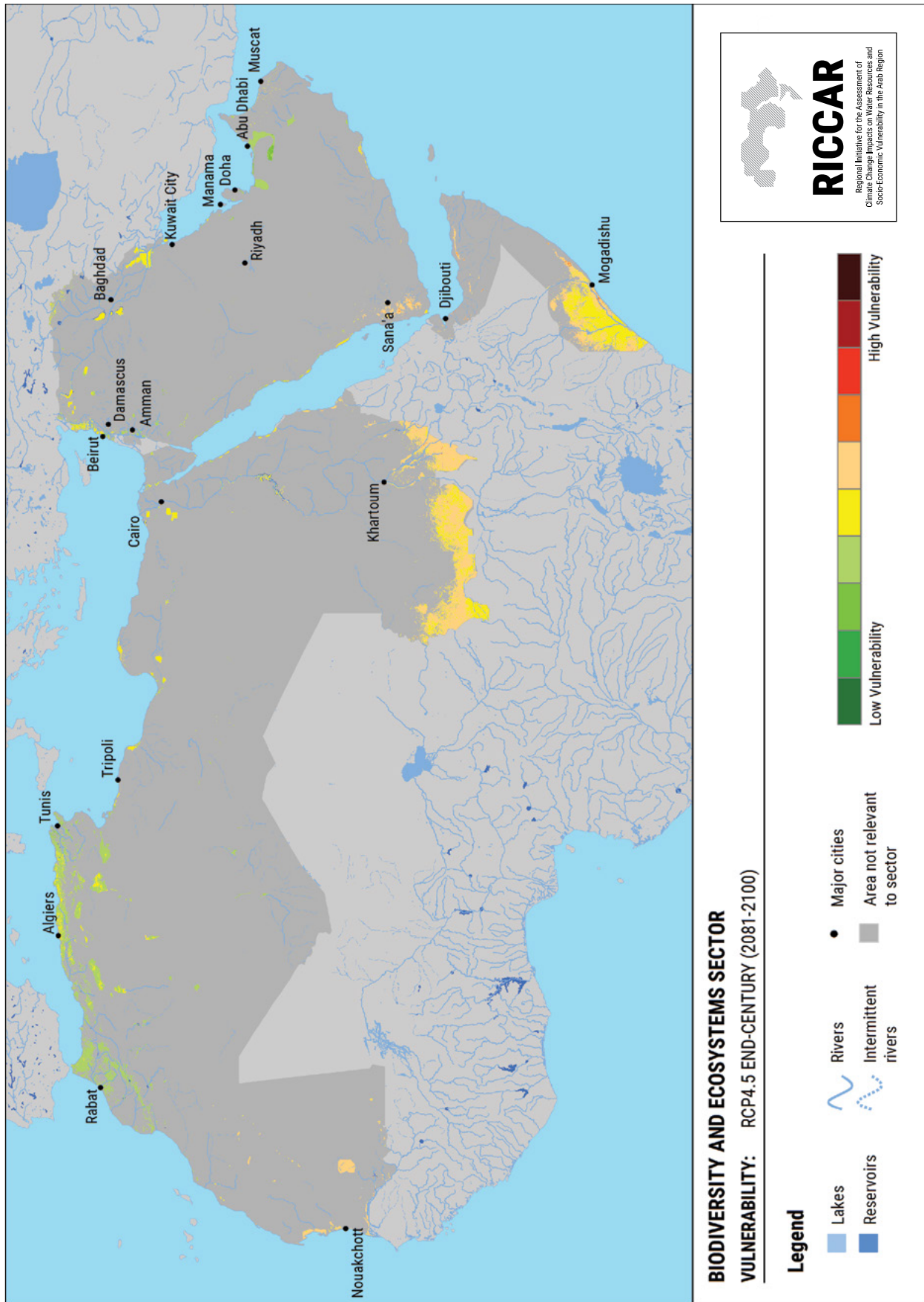
12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.3. MID-CENTURY RCP 8.5

FIGURE 316



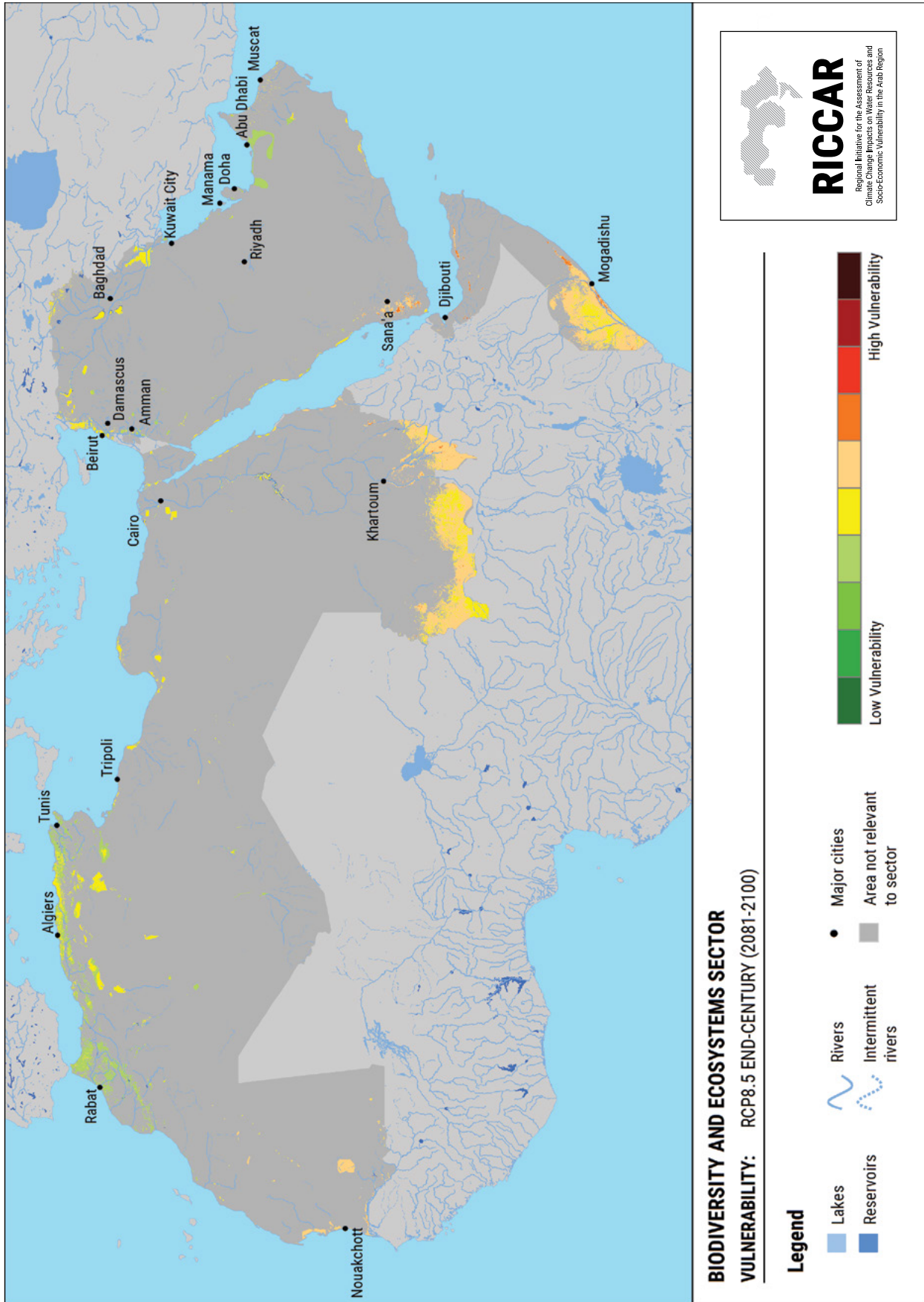
12.3. BIODIVERSITY AND ECOSYSTEMS SECTOR: VULNERABILITY – 12.3.4. END-CENTURY RCP 4.5

FIGURE 317



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

FIGURE 318



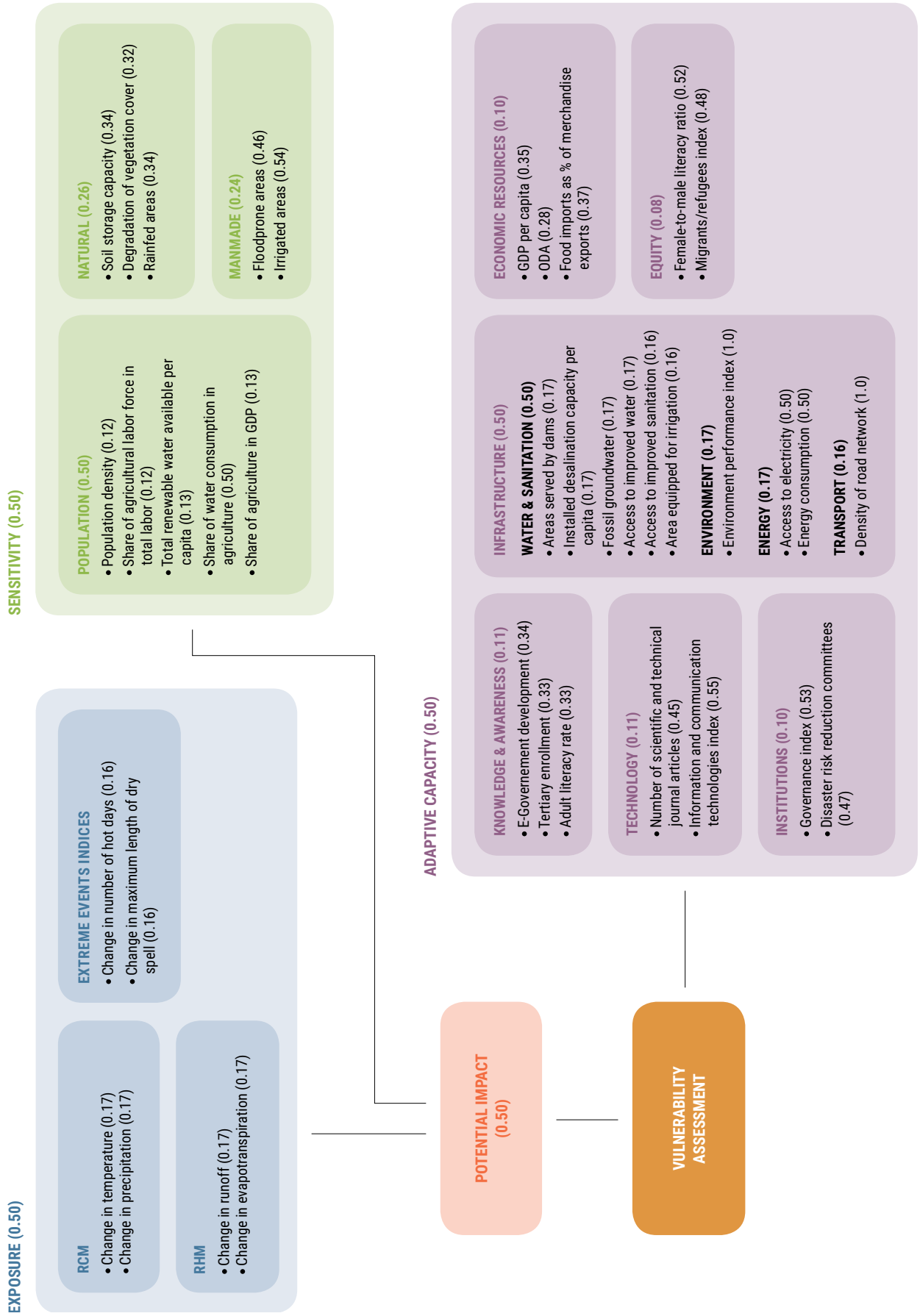
CHAPTER 13



AGRICULTURE SECTOR

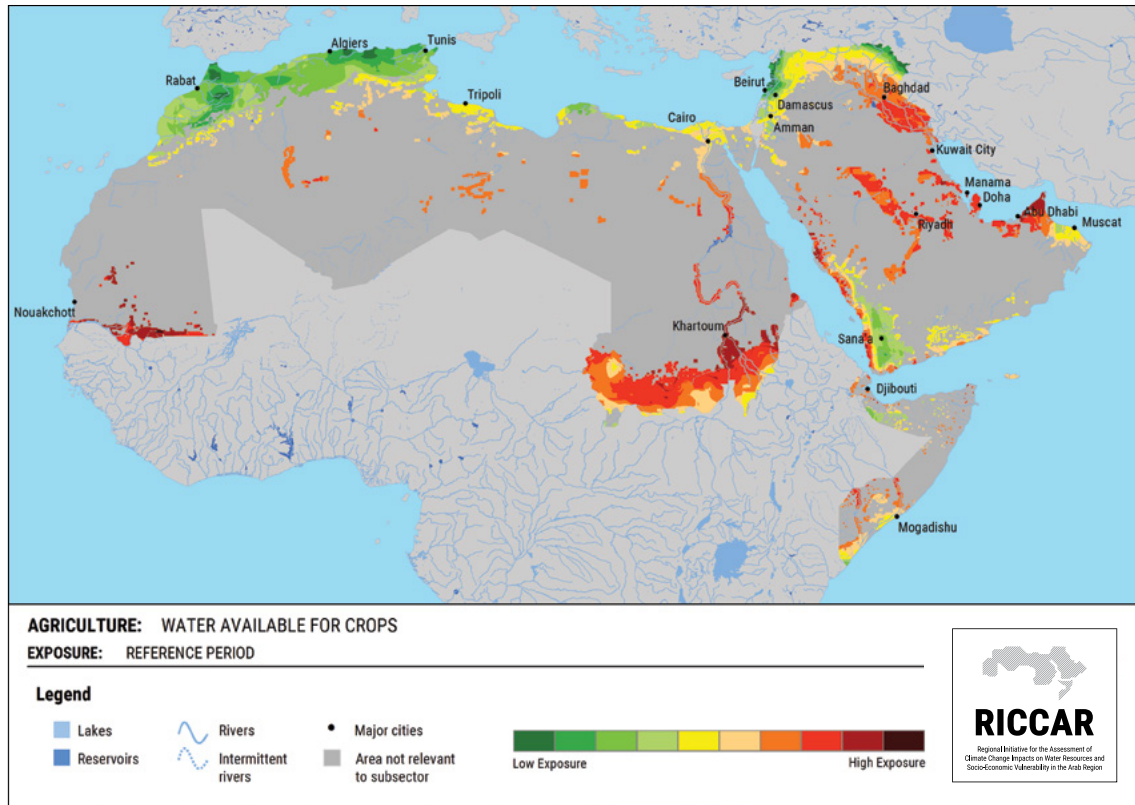
13.1. WATER AVAILABLE FOR CROPS – 13.1.1. IMPACT CHAIN

FIGURE 319



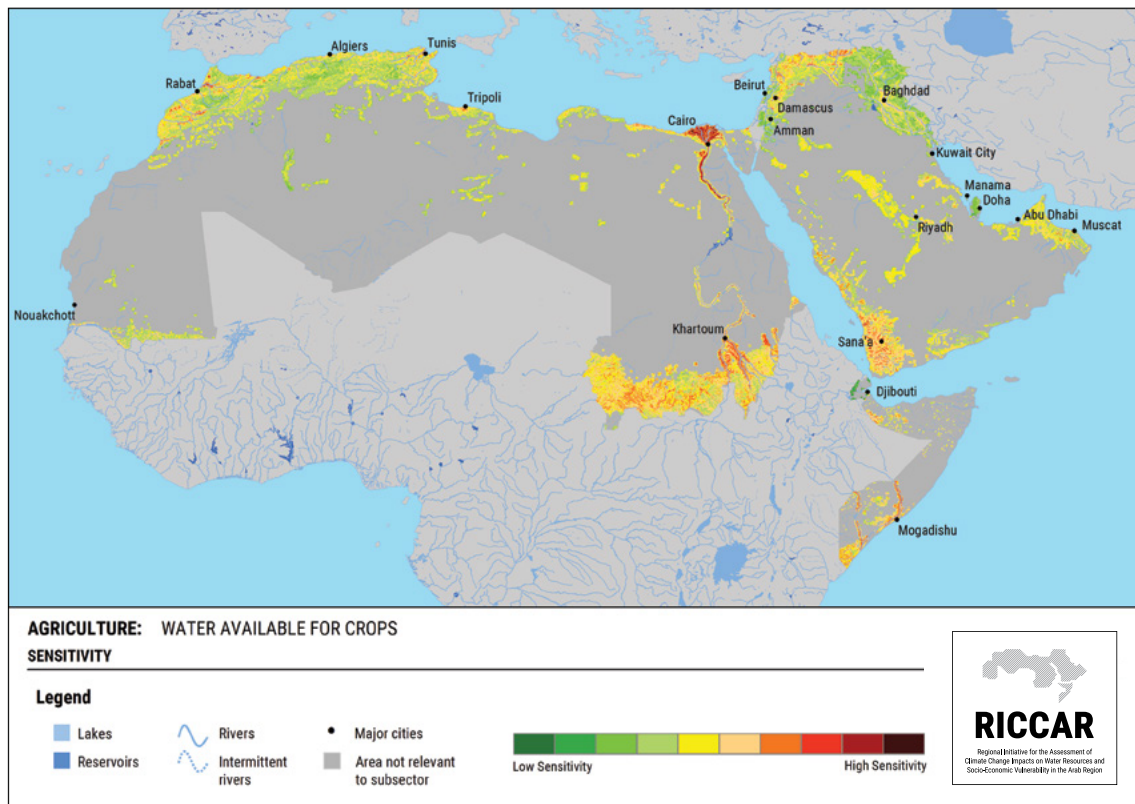
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.1. EXPOSURE

FIGURE 320



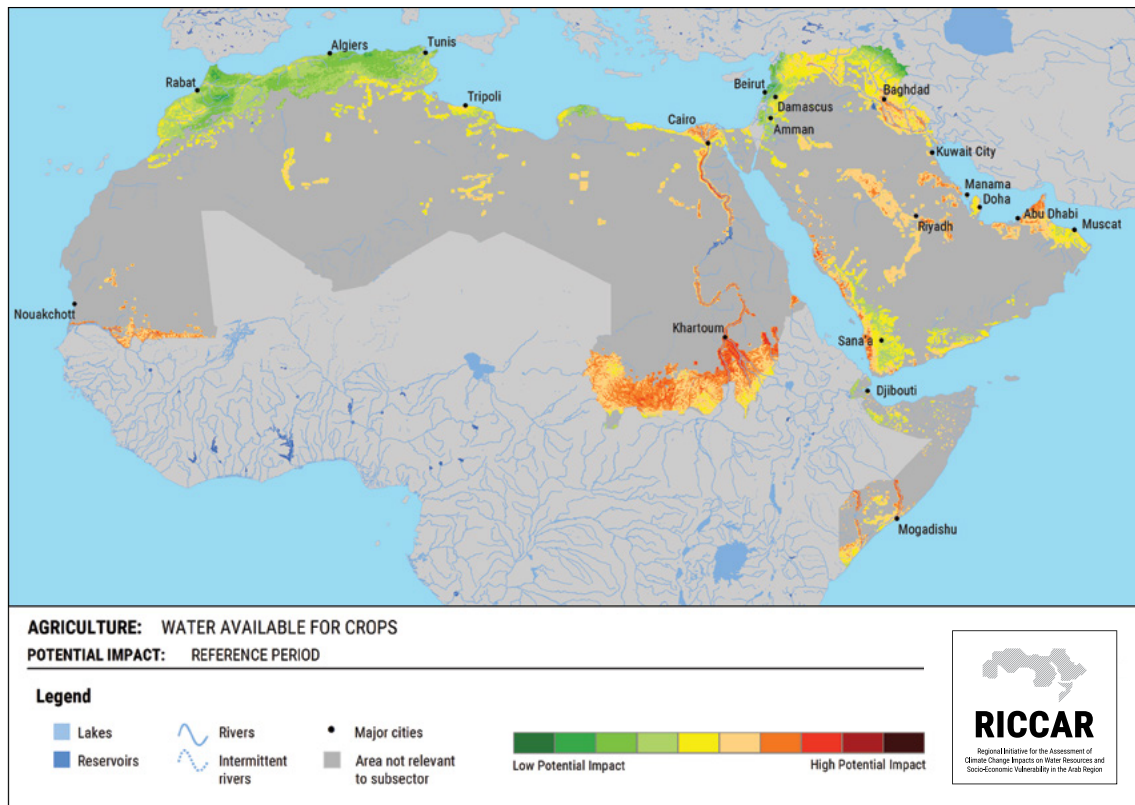
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.2. SENSITIVITY

FIGURE 321



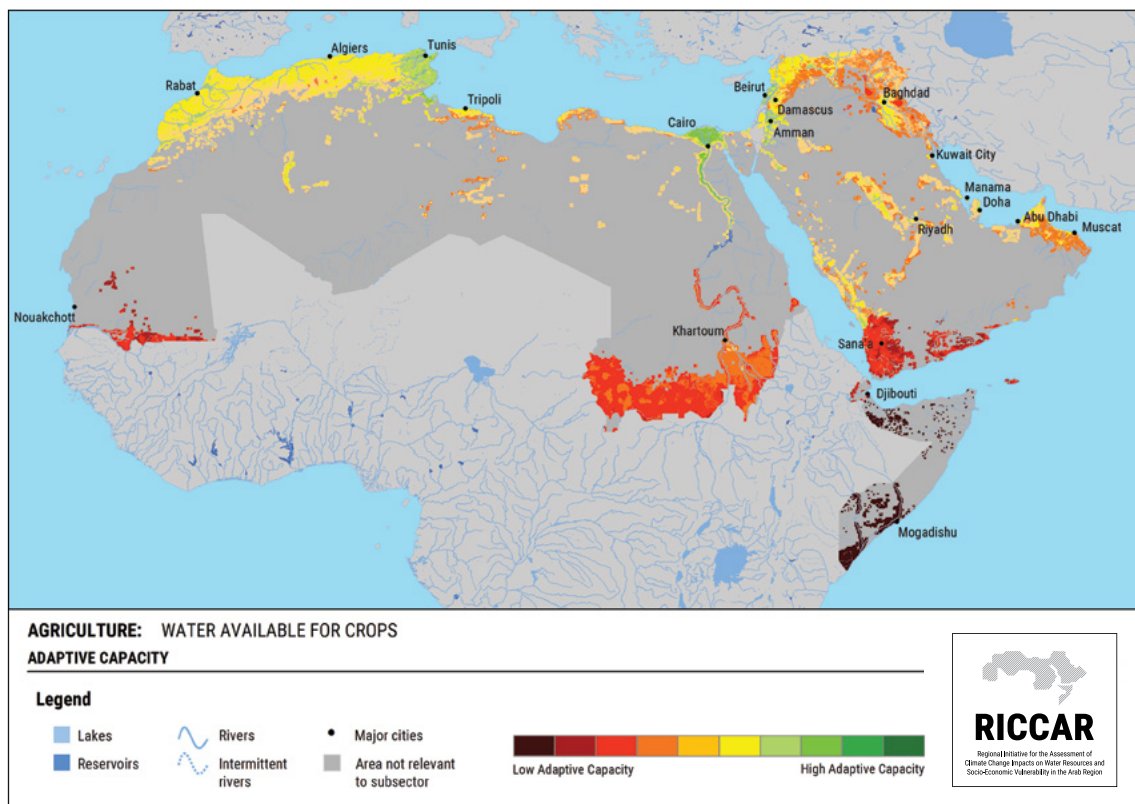
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.3. POTENTIAL IMPACT

FIGURE 322



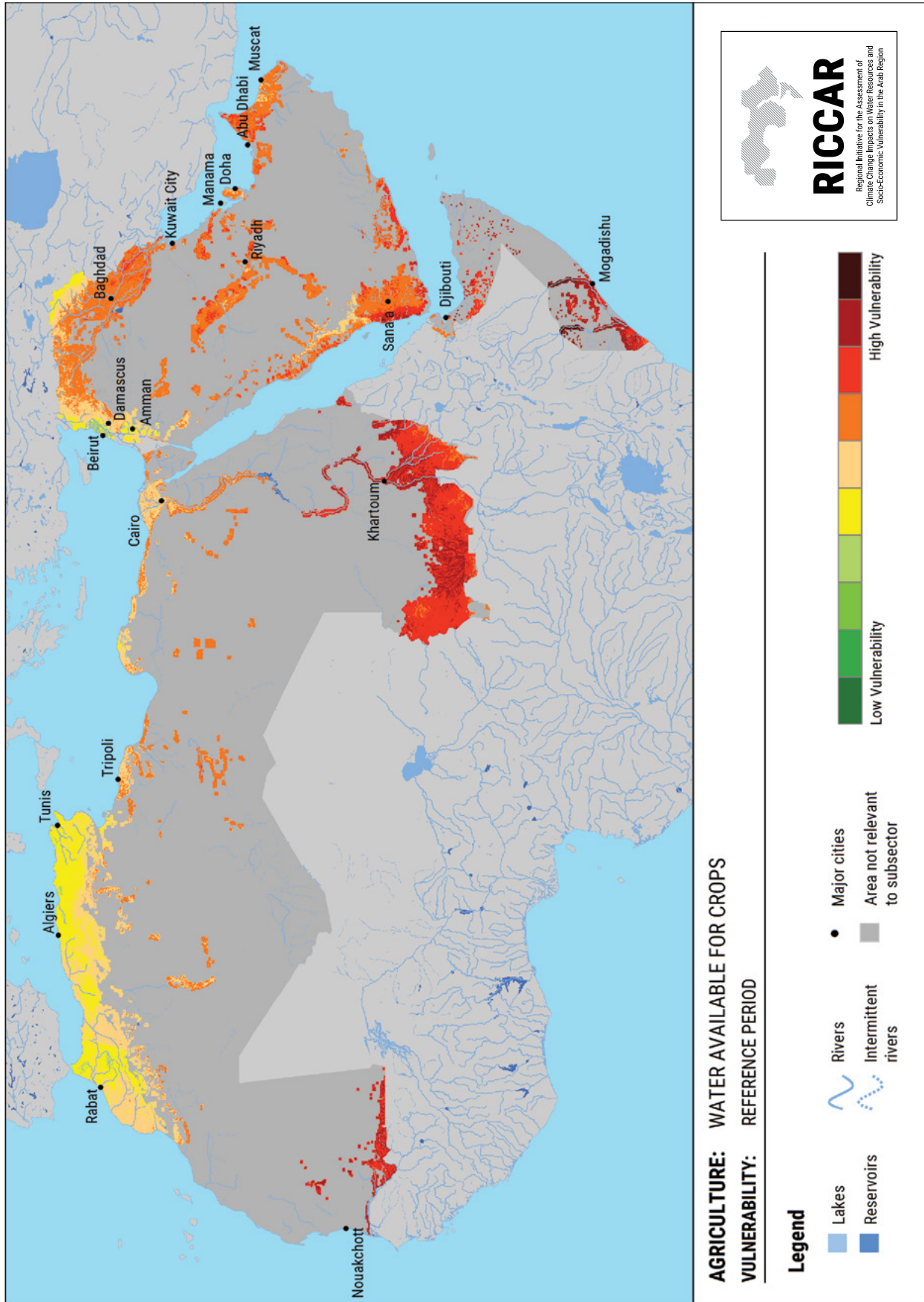
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.4. ADAPTIVE CAPACITY

FIGURE 323



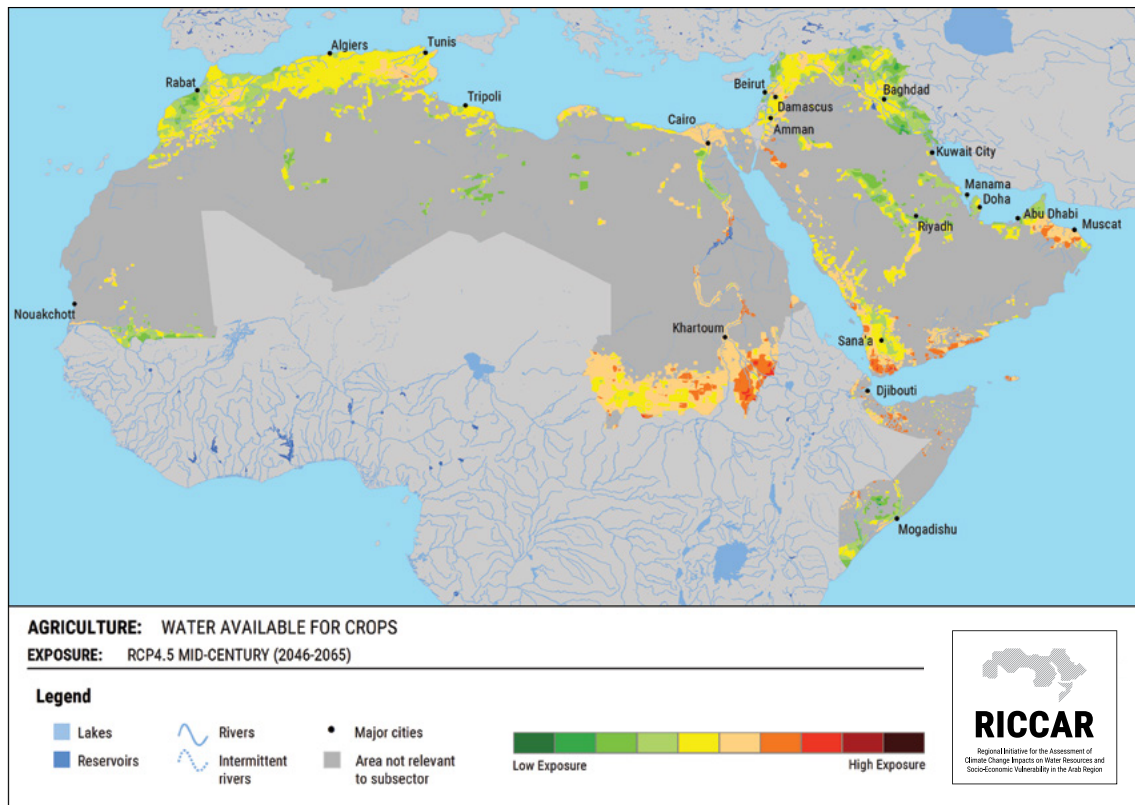
13.1. WATER AVAILABLE FOR CROPS – 13.1.2. REFERENCE PERIOD – 13.1.2.5. VULNERABILITY

FIGURE 324



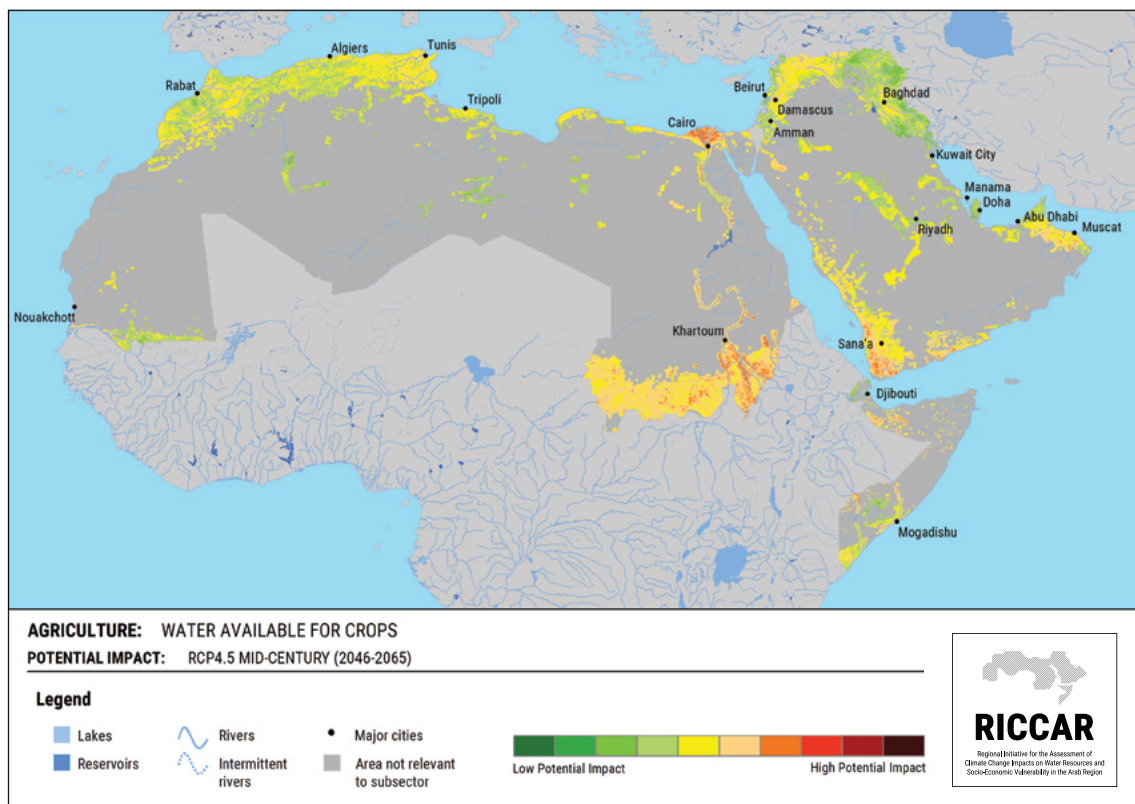
13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – 13.1.3.1. EXPOSURE

FIGURE 325



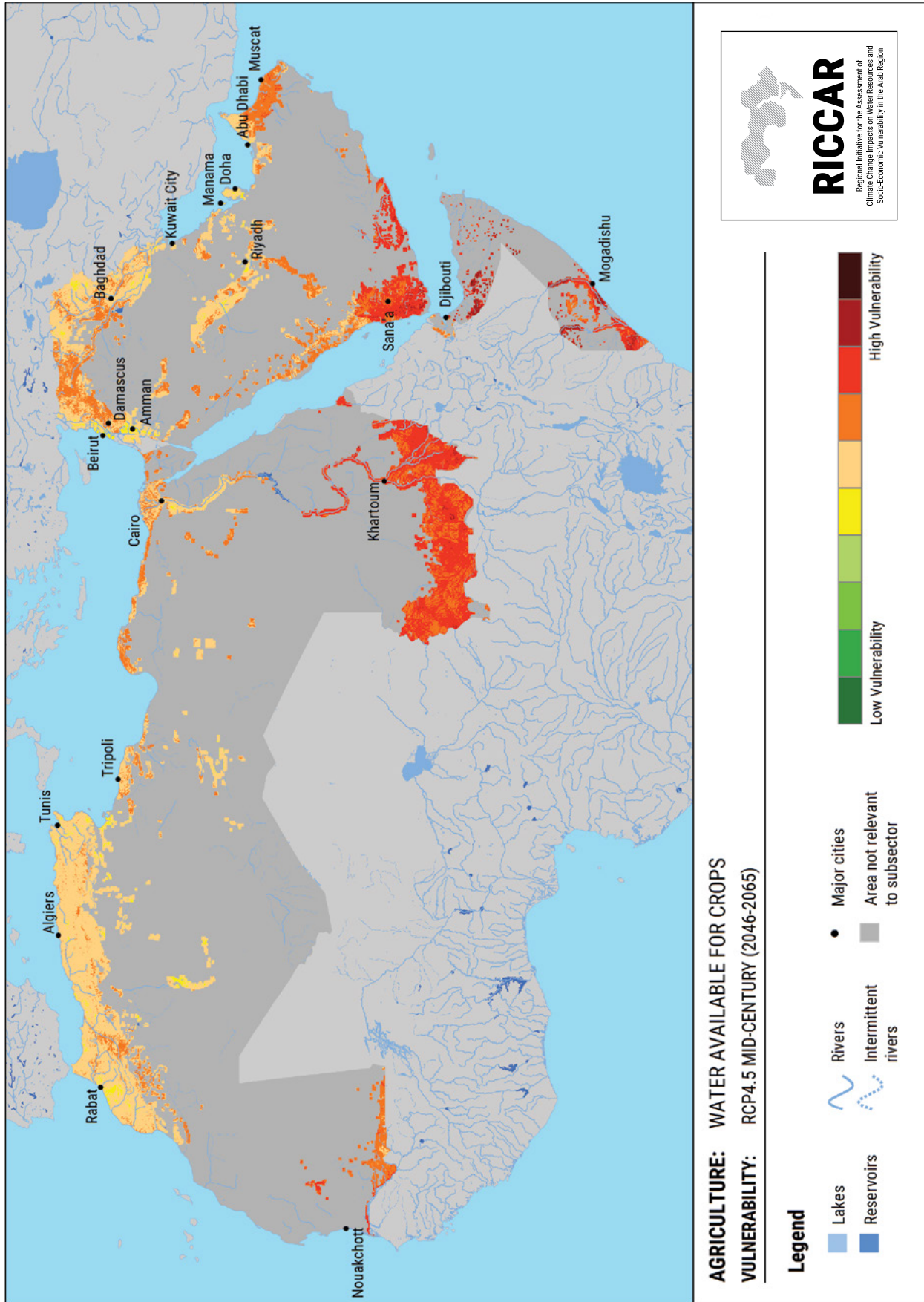
13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – 13.1.3.2. POTENTIAL IMPACT

FIGURE 326



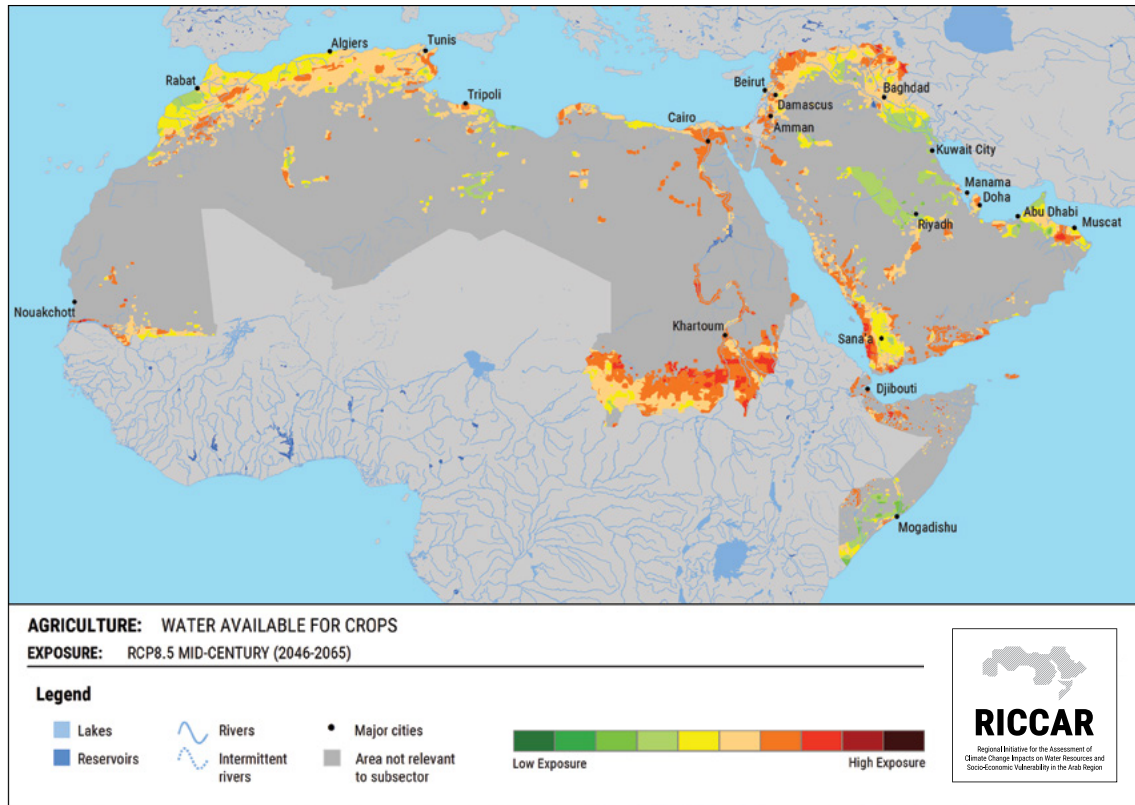
13.1. WATER AVAILABLE FOR CROPS – 13.1.3. MID-CENTURY RCP 4.5 – 13.1.3.3. VULNERABILITY

FIGURE 327



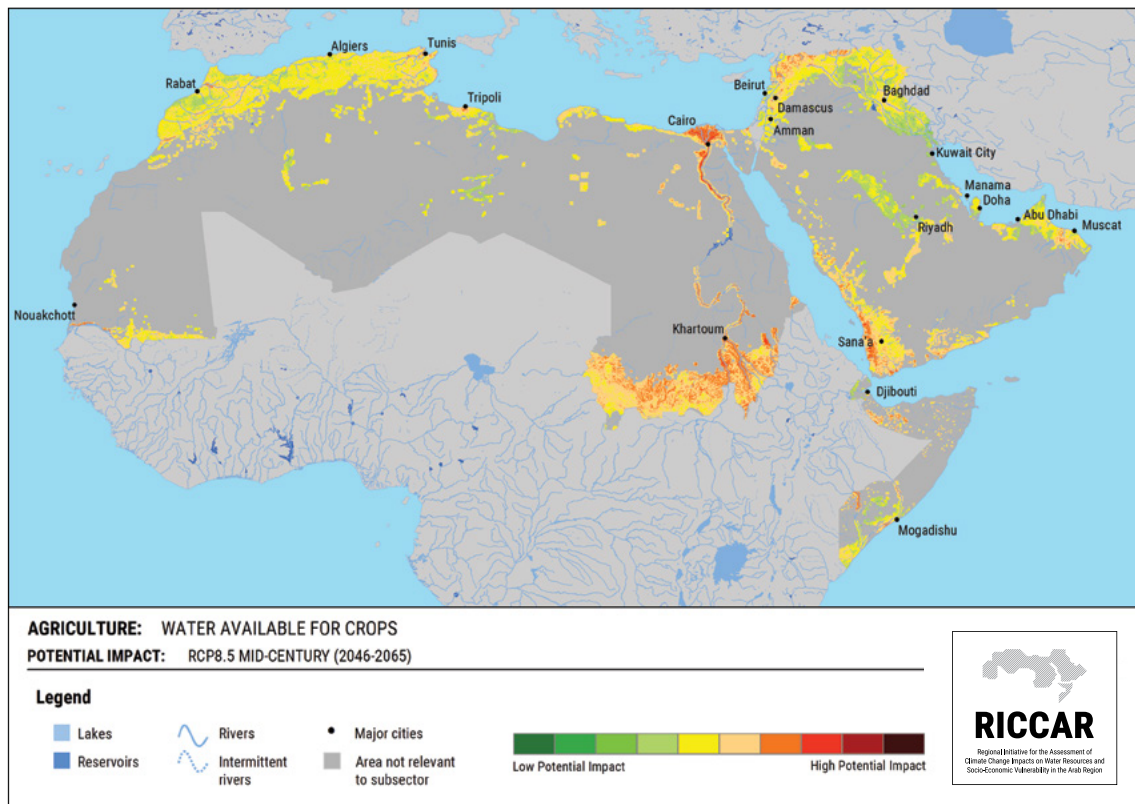
13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – 13.1.4.1. EXPOSURE

FIGURE 328



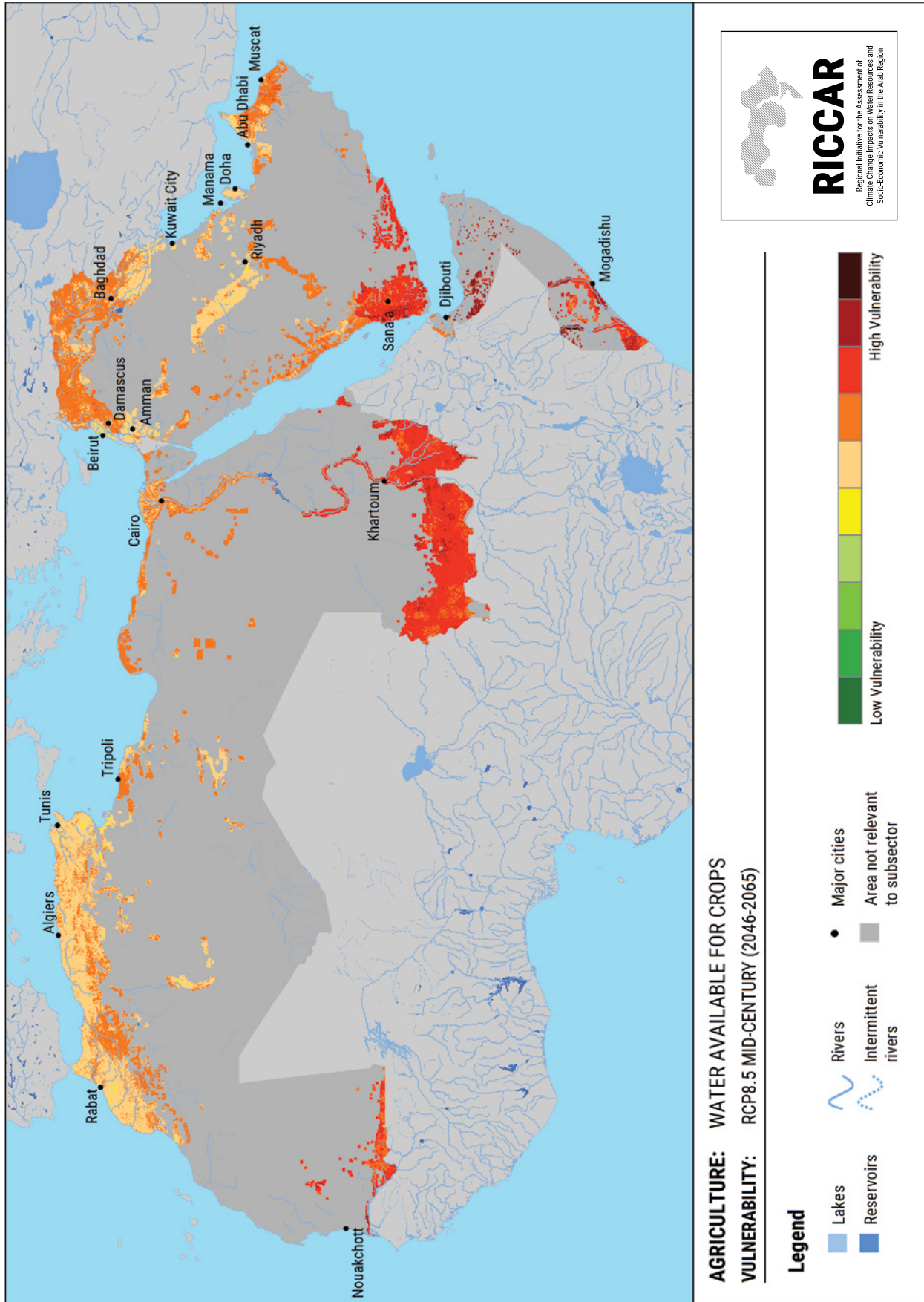
13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – 13.1.4.2. POTENTIAL IMPACT

FIGURE 329



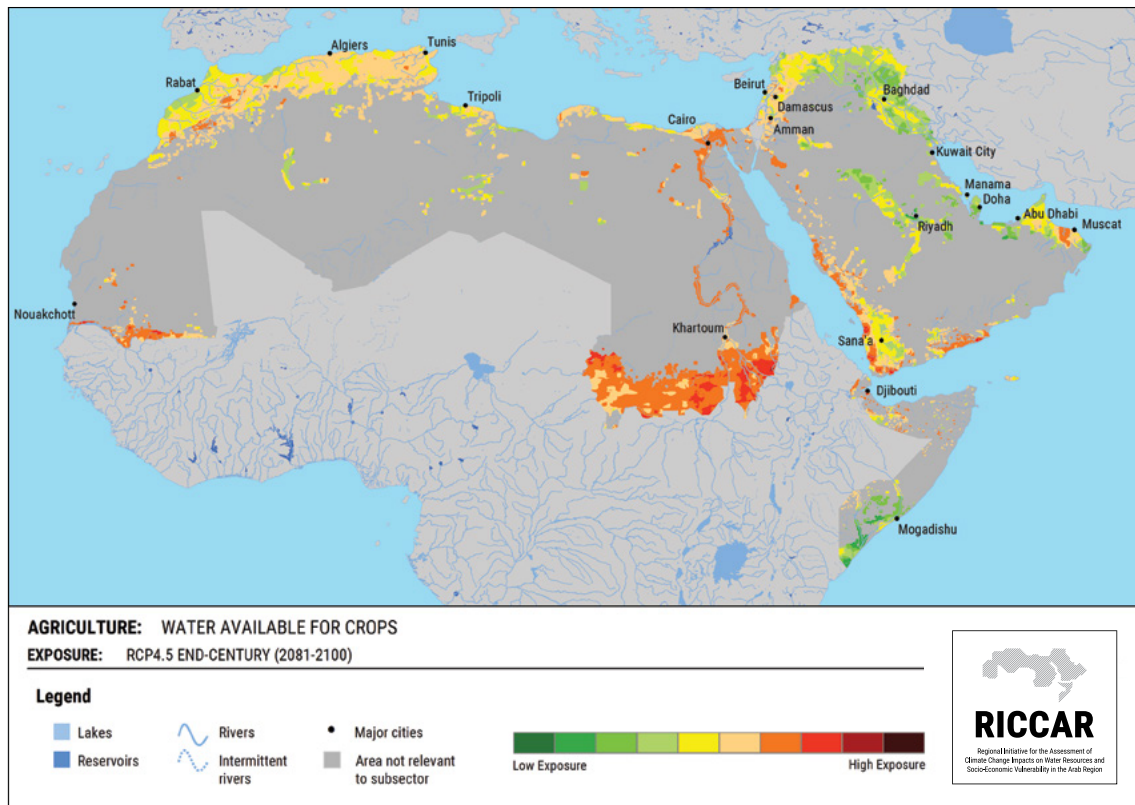
13.1. WATER AVAILABLE FOR CROPS – 13.1.4. MID-CENTURY RCP 8.5 – 13.1.4.3. VULNERABILITY

FIGURE 330



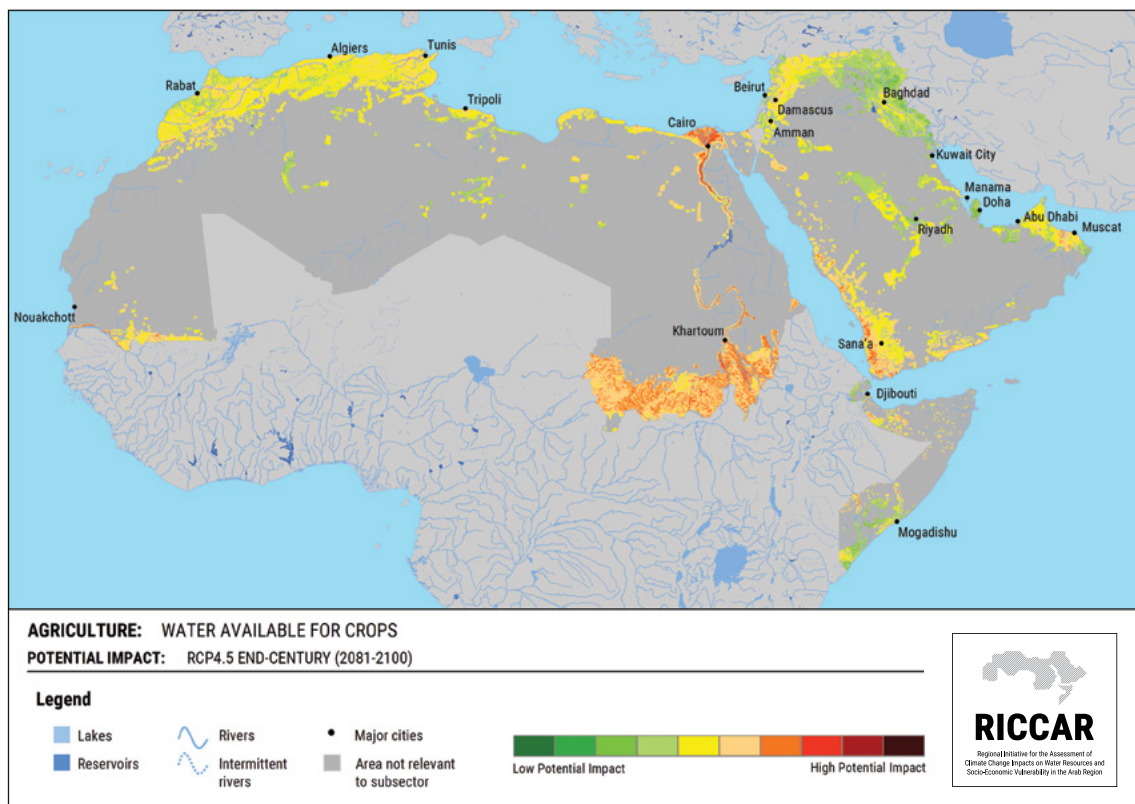
13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – 13.1.5.1. EXPOSURE

FIGURE 331



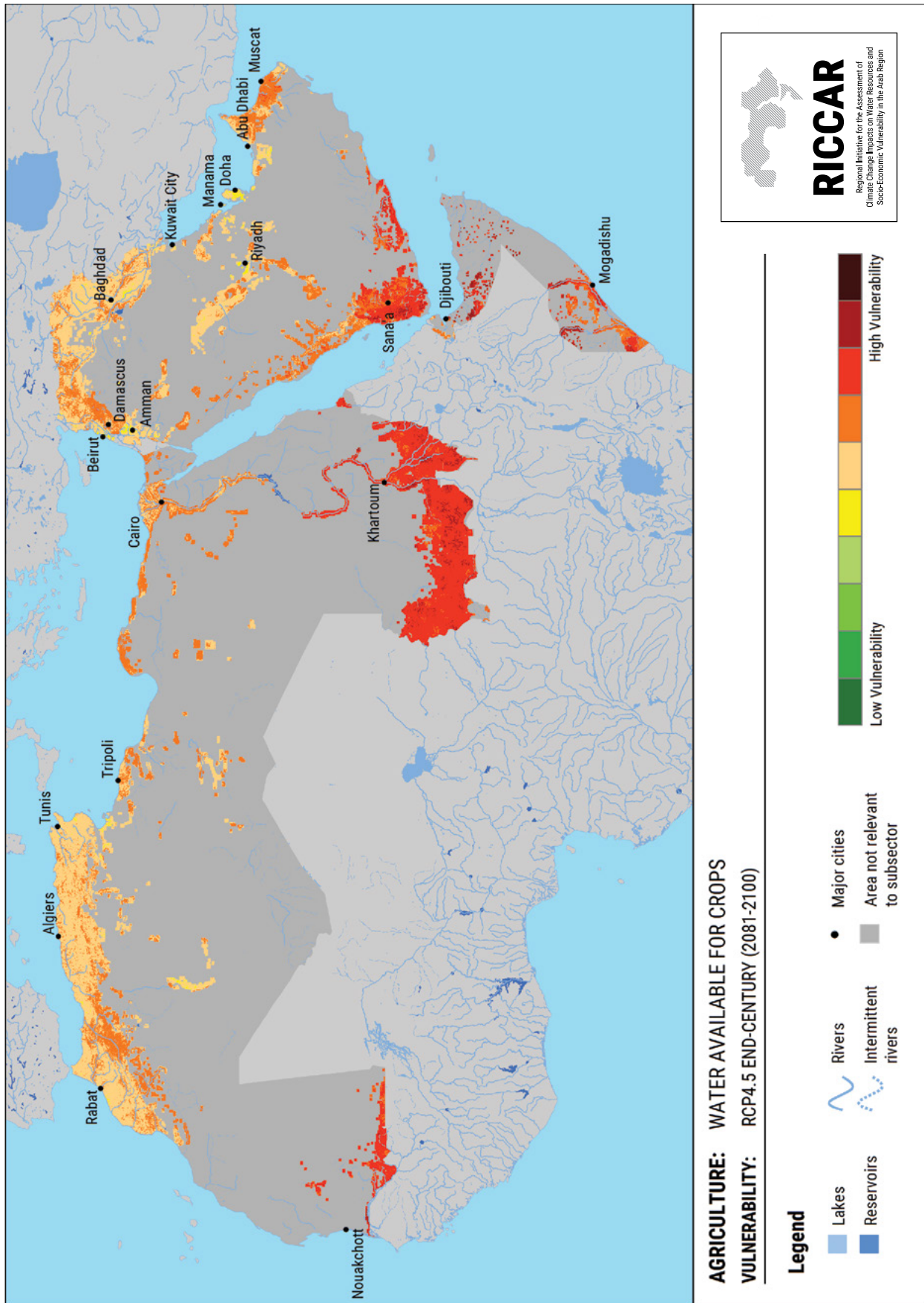
13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – 13.1.5.2. POTENTIAL IMPACT

FIGURE 332



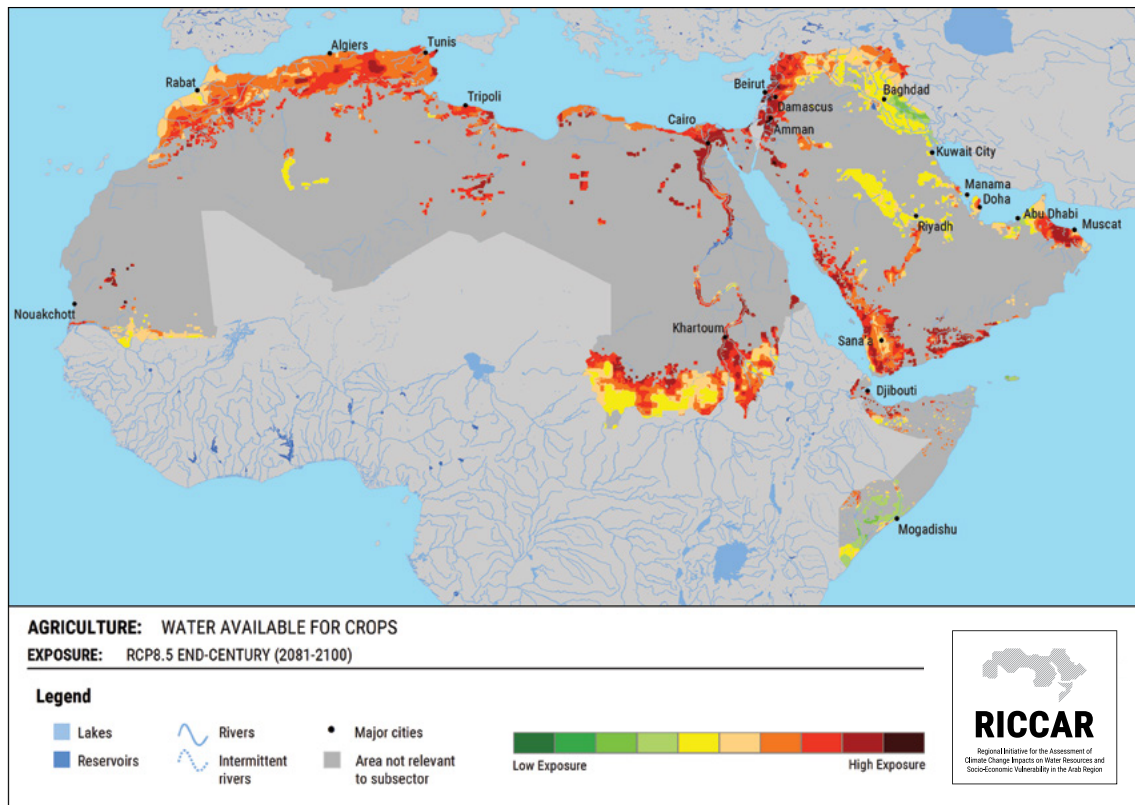
13.1. WATER AVAILABLE FOR CROPS – 13.1.5. END-CENTURY RCP 4.5 – 13.1.5.3. VULNERABILITY

FIGURE 333



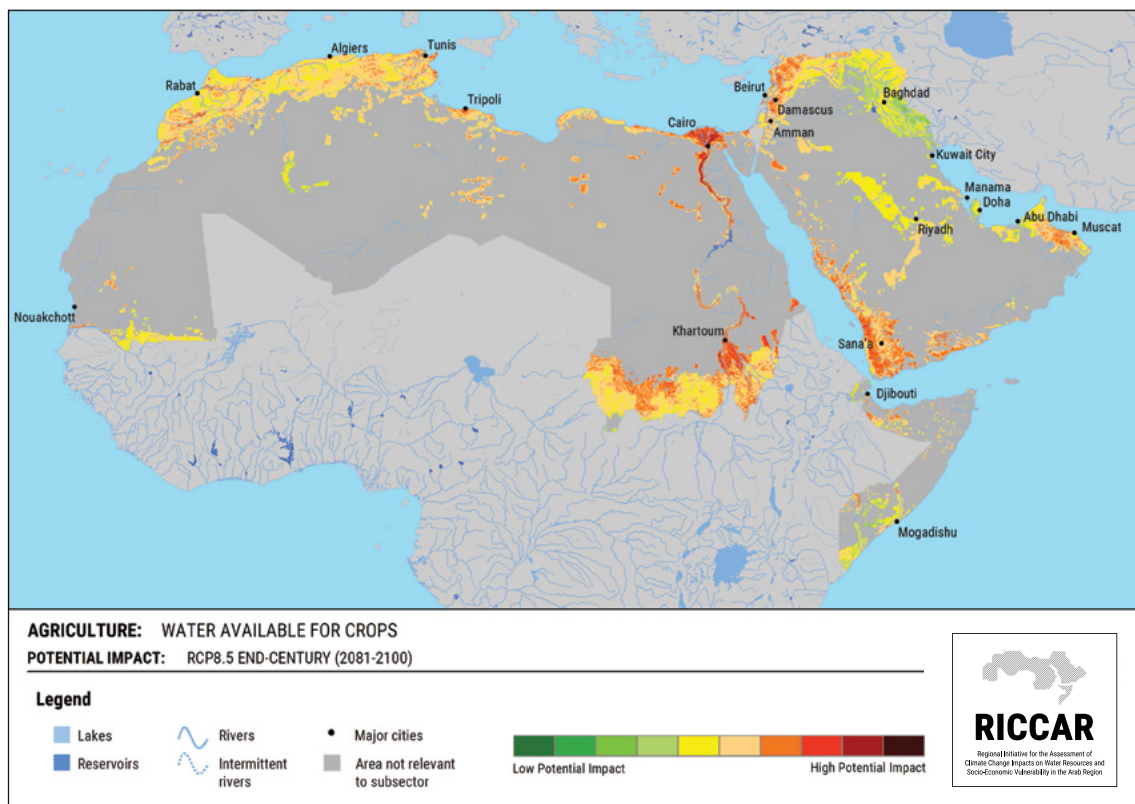
13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – 13.1.6.1. EXPOSURE

FIGURE 334



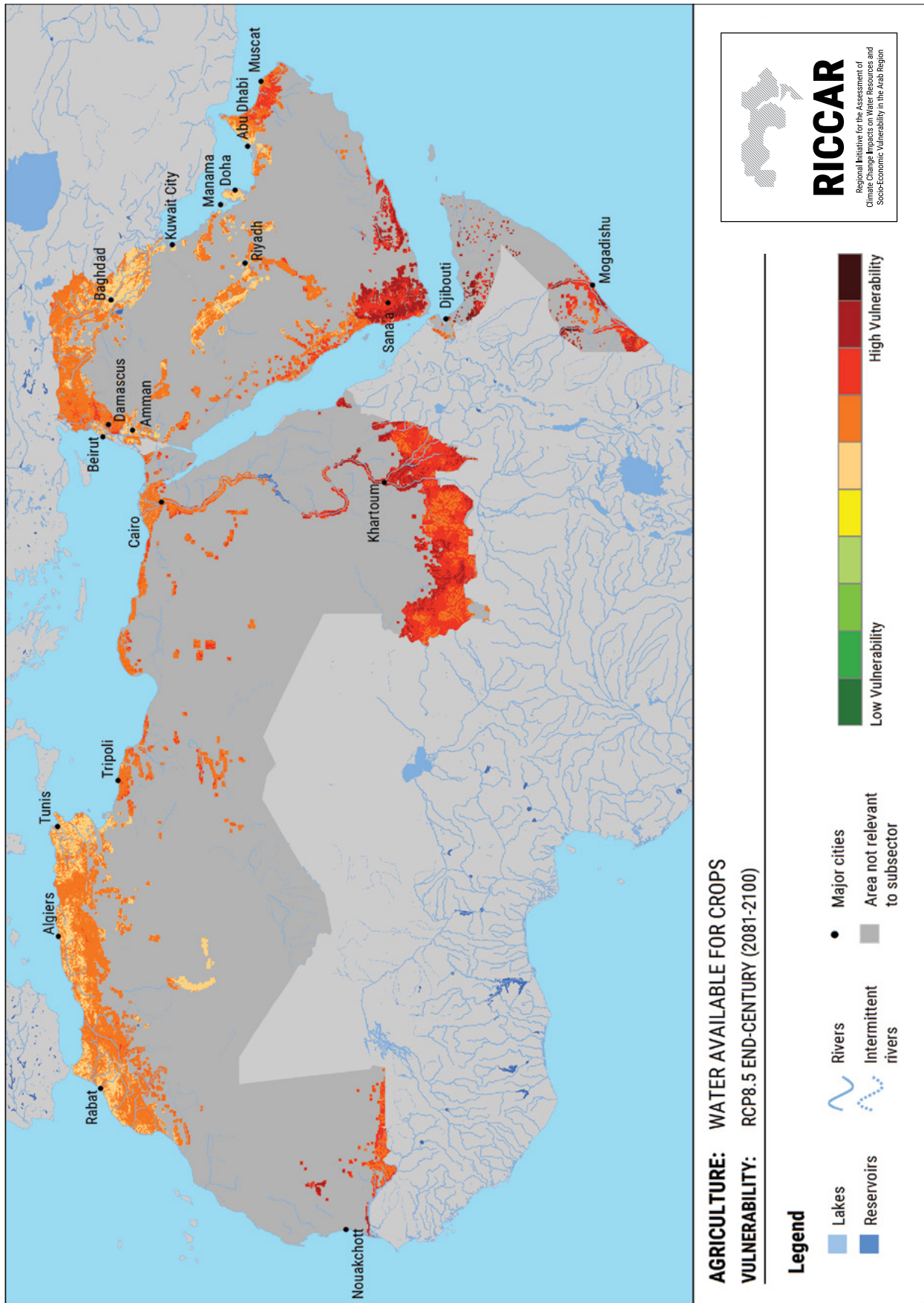
13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – 13.1.6.2. POTENTIAL IMPACT

FIGURE 335



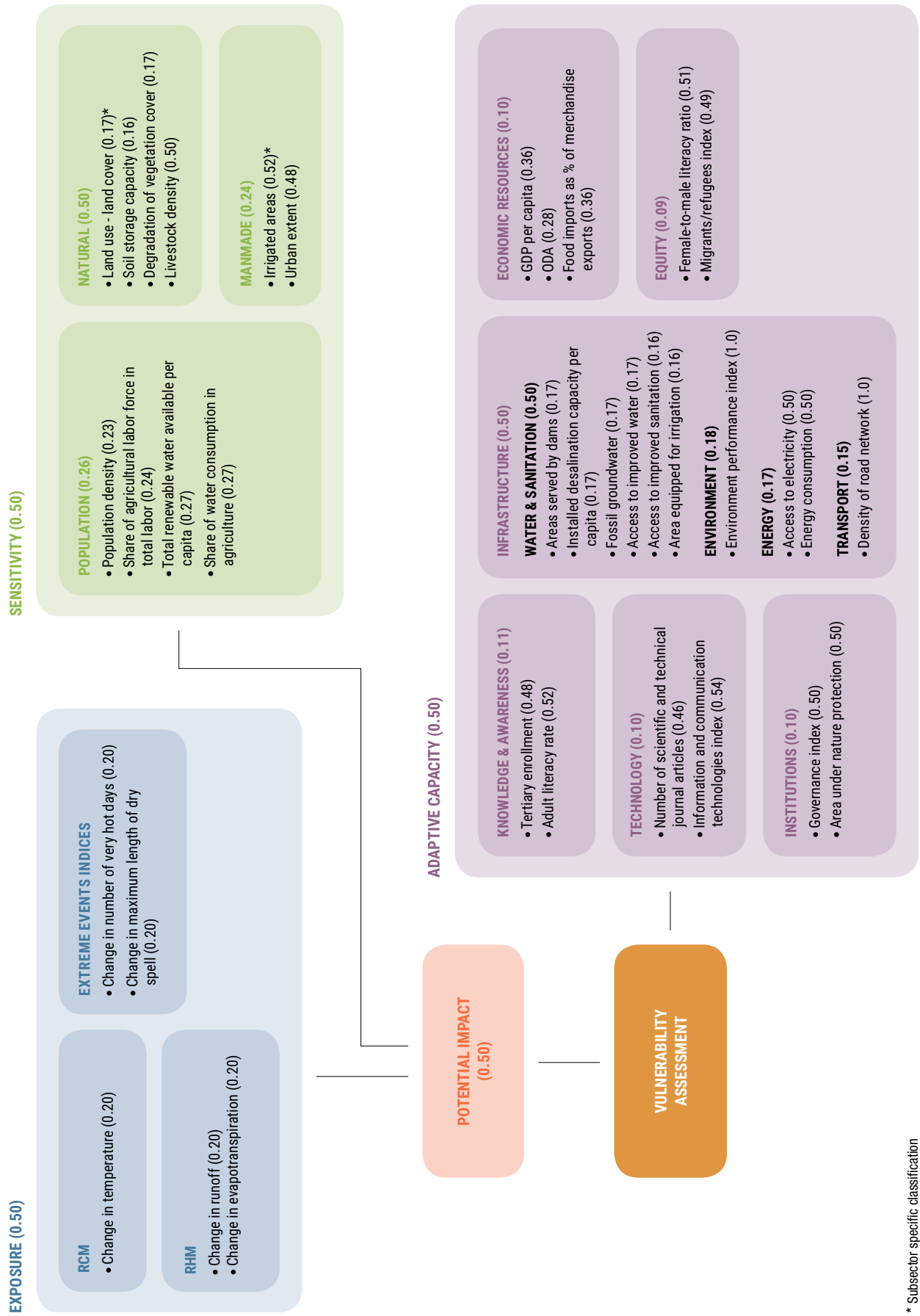
13.1. WATER AVAILABLE FOR CROPS – 13.1.6. END-CENTURY RCP 8.5 – 13.1.6.3. VULNERABILITY

FIGURE 336



13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.1. IMPACT CHAIN

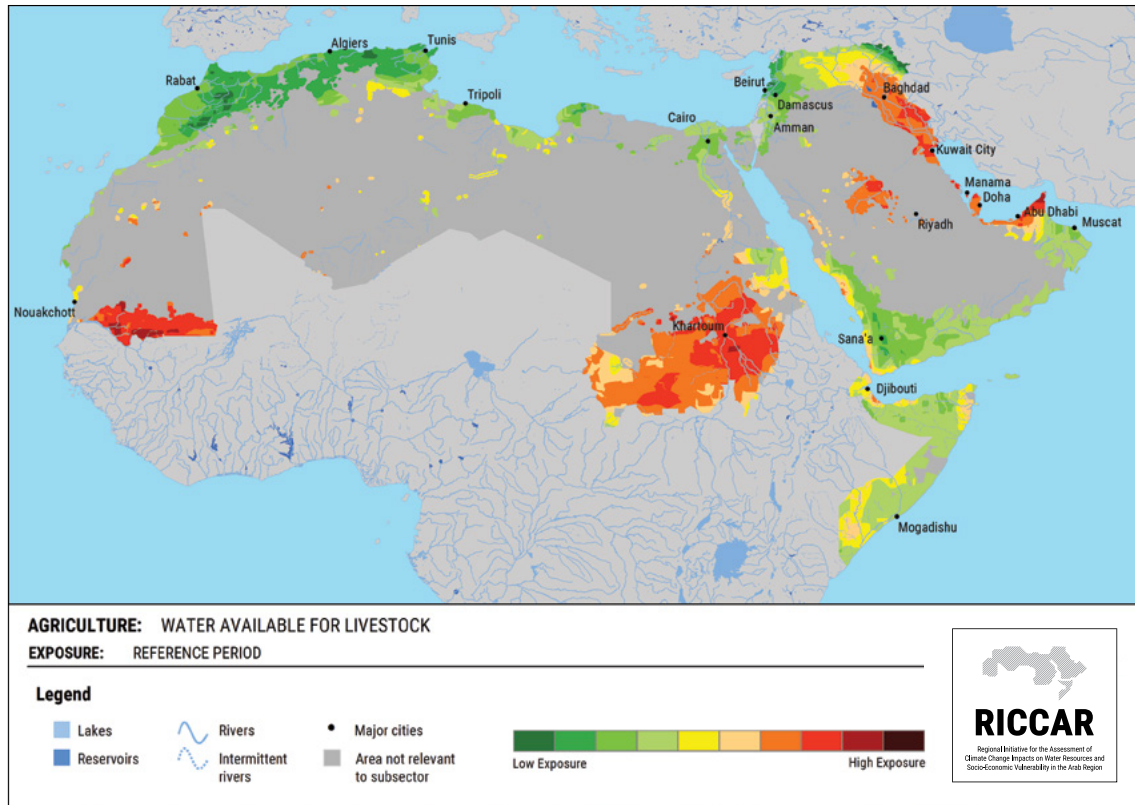
FIGURE 337



* Subsector specific classification

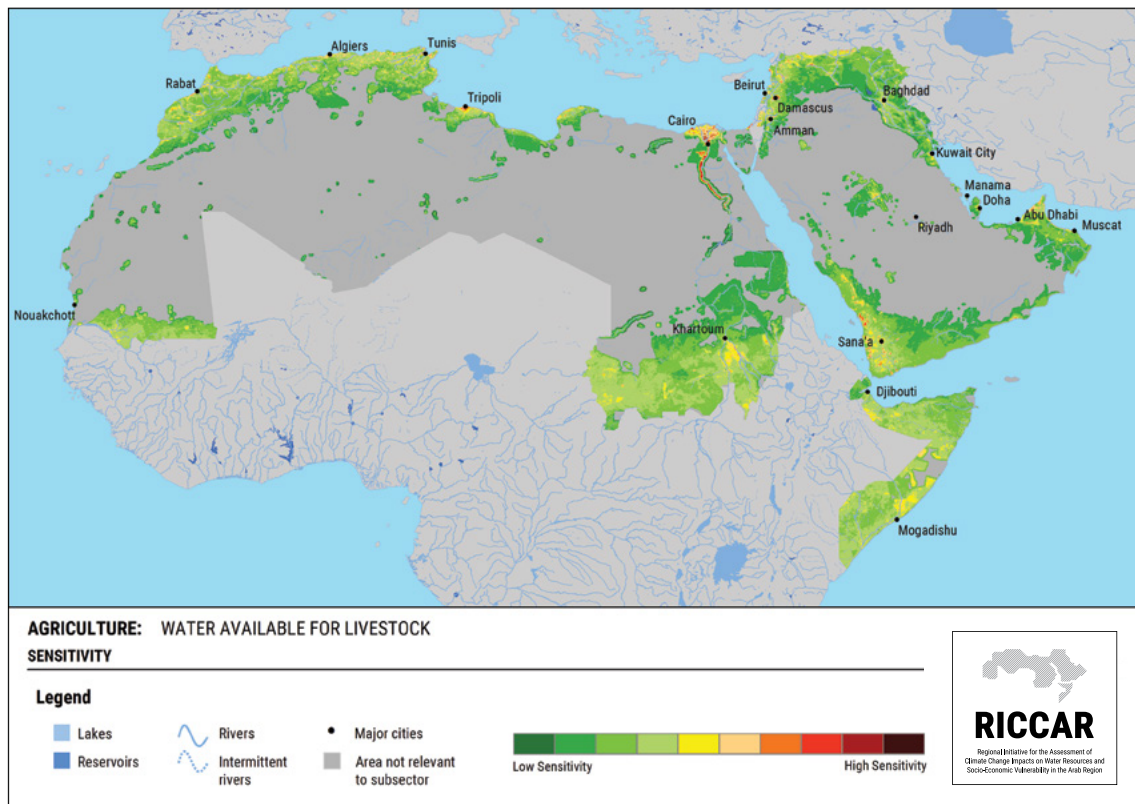
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.1. EXPOSURE

FIGURE 338



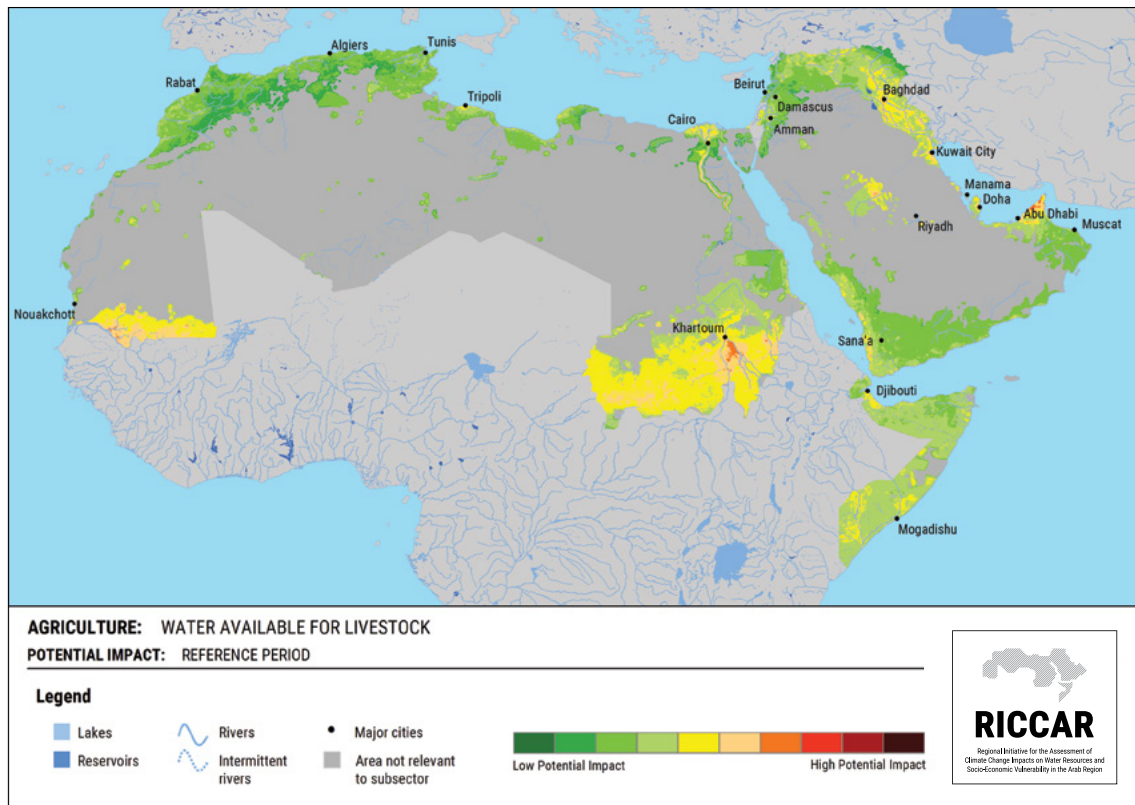
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.2. SENSITIVITY

FIGURE 339



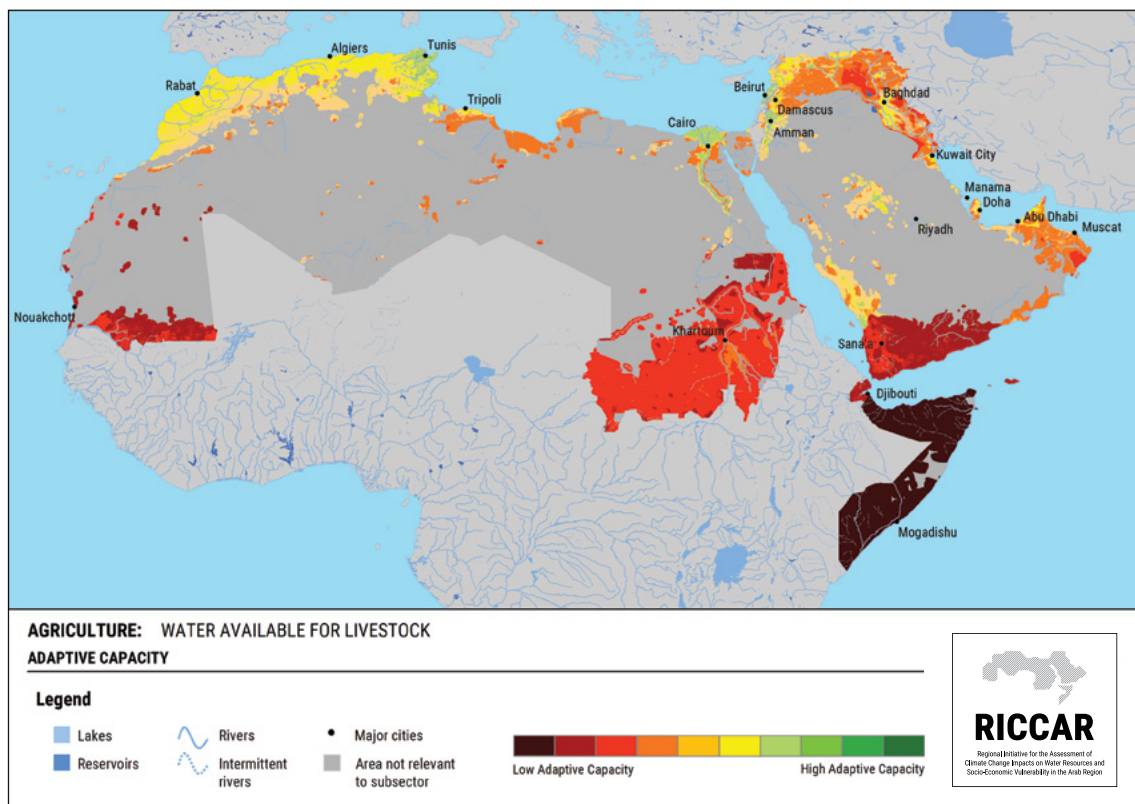
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.3. POTENTIAL IMPACT

FIGURE 340



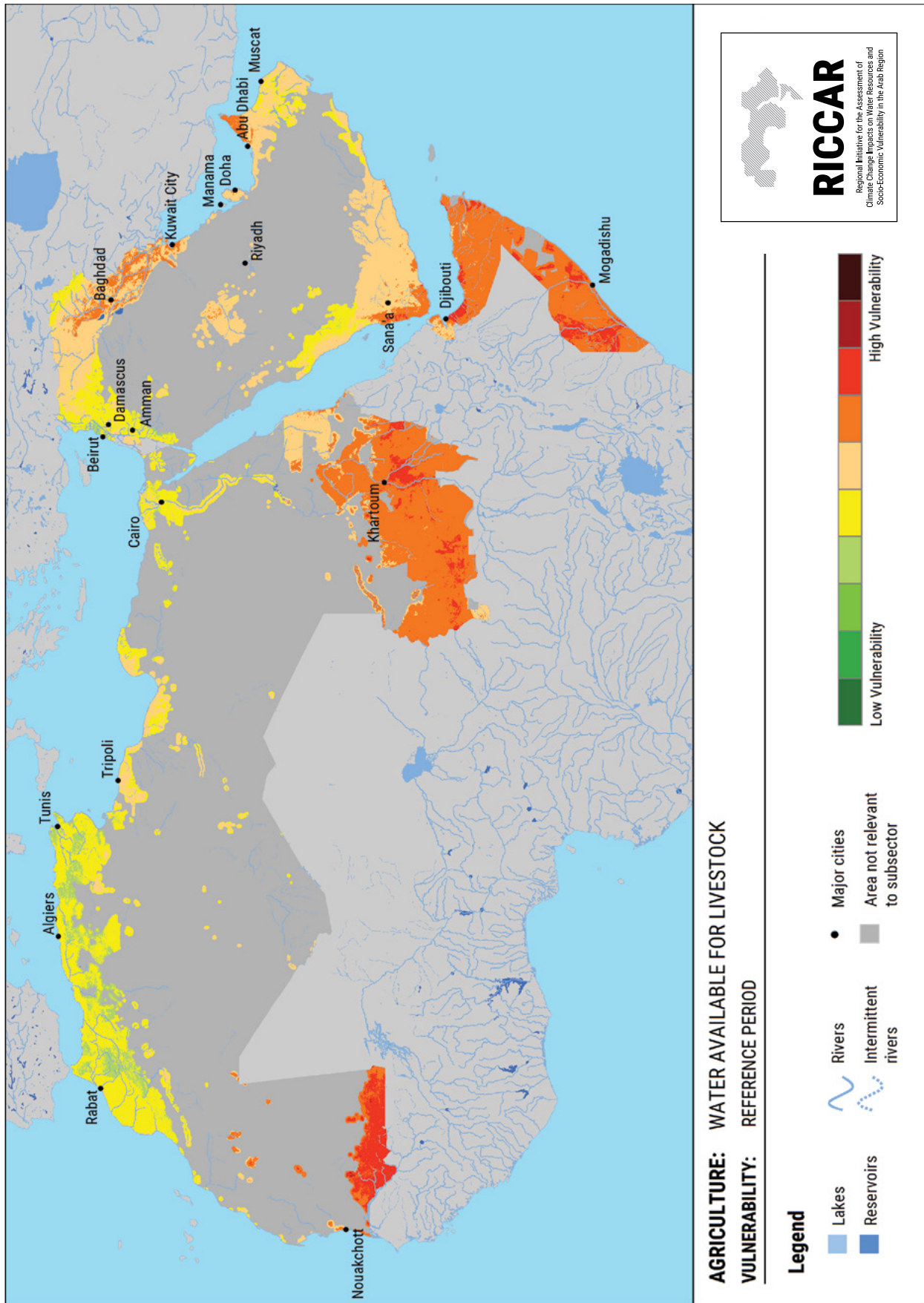
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.4. ADAPTIVE CAPACITY

FIGURE 341



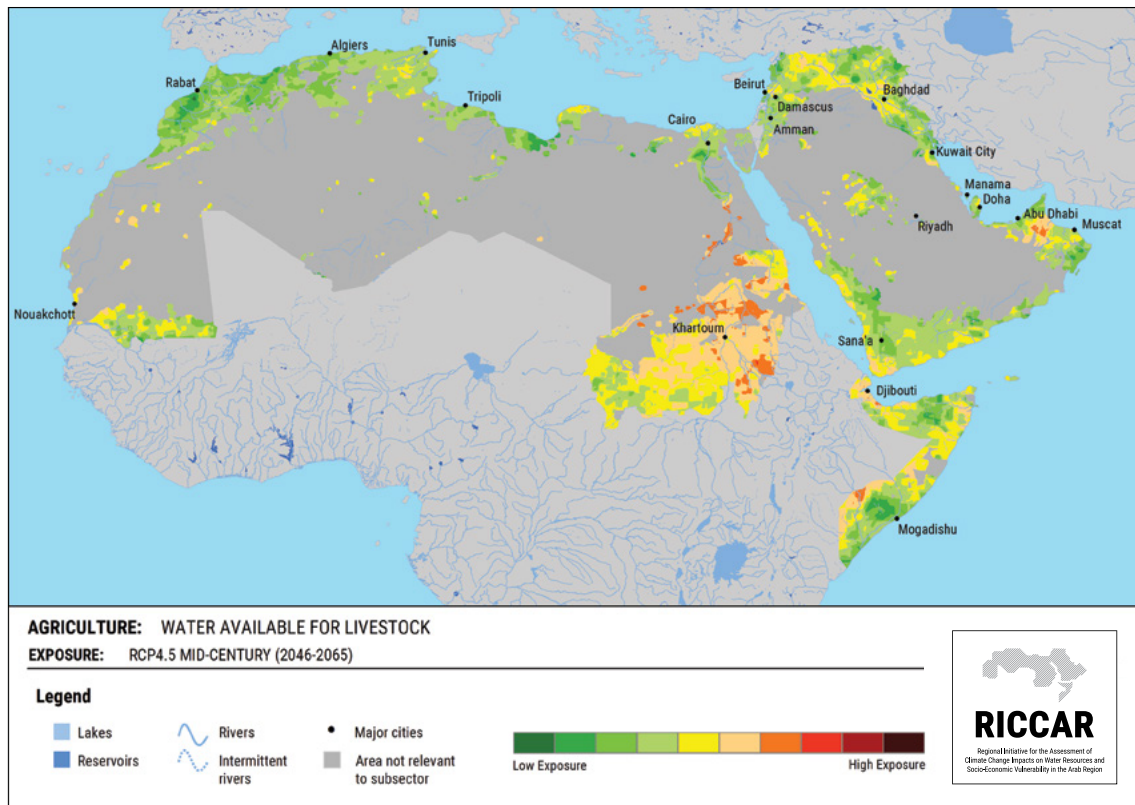
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.2. REFERENCE PERIOD – 13.2.2.5. VULNERABILITY

FIGURE 342



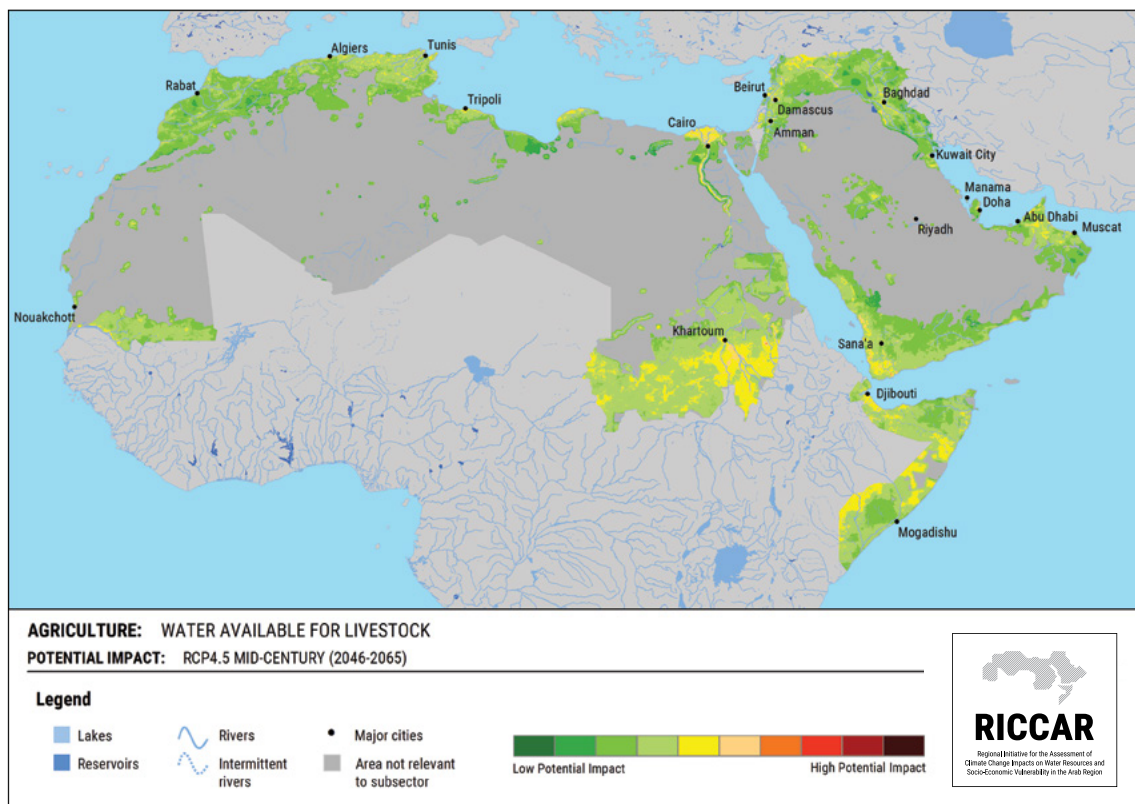
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – 13.2.3.1. EXPOSURE

FIGURE 343



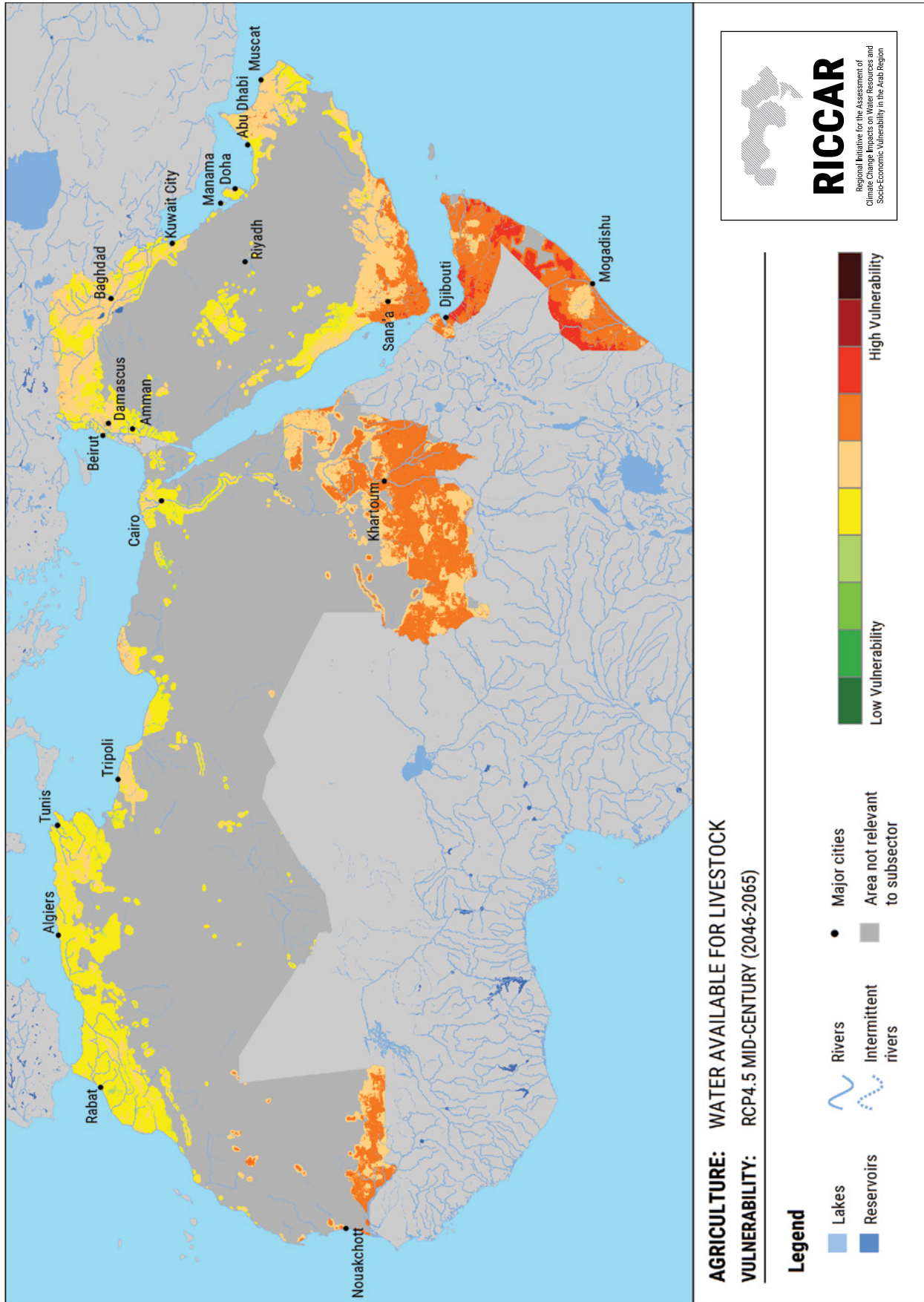
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – 13.2.3.2. POTENTIAL IMPACT

FIGURE 344



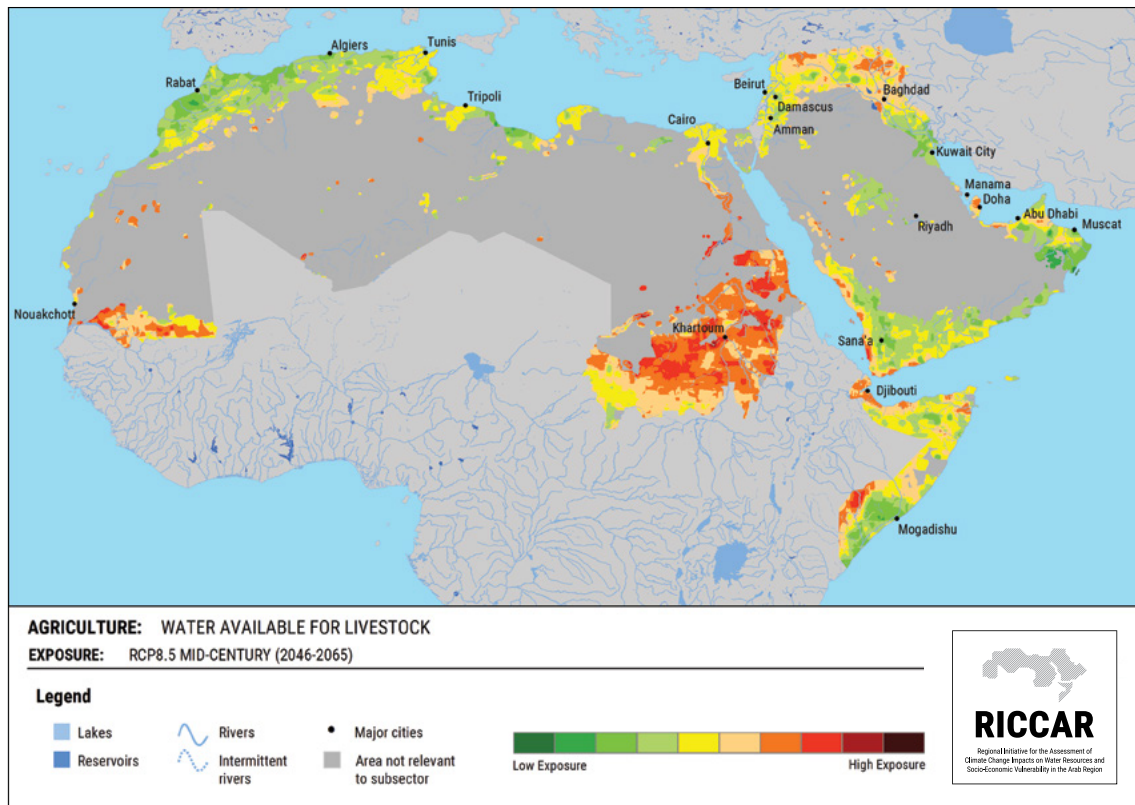
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.3. MID-CENTURY RCP 4.5 – 13.2.3.3. VULNERABILITY

FIGURE 345



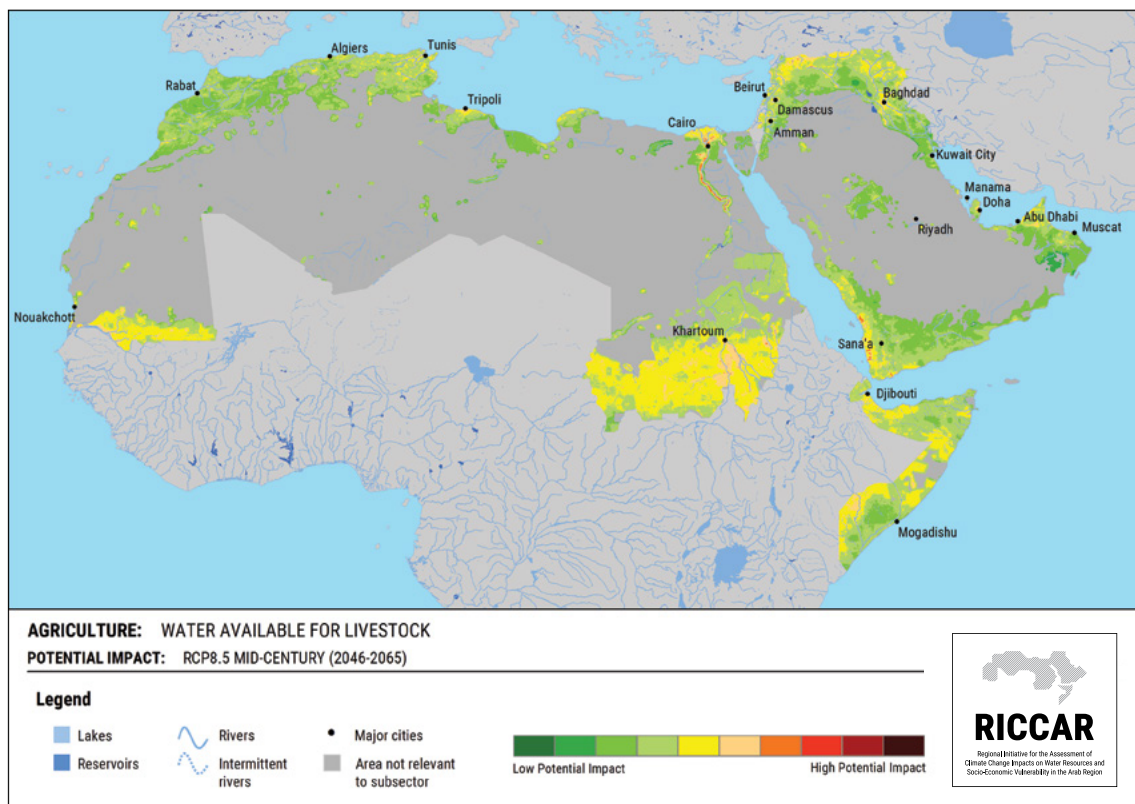
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – 13.2.4.1. EXPOSURE

FIGURE 346



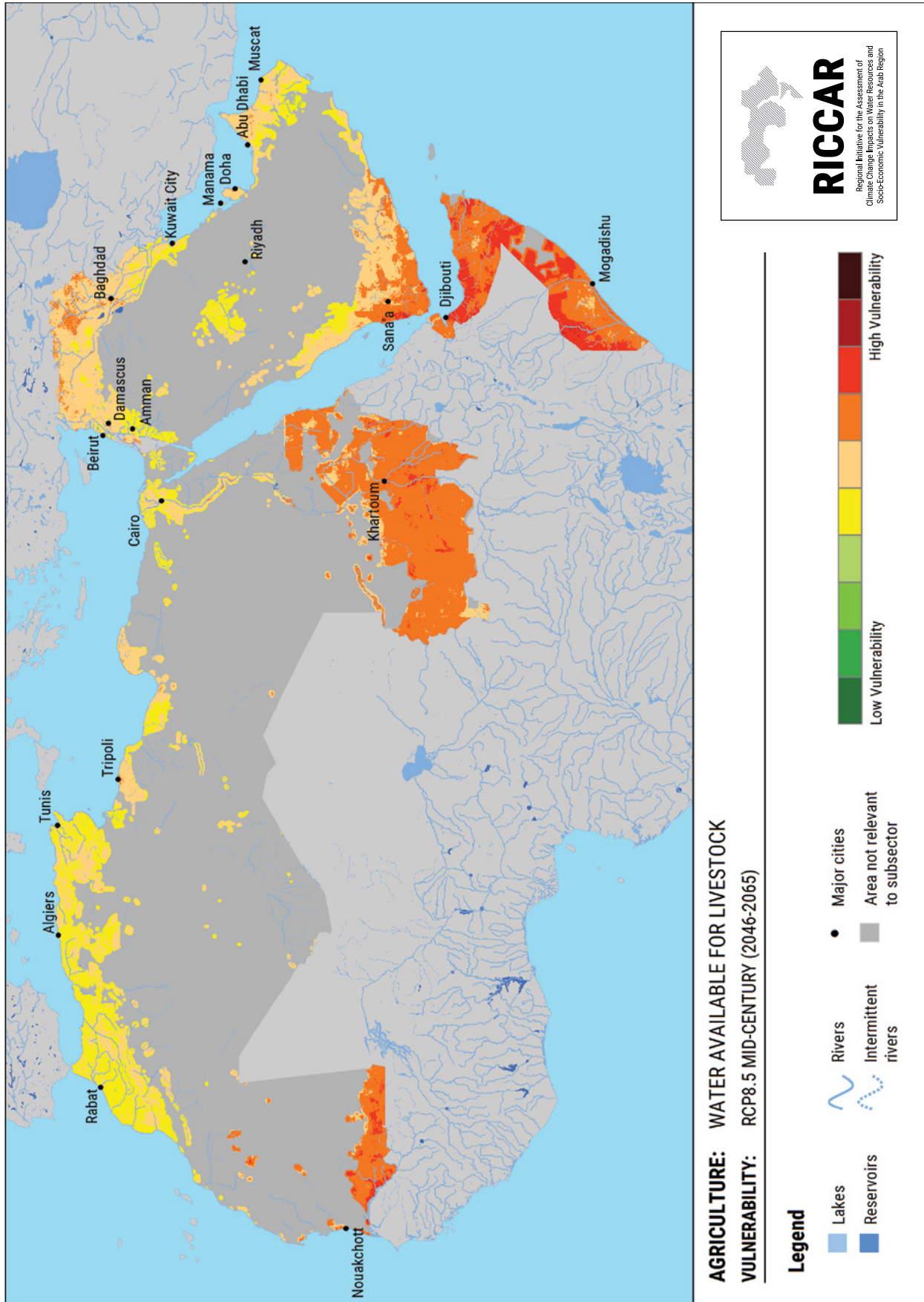
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – 13.2.4.2. POTENTIAL IMPACT

FIGURE 347



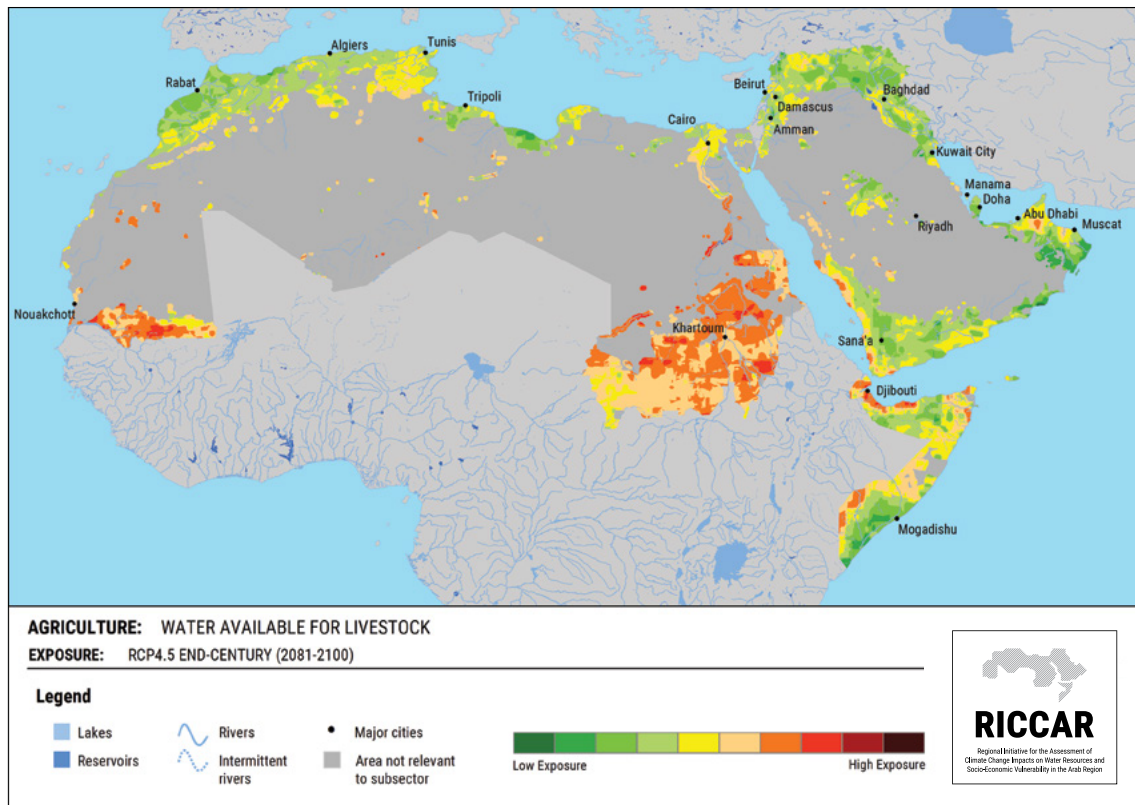
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.4. MID-CENTURY RCP 8.5 – 13.2.4.3. VULNERABILITY

FIGURE 348



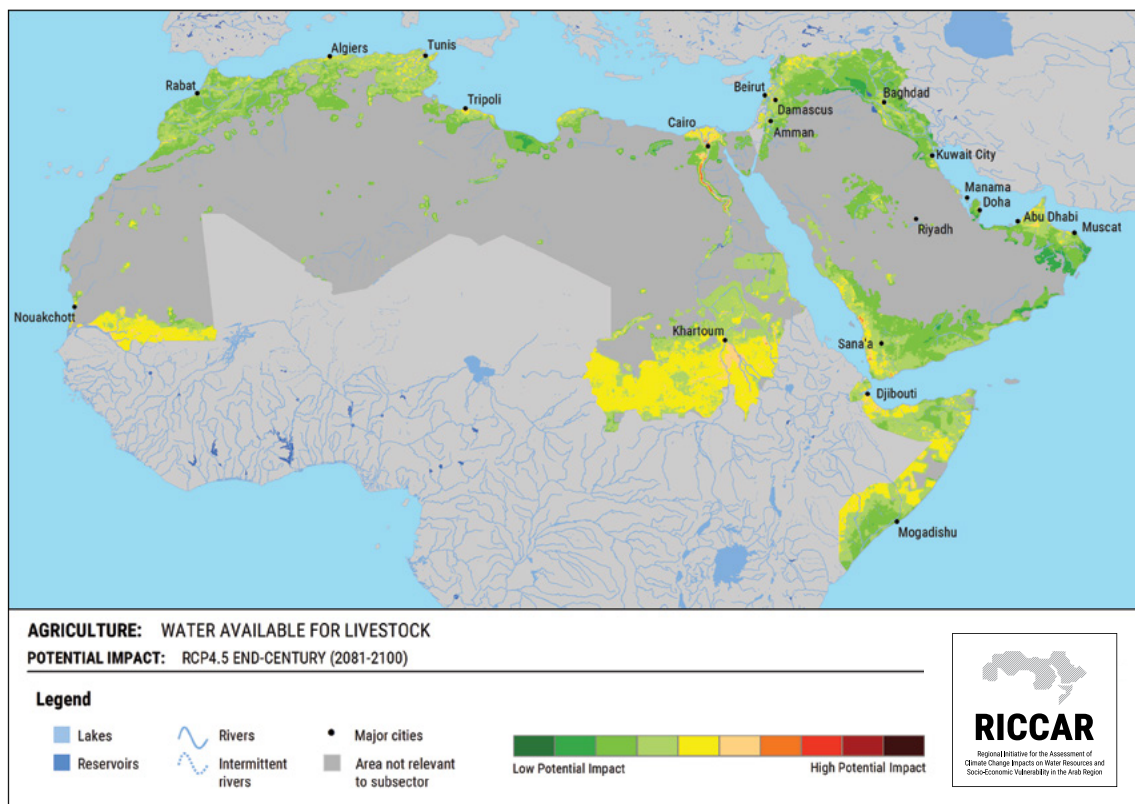
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – 13.2.5.1. EXPOSURE

FIGURE 349



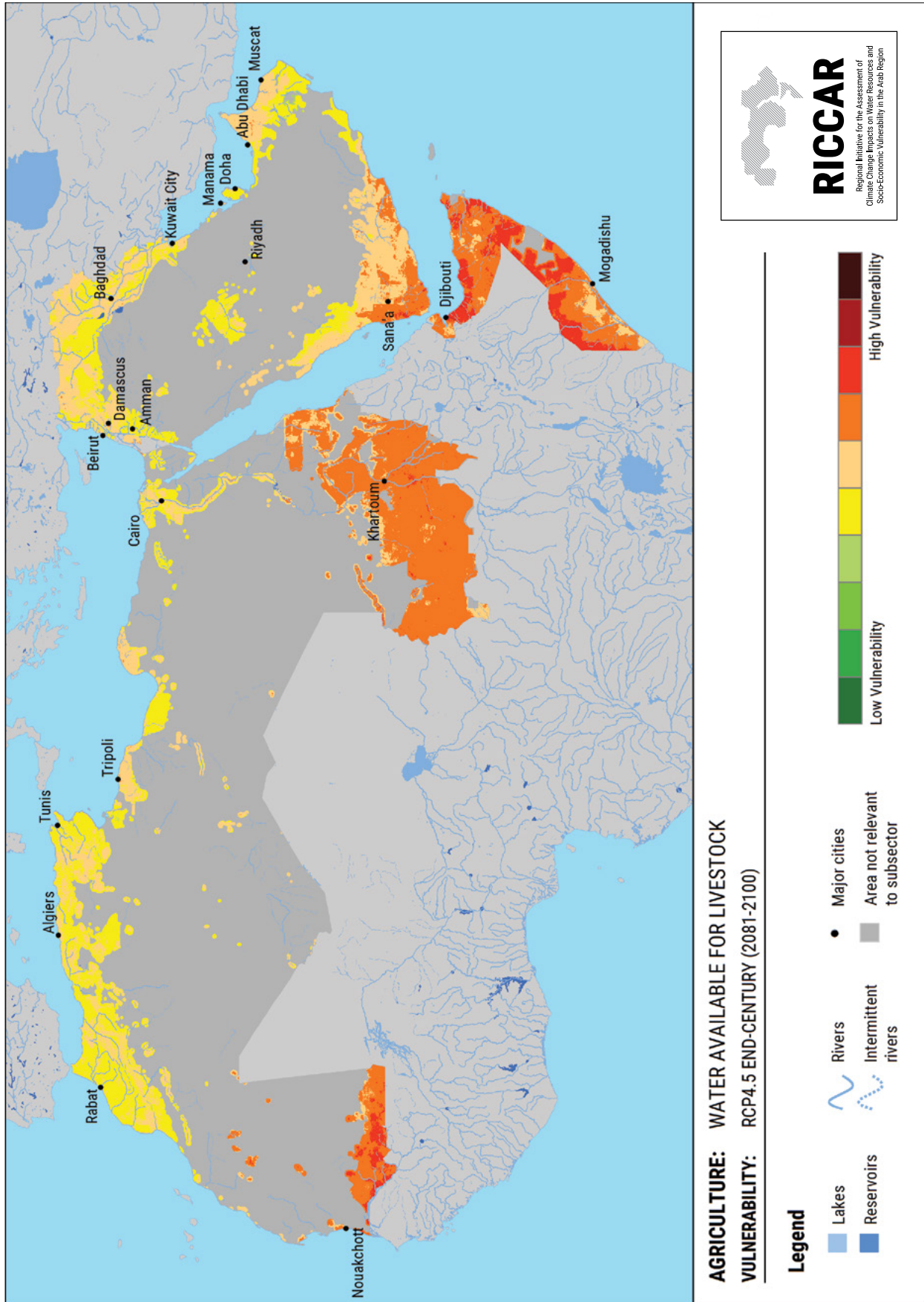
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – 13.2.5.2. POTENTIAL IMPACT

FIGURE 350



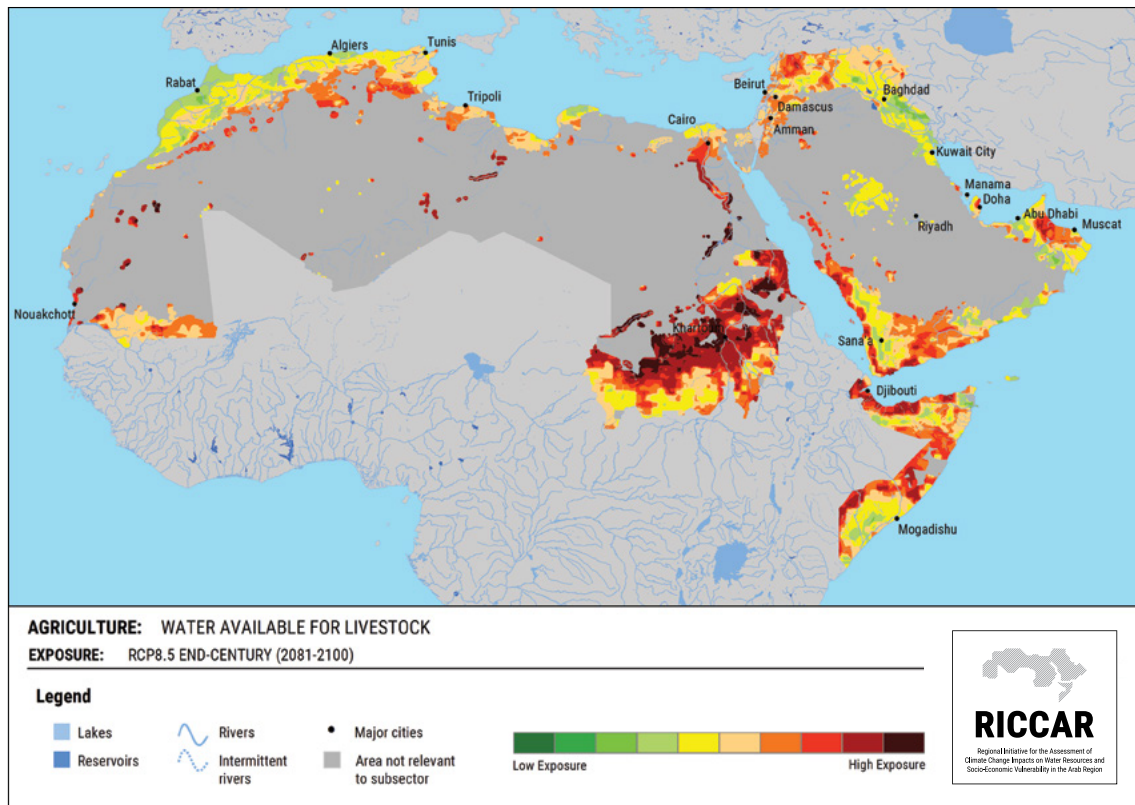
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.5. END-CENTURY RCP 4.5 – 13.2.5.3. VULNERABILITY

FIGURE 351



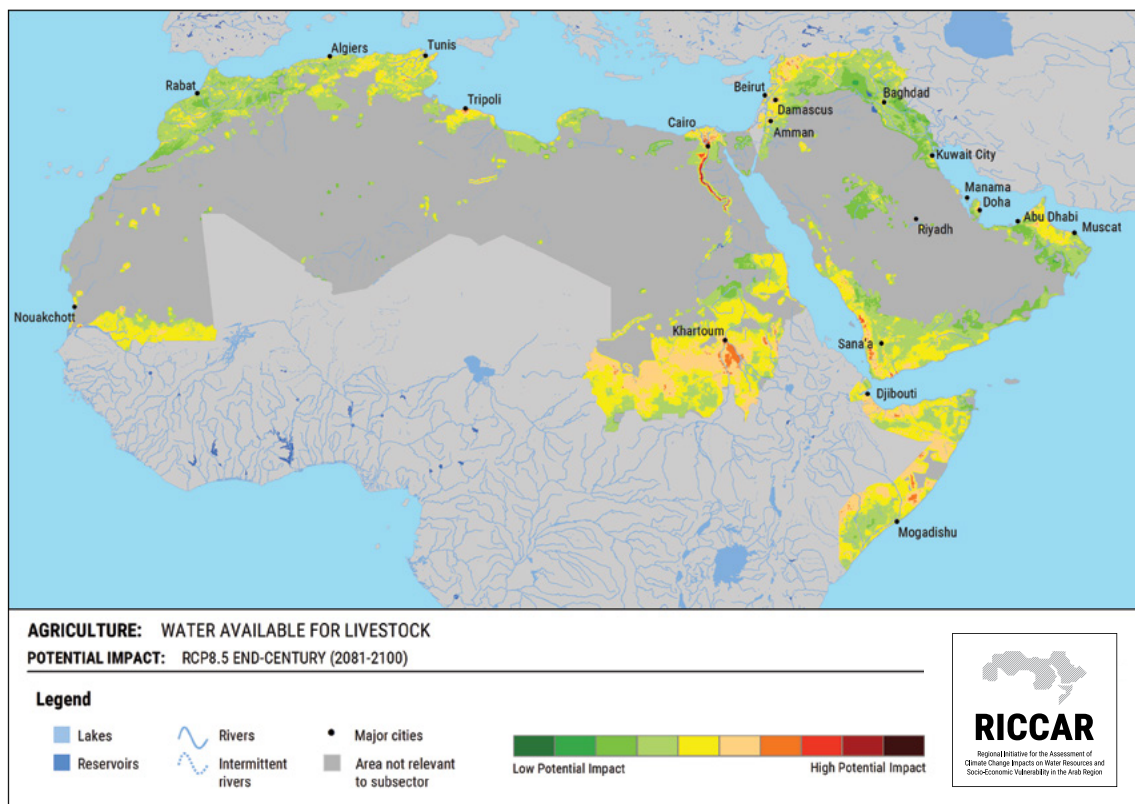
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.6. END-CENTURY RCP 8.5 – 13.2.6.1. EXPOSURE

FIGURE 352



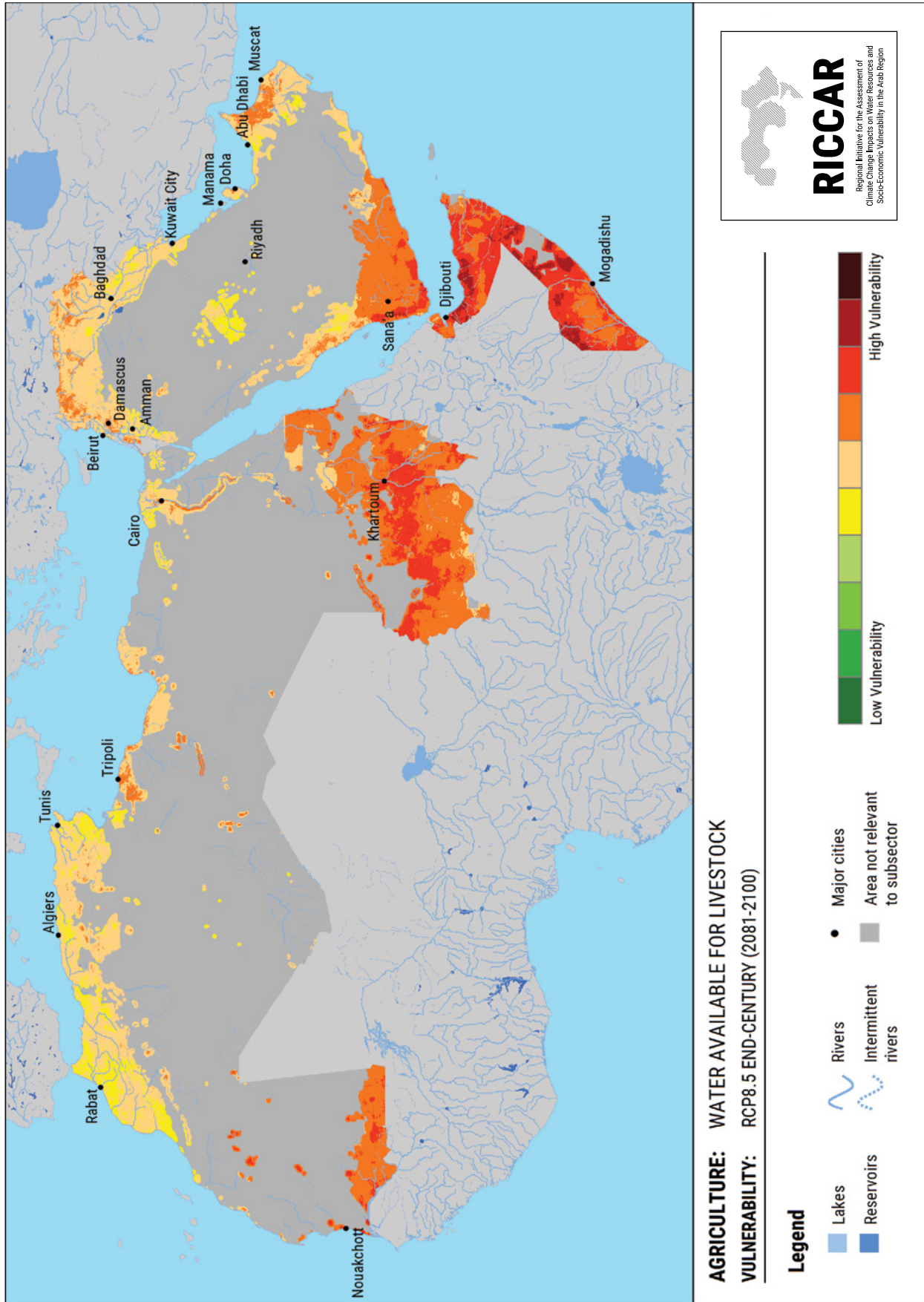
13.2. WATER AVAILABLE FOR LIVESTOCK – 13.2.6. END-CENTURY RCP 8.5 – 13.2.6.2. POTENTIAL IMPACT

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

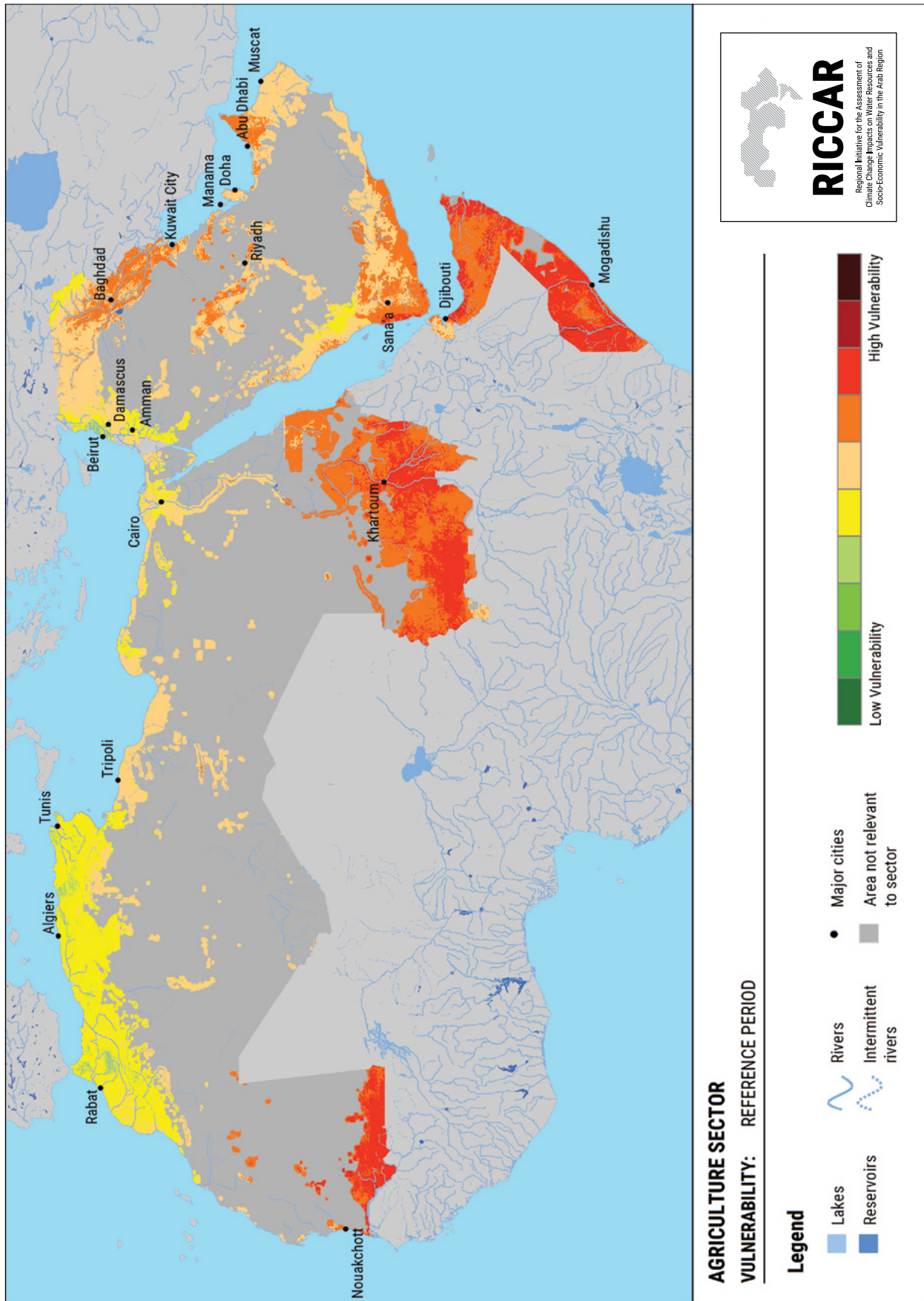
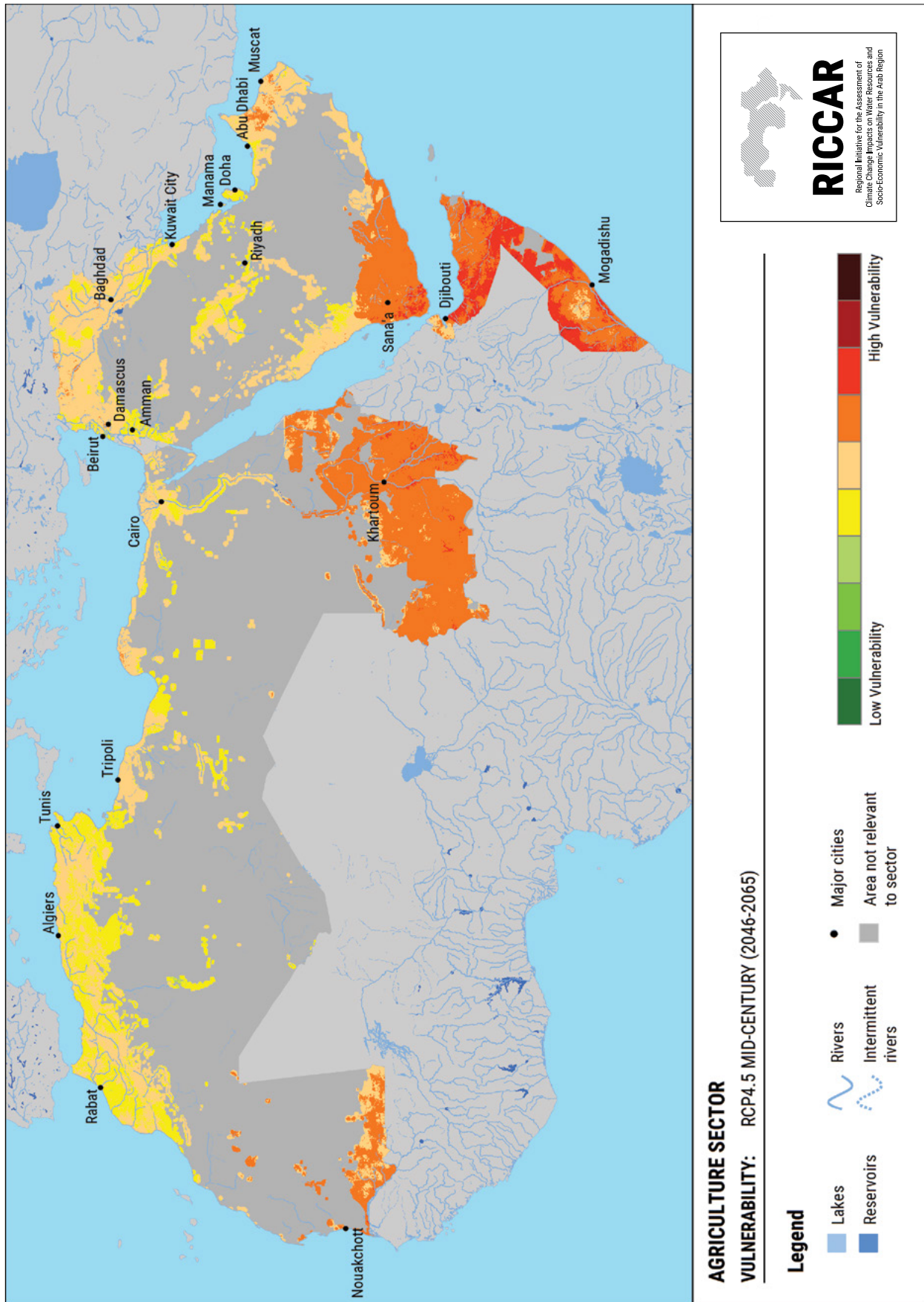


FIGURE 355

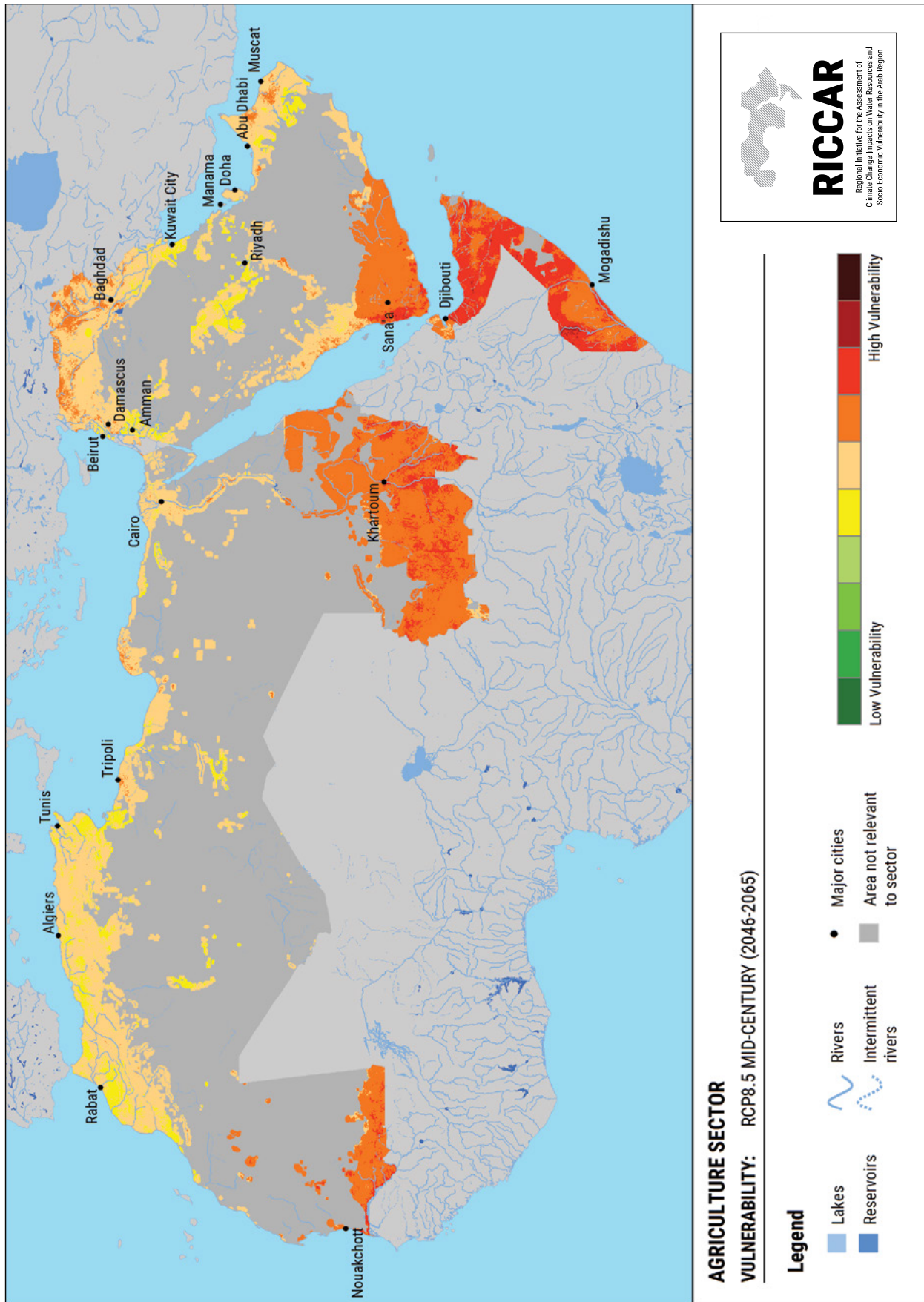
13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.2. MID-CENTURY RCP 4.5

FIGURE 356



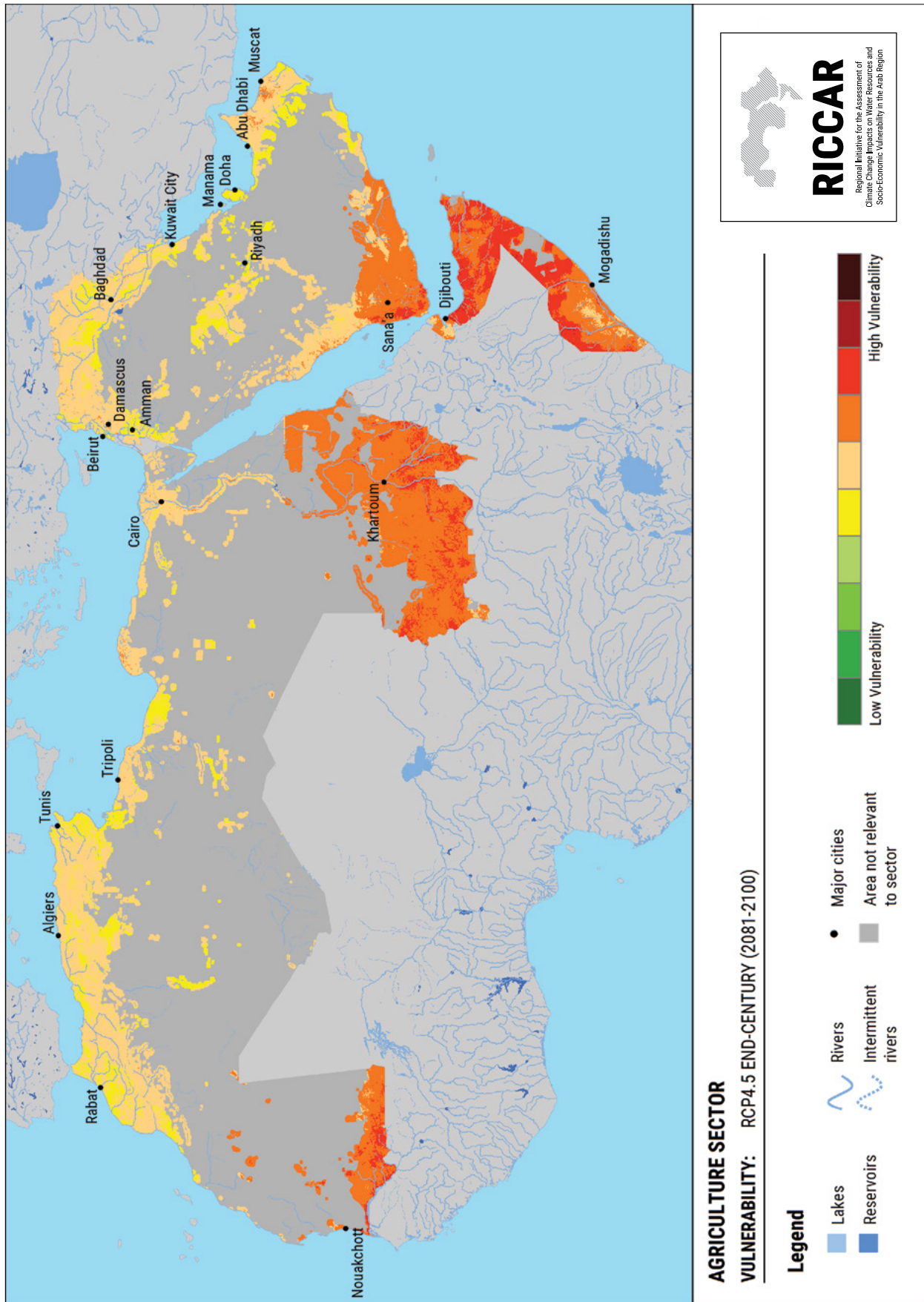
13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.3. MID-CENTURY RCP 8.5

FIGURE 357



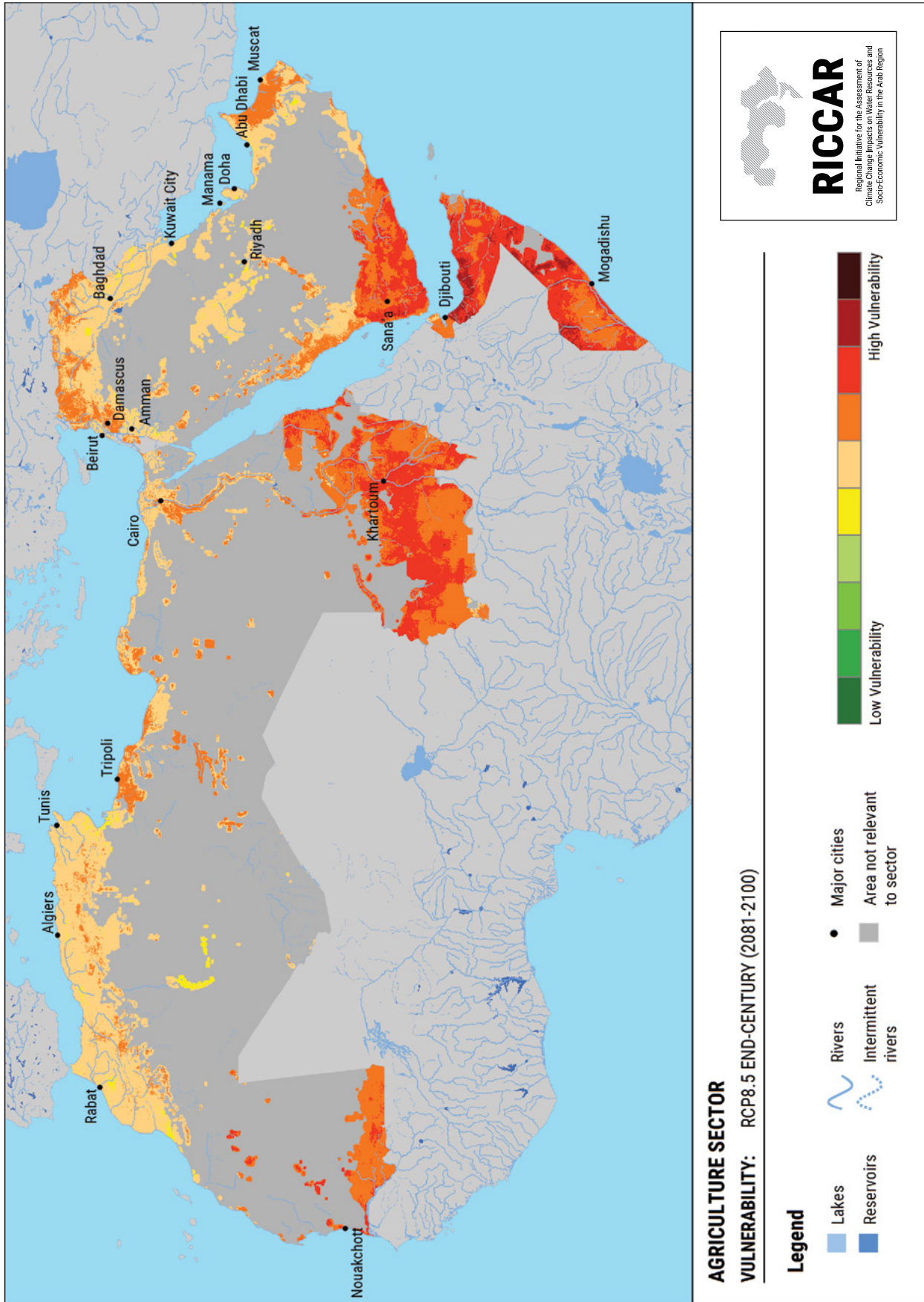
13.3. AGRICULTURE SECTOR: VULNERABILITY – 13.3.4. END-CENTURY RCP 4.5

FIGURE 358



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

FIGURE 359



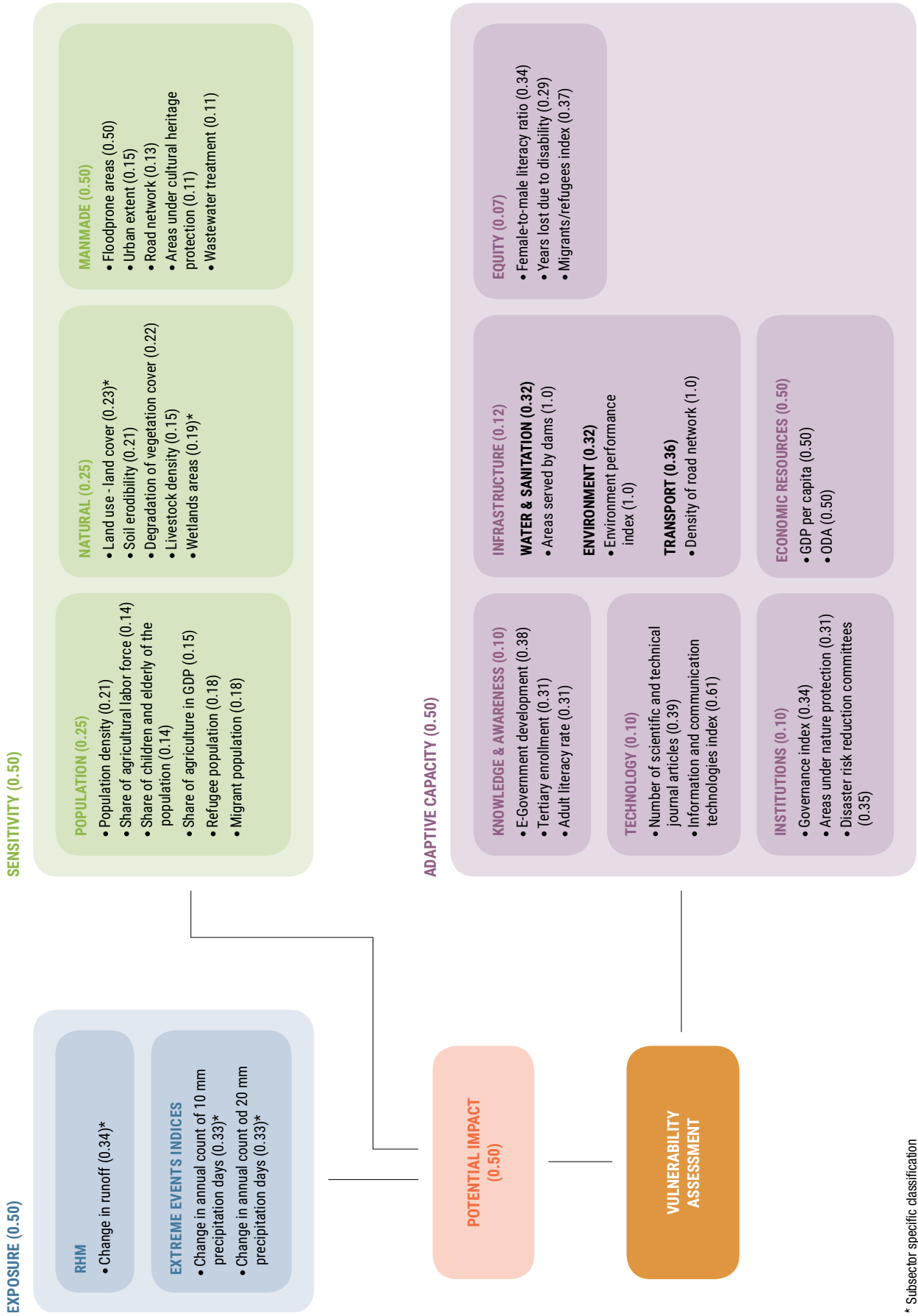
CHAPTER 14



**INFRASTRUCTURE AND HUMAN
SETTLEMENTS SECTOR**

14.1. INLAND FLOODING AREA – 14.1.1. IMPACT CHAIN

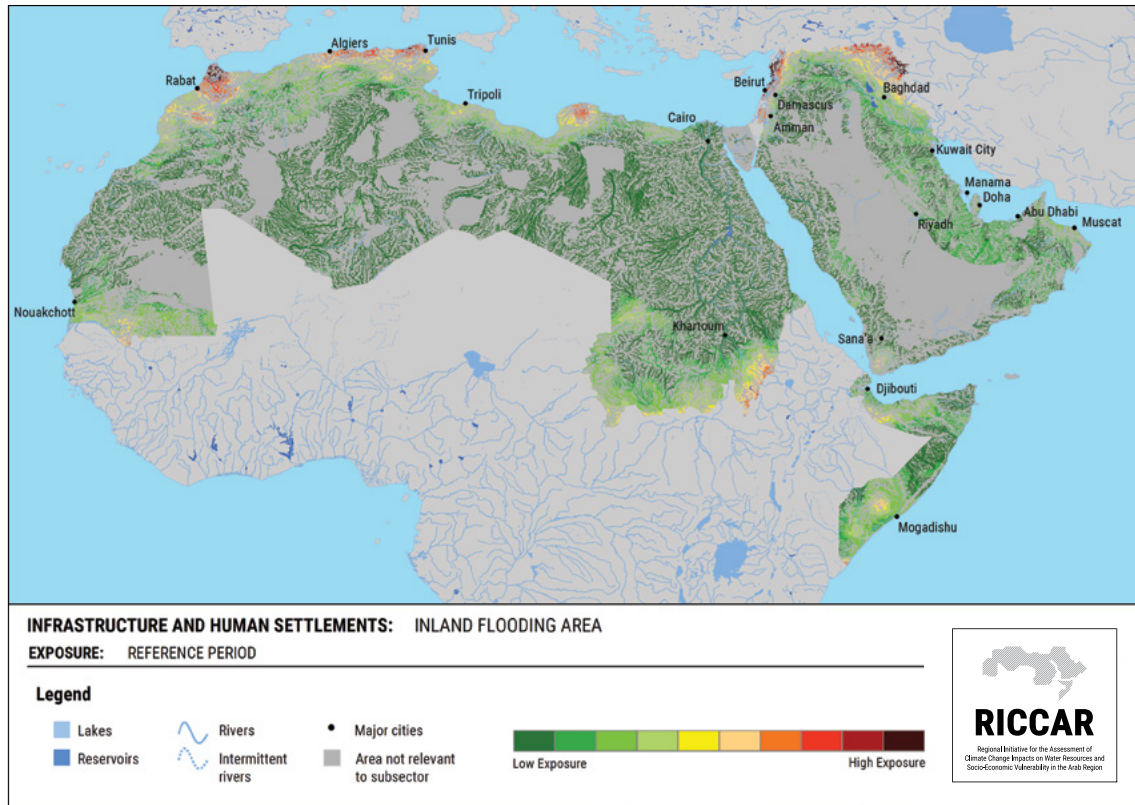
FIGURE 360



* Subsector specific classification

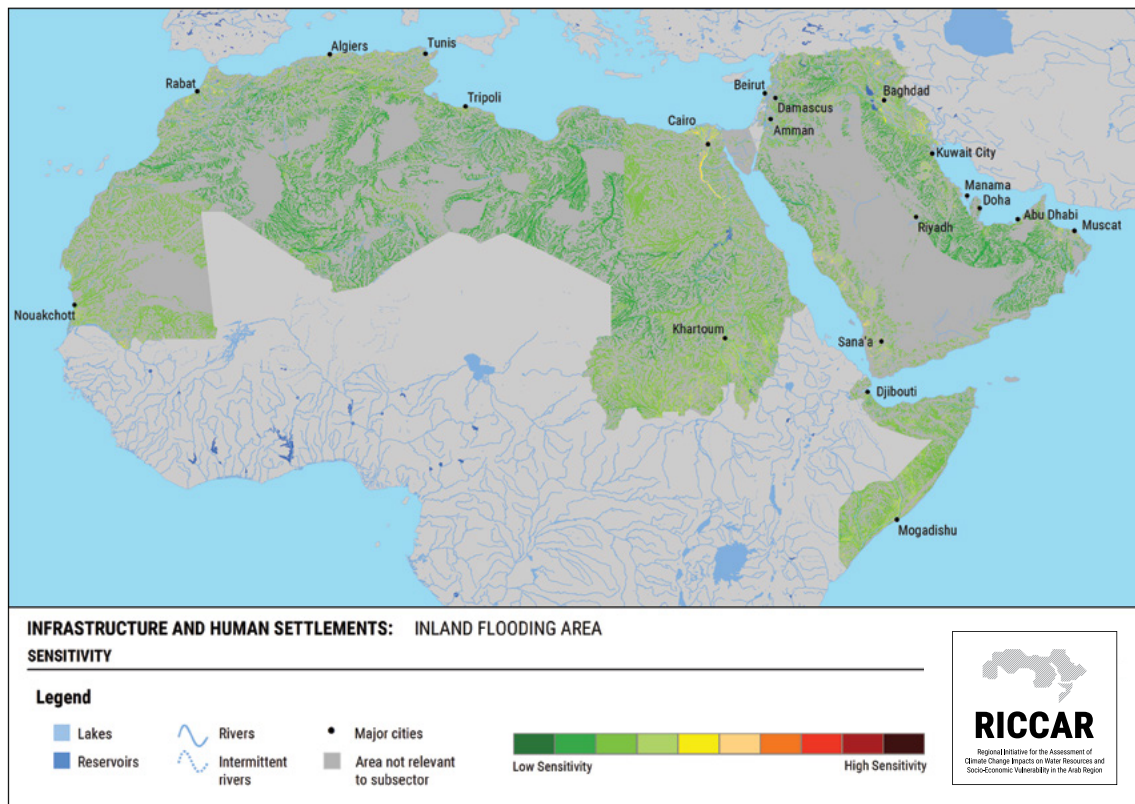
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – 14.1.2.1. EXPOSURE

FIGURE 361



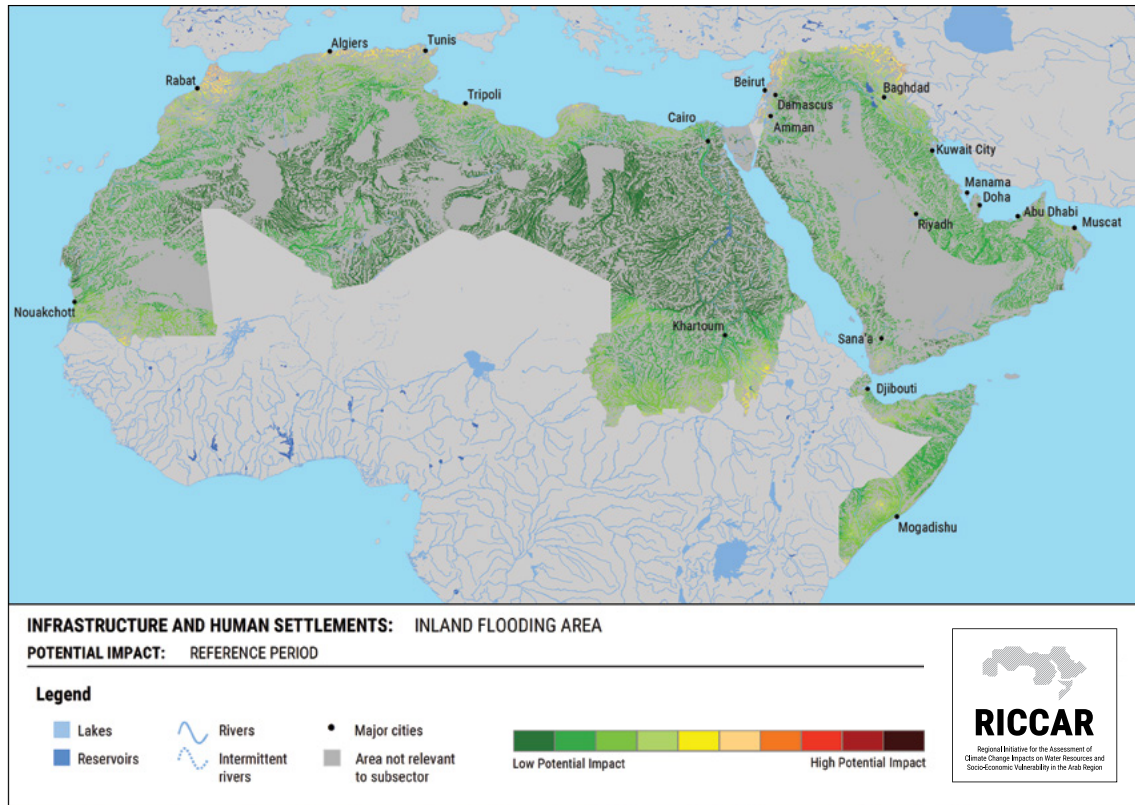
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – 14.1.2.2. SENSITIVITY

FIGURE 362



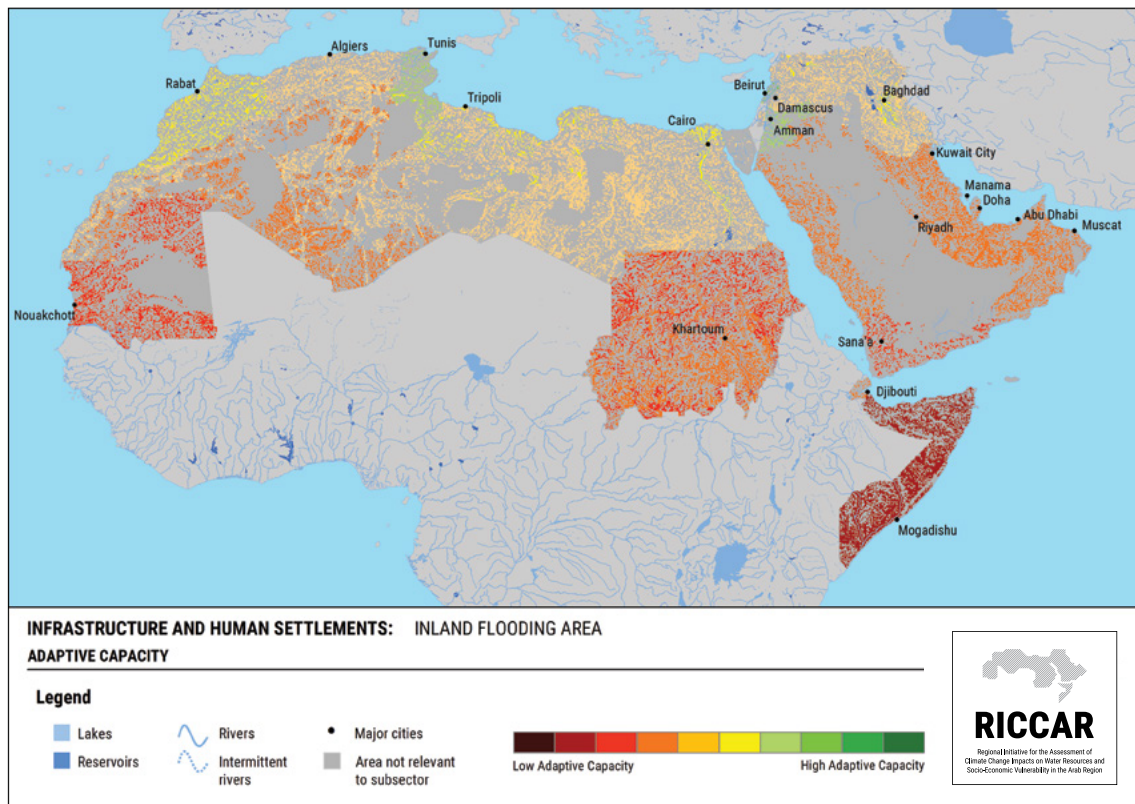
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – 14.1.1.3. POTENTIAL IMPACT

FIGURE 363



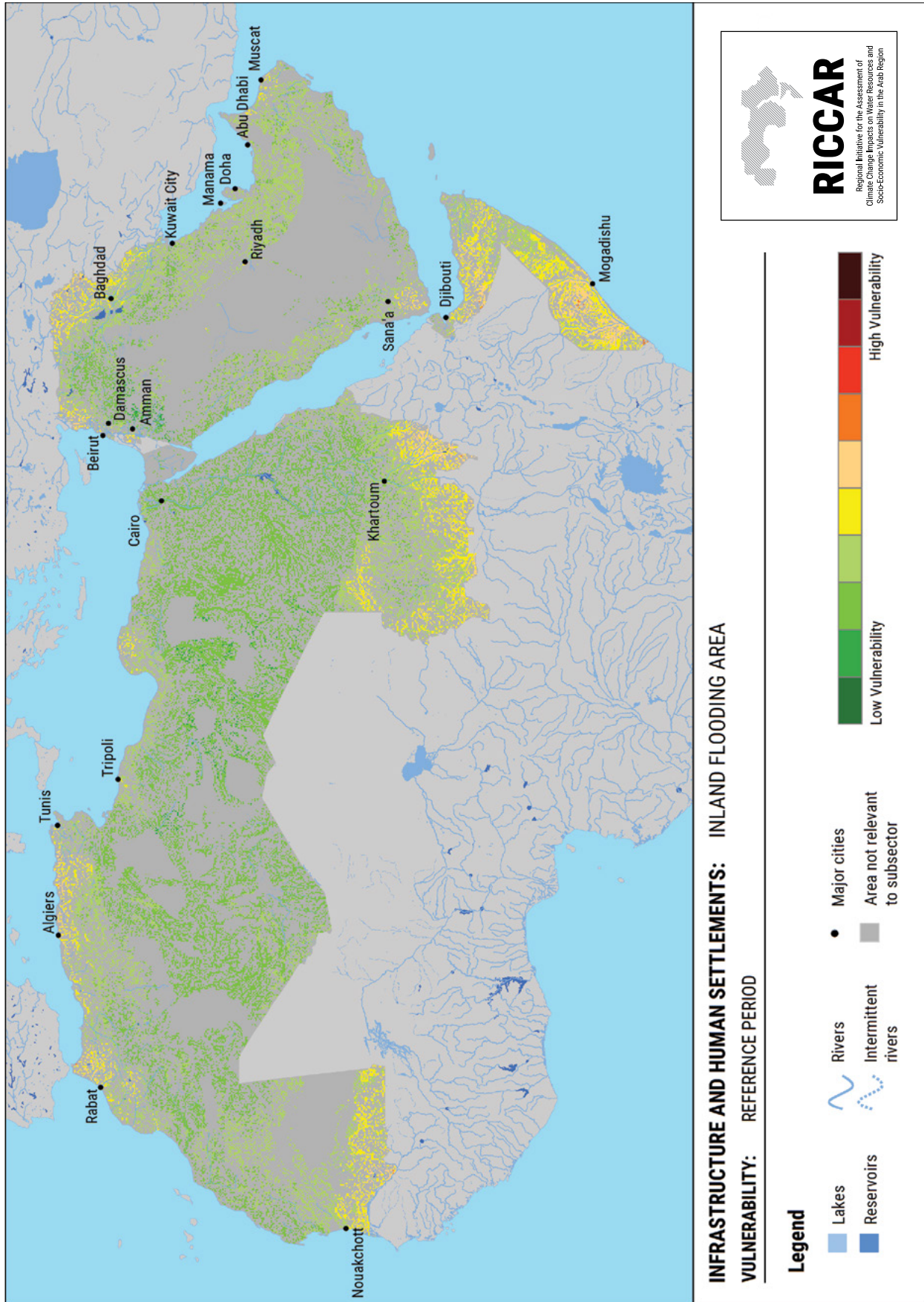
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – 14.1.1.4. ADAPTIVE CAPACITY

FIGURE 364



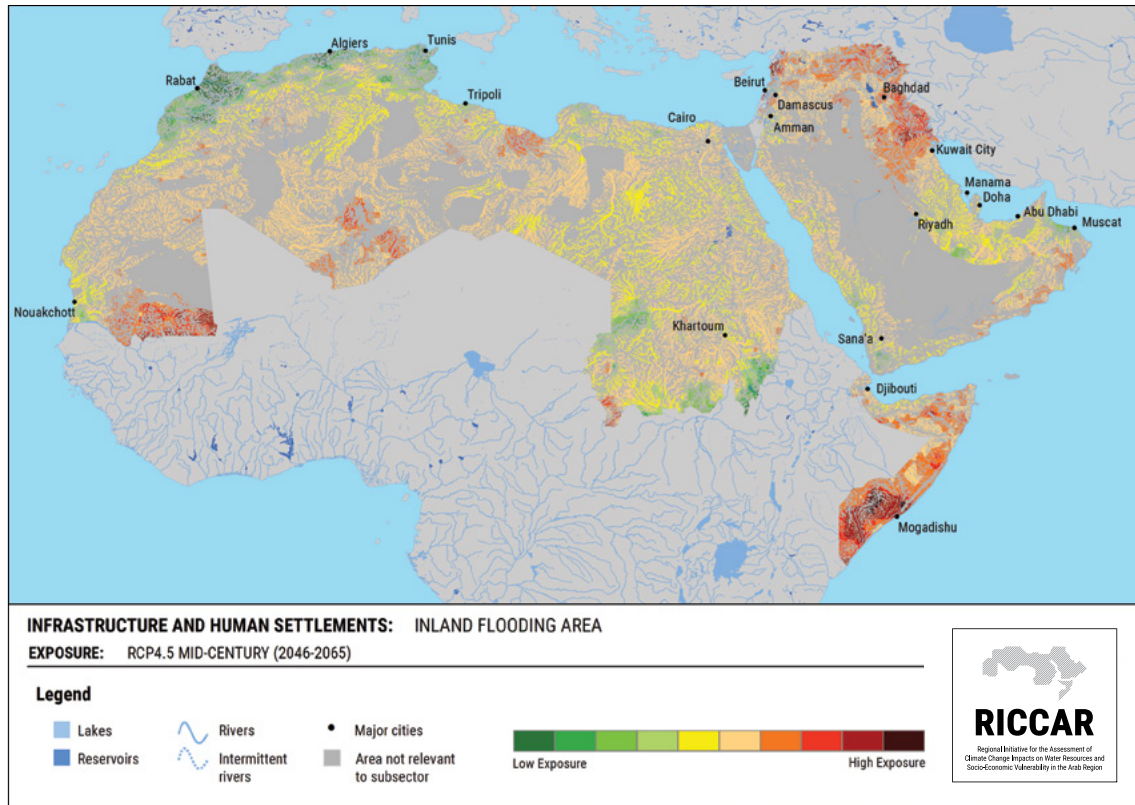
14.1. INLAND FLOODING AREA – 14.1.2. REFERENCE PERIOD – 14.1.1.5. VULNERABILITY

FIGURE 365



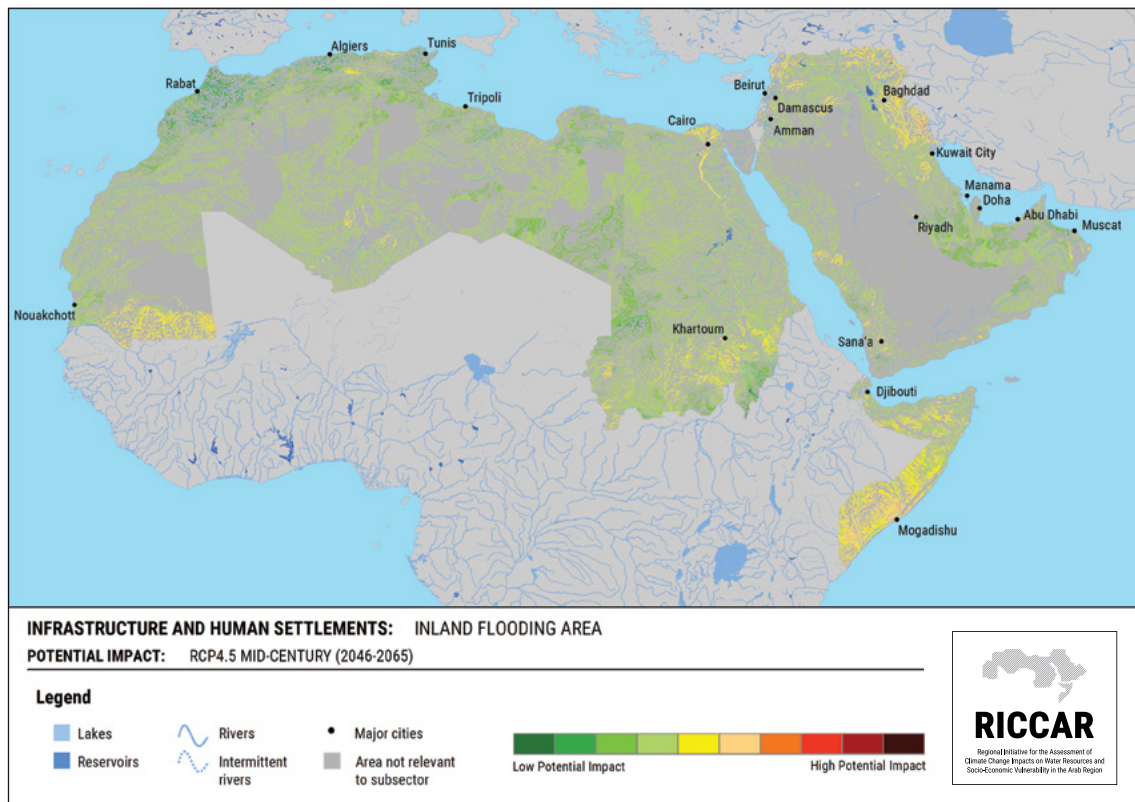
14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – 14.1.3.1. EXPOSURE

FIGURE 366



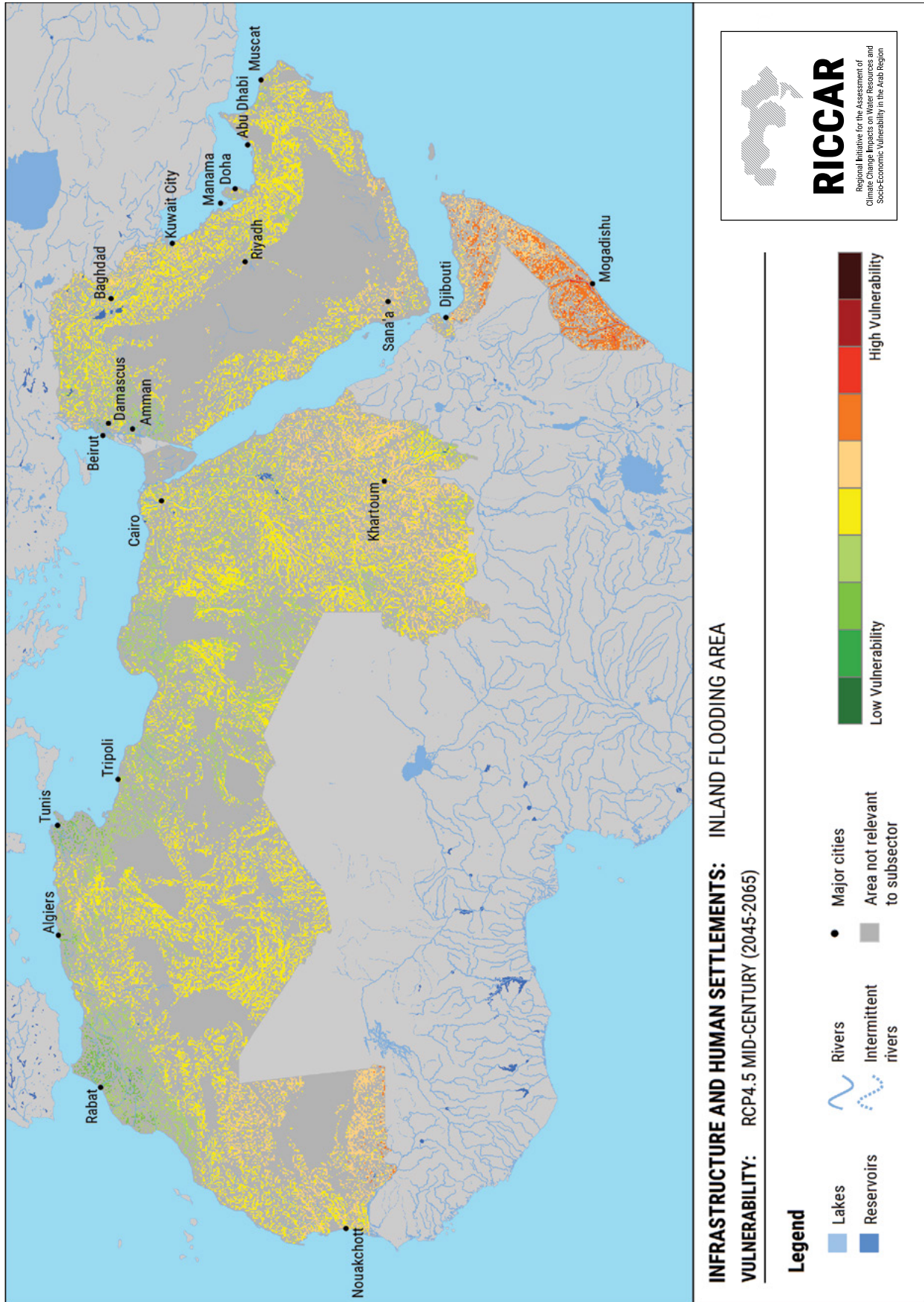
14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – 14.1.3.2. POTENTIAL IMPACT

FIGURE 367



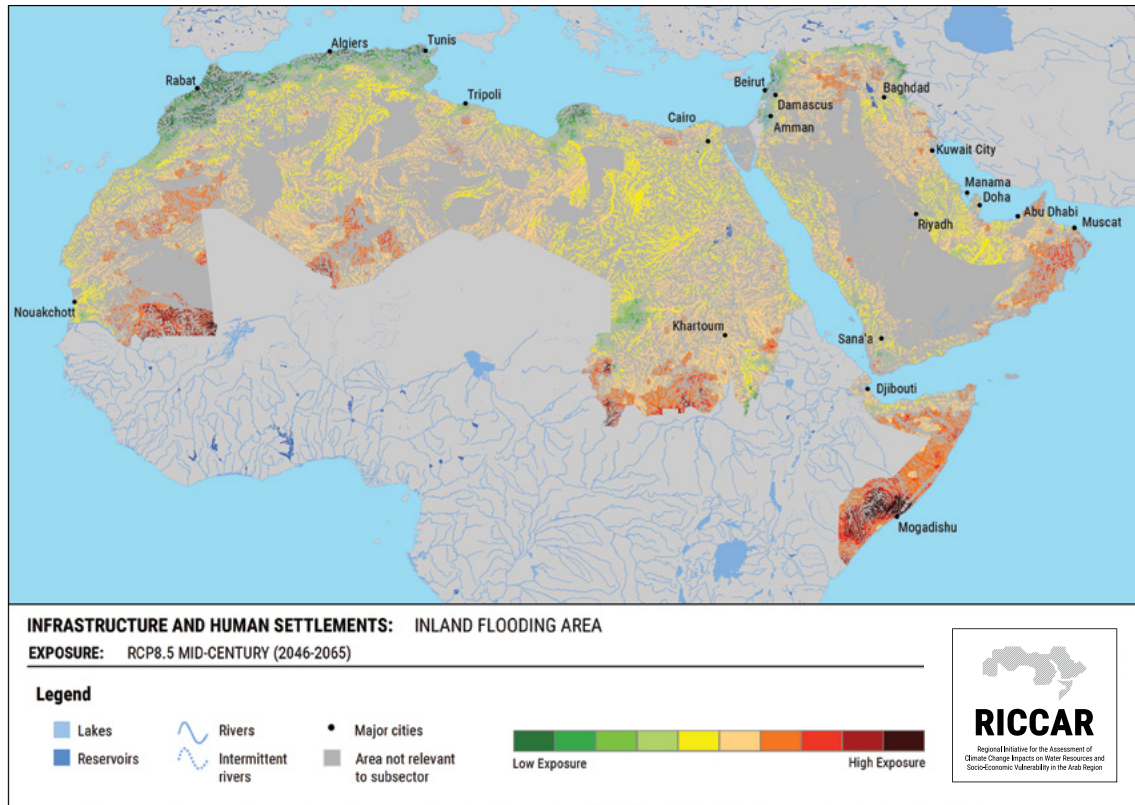
14.1. INLAND FLOODING AREA – 14.1.3. MID-CENTURY RCP 4.5 – 14.1.3.3. VULNERABILITY

FIGURE 368



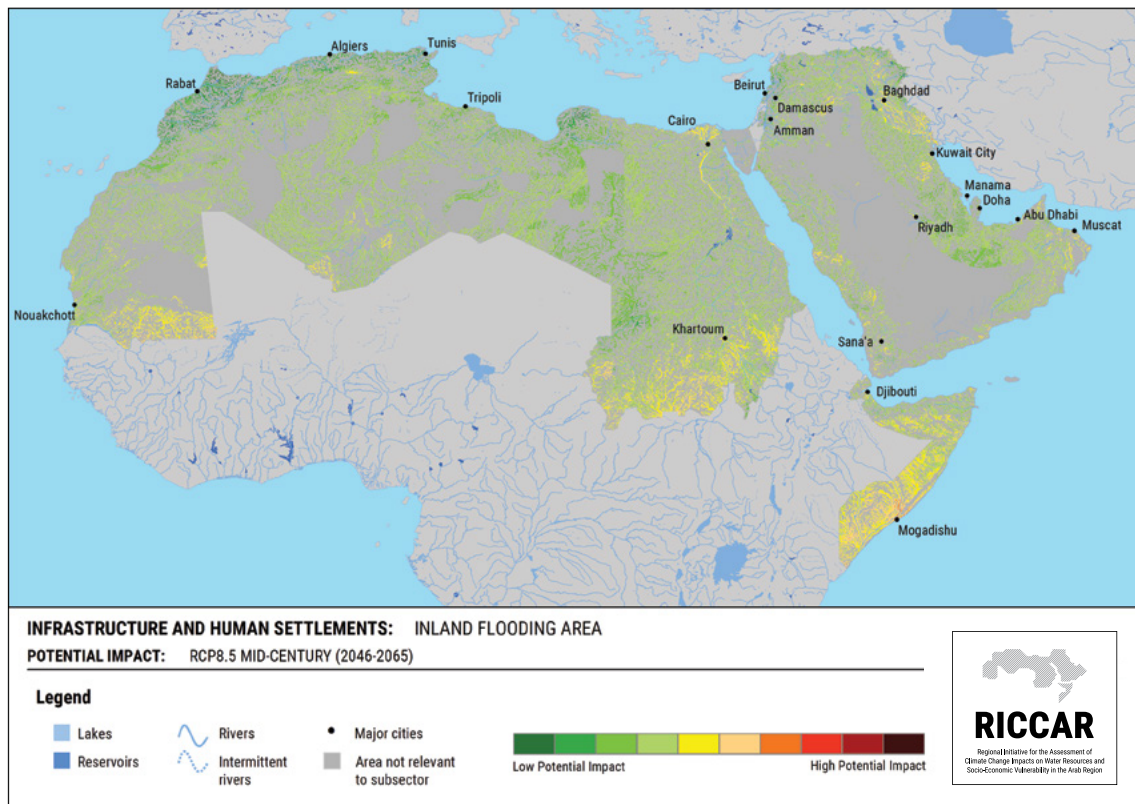
14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – 14.1.4.1. EXPOSURE

FIGURE 369



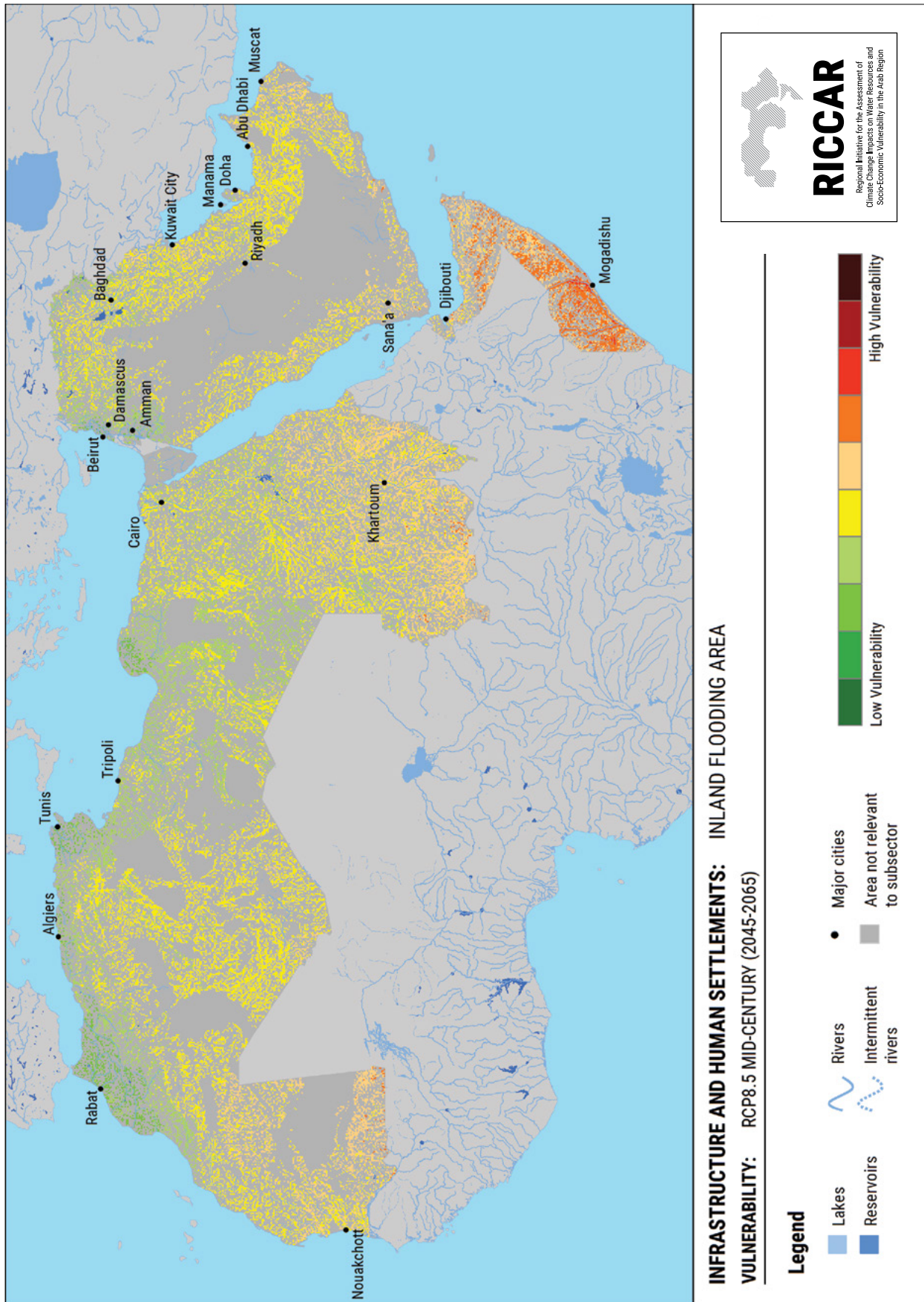
14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – 14.1.4.2. POTENTIAL IMPACT

FIGURE 370



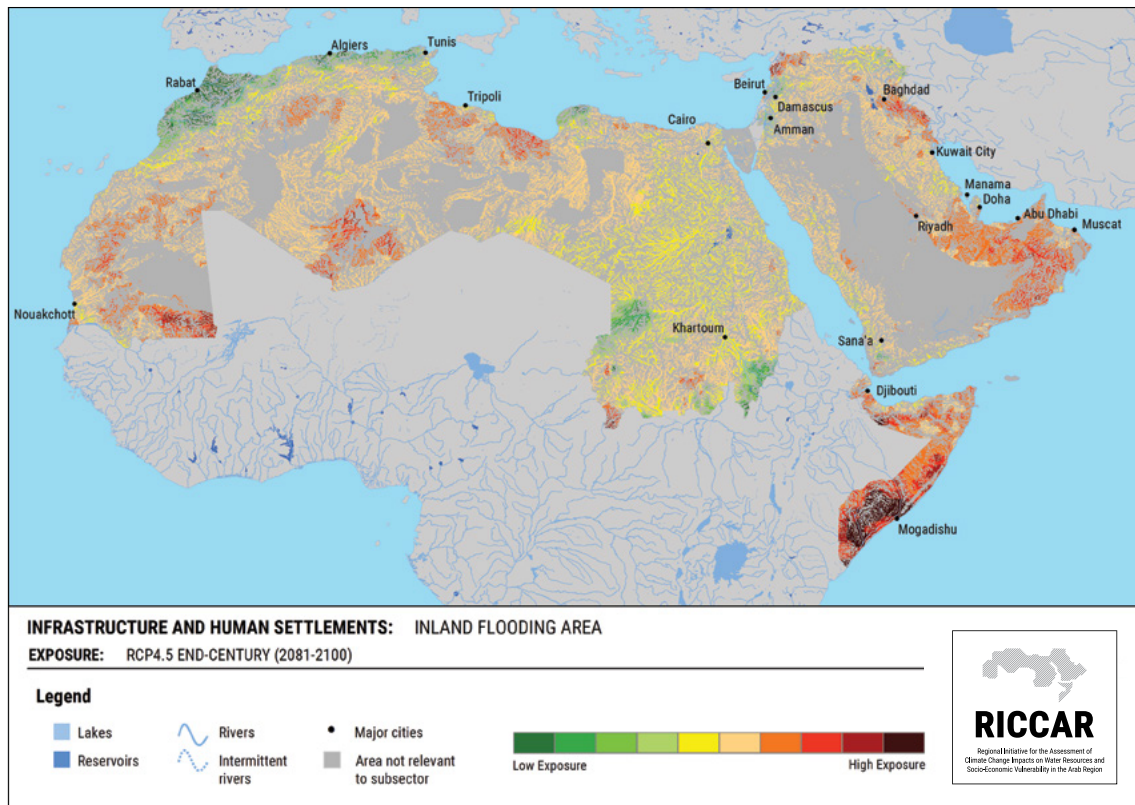
14.1. INLAND FLOODING AREA – 14.1.4. MID-CENTURY RCP 8.5 – 14.1.4.3. VULNERABILITY

FIGURE 371



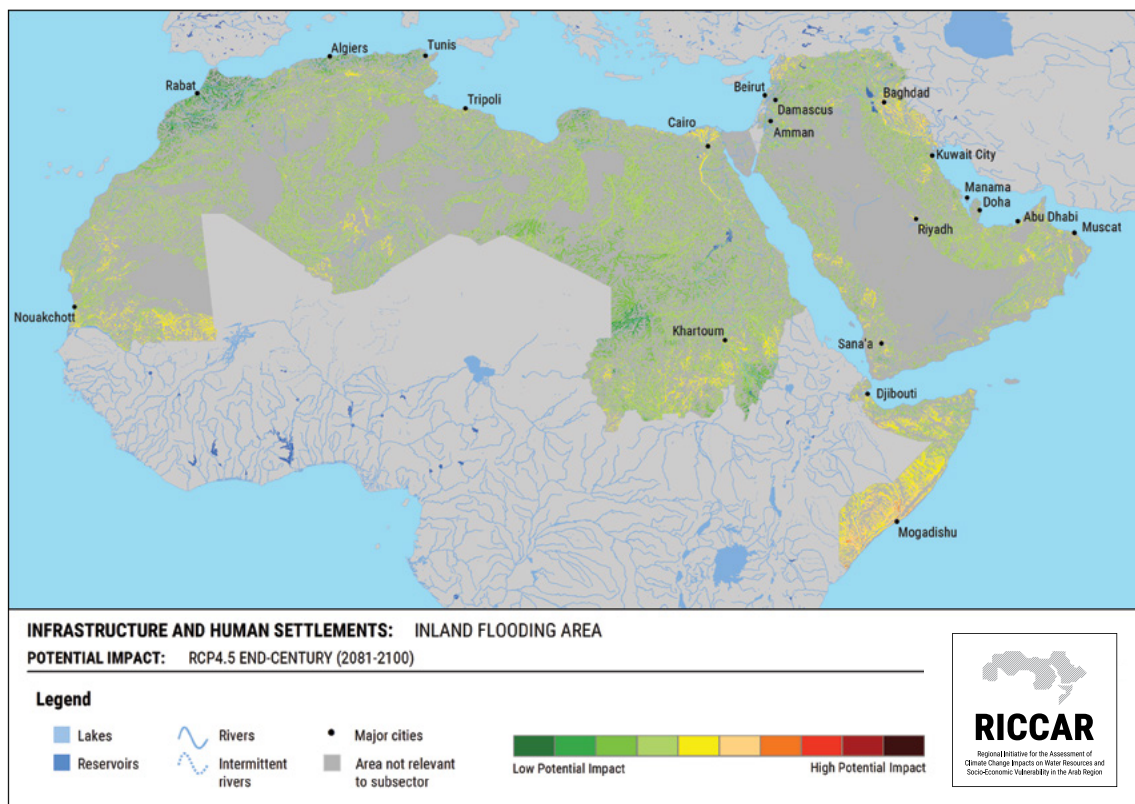
14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – 14.1.5.1. EXPOSURE

FIGURE 372



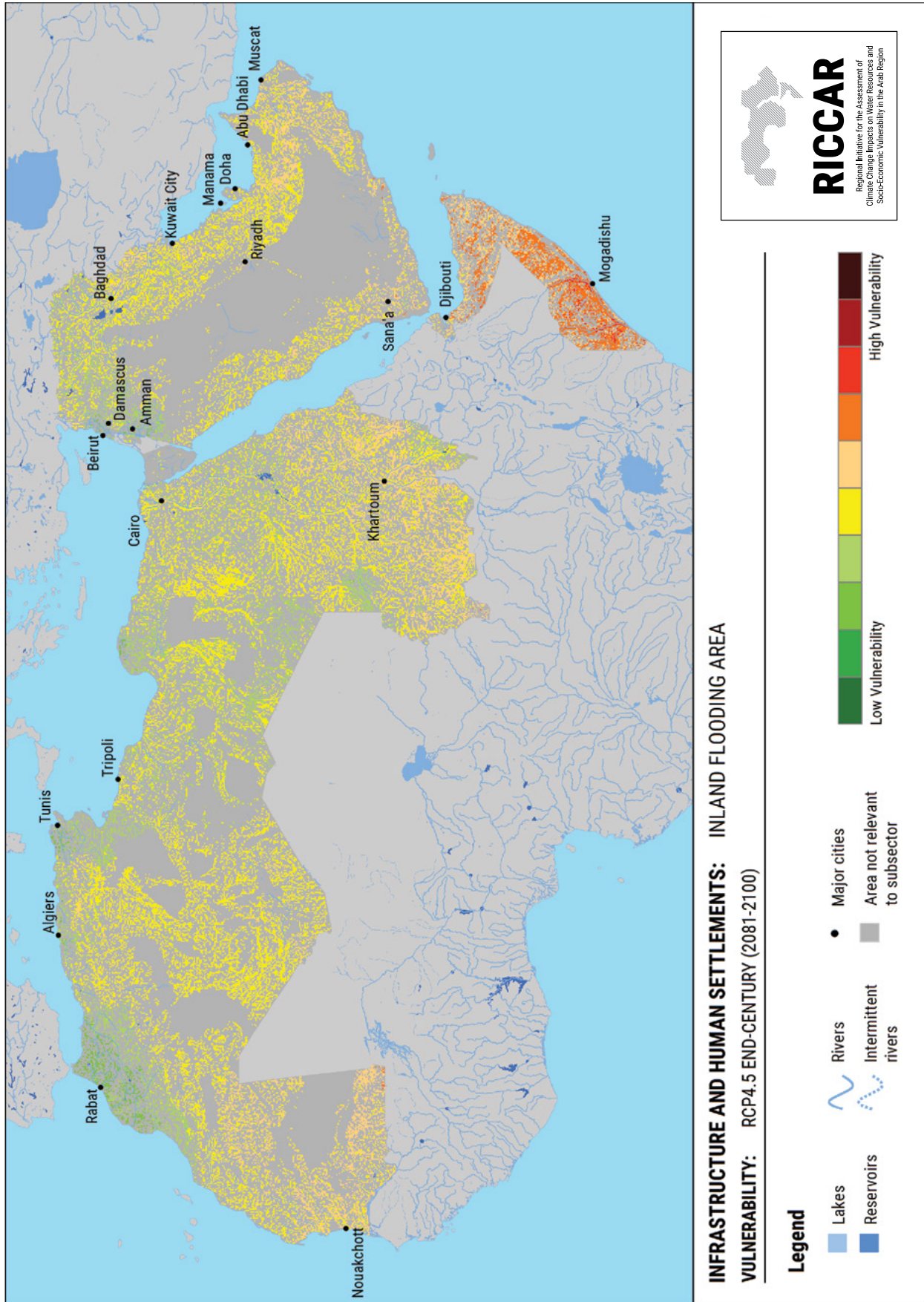
14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – 14.1.5.2. POTENTIAL IMPACT

FIGURE 373



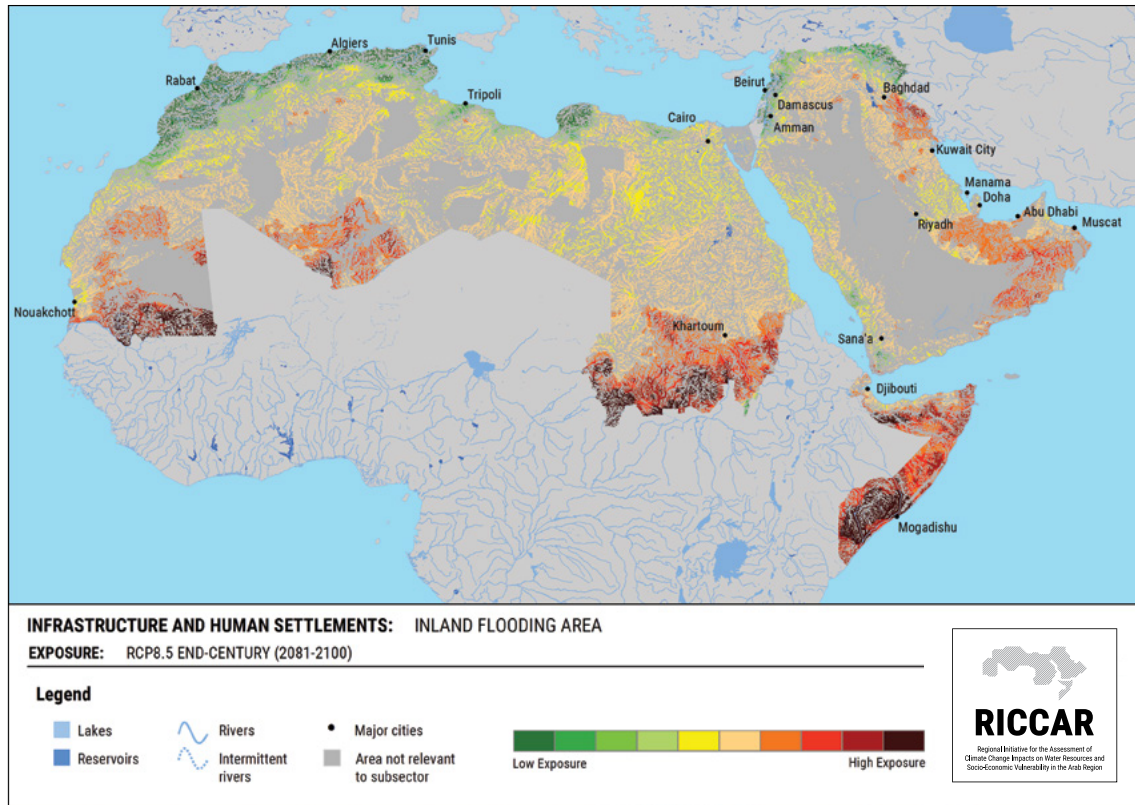
14.1. INLAND FLOODING AREA – 14.1.5. END-CENTURY RCP 4.5 – 14.1.5.3. VULNERABILITY

FIGURE 374



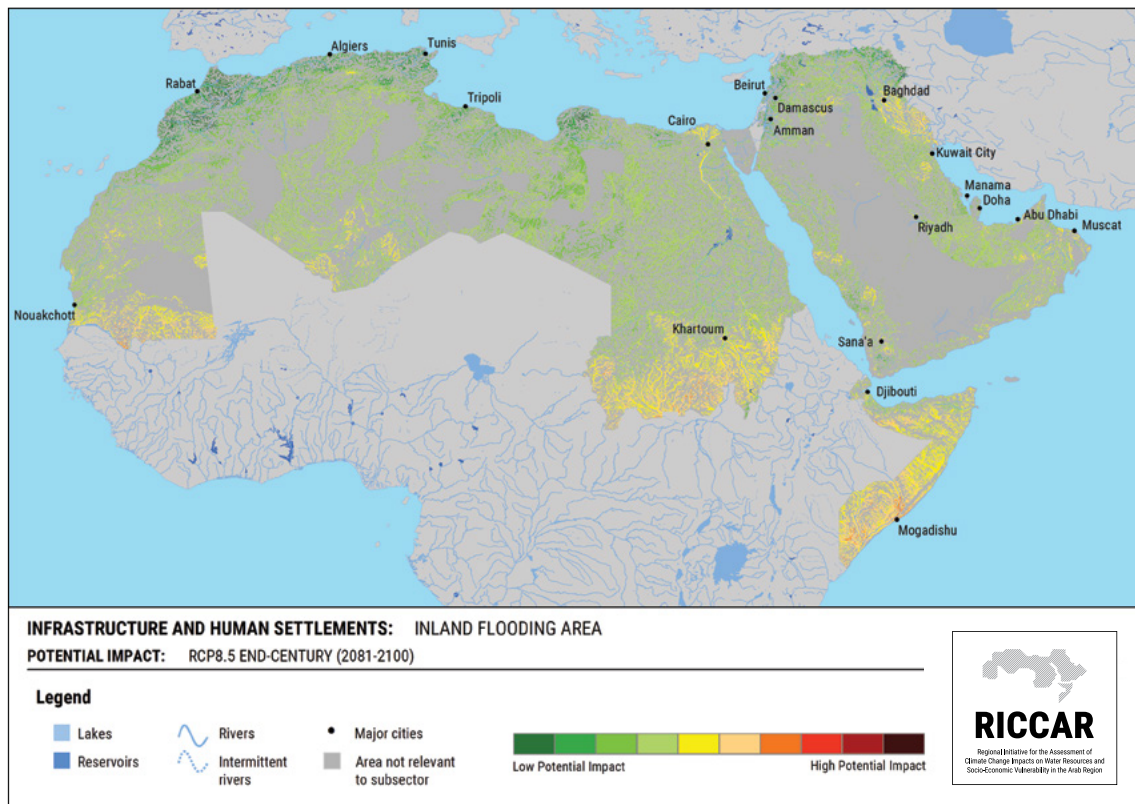
14.1. INLAND FLOODING AREA – 14.1.6. END-CENTURY RCP 8.5 – 14.1.6.1. EXPOSURE

FIGURE 375



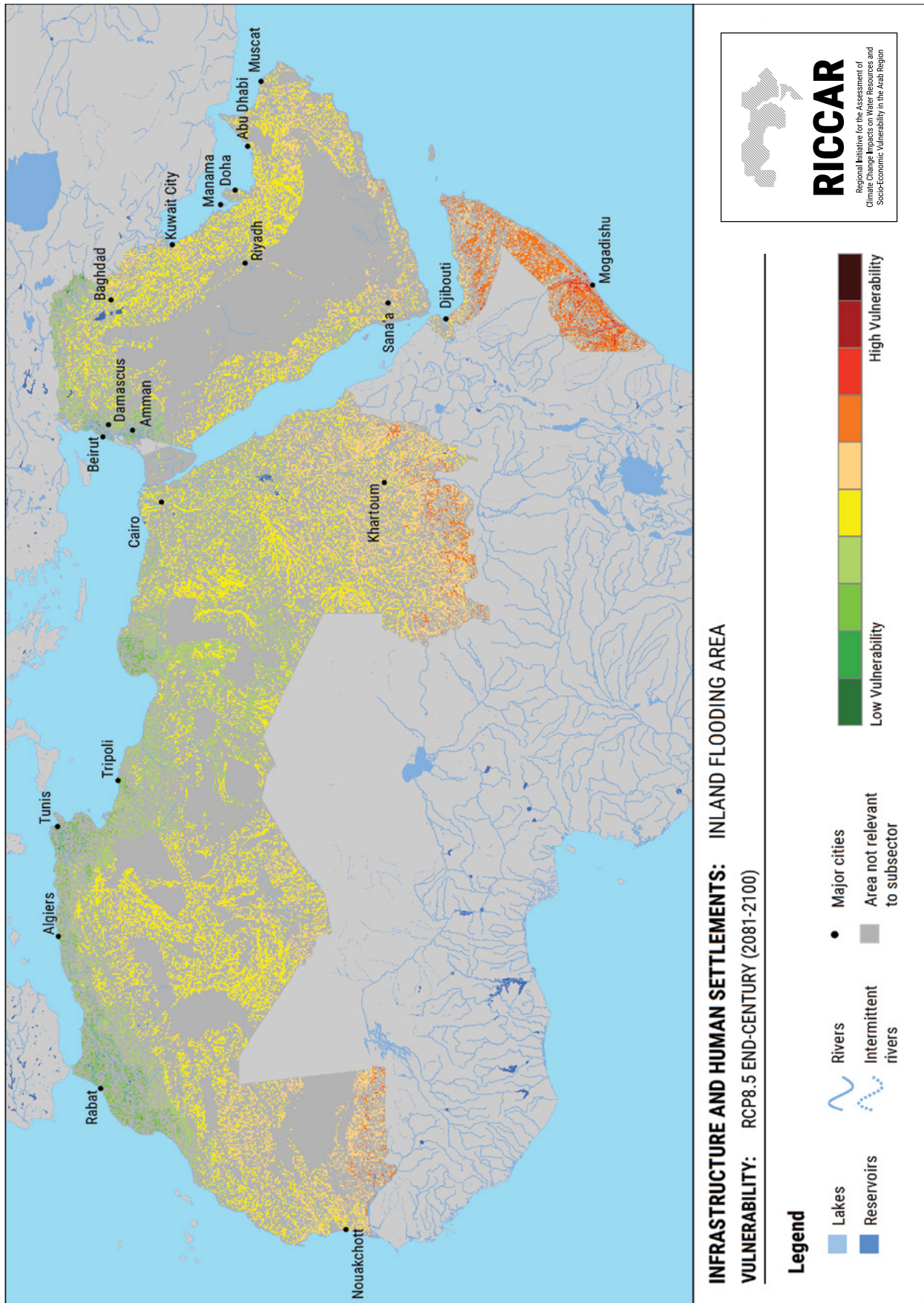
14.1. INLAND FLOODING AREA – 14.1.6. END-CENTURY RCP 8.5 – 14.1.6.2. POTENTIAL IMPACT

FIGURE 376



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

FIGURE 377



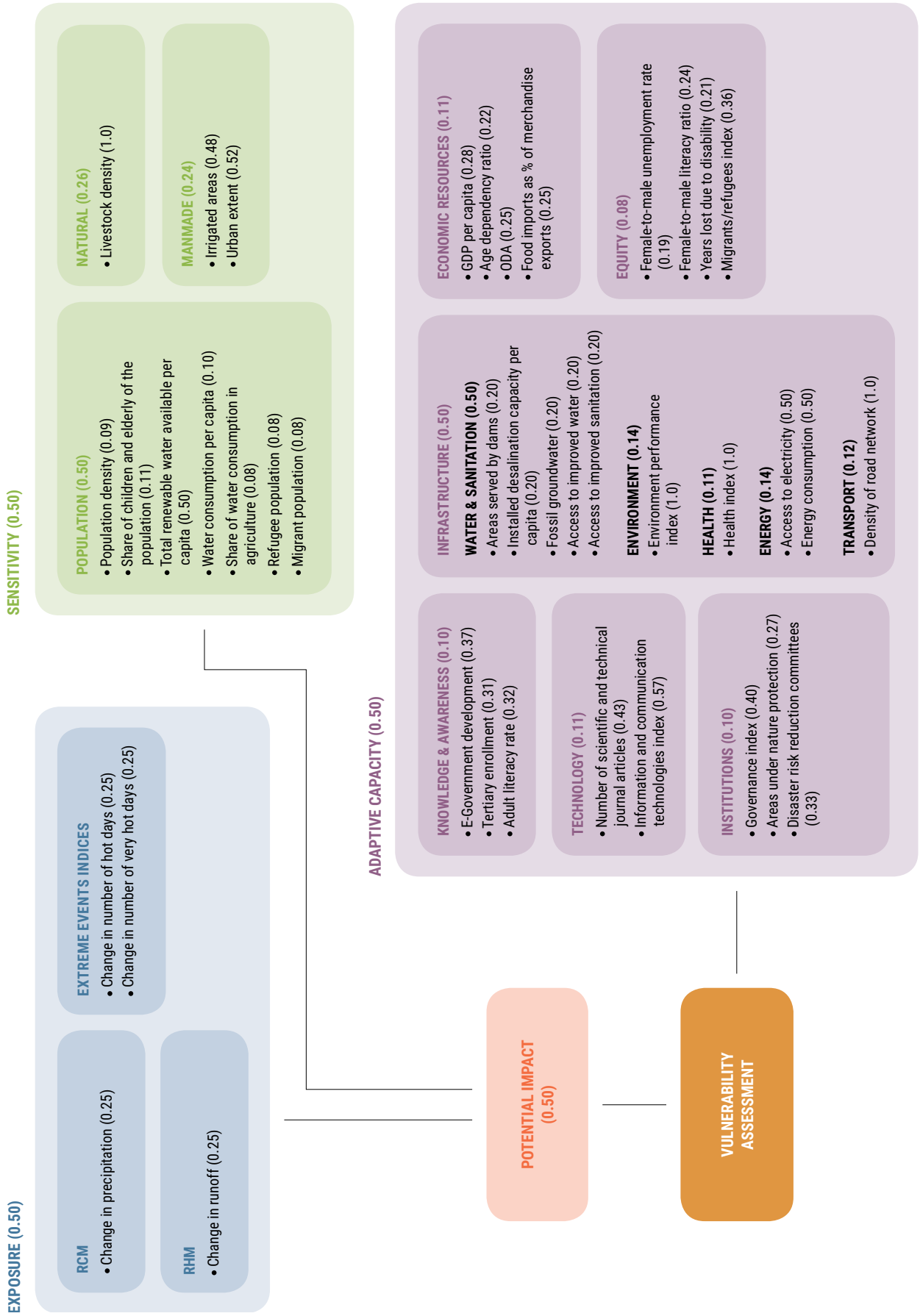
CHAPTER 15



PEOPLE SECTOR

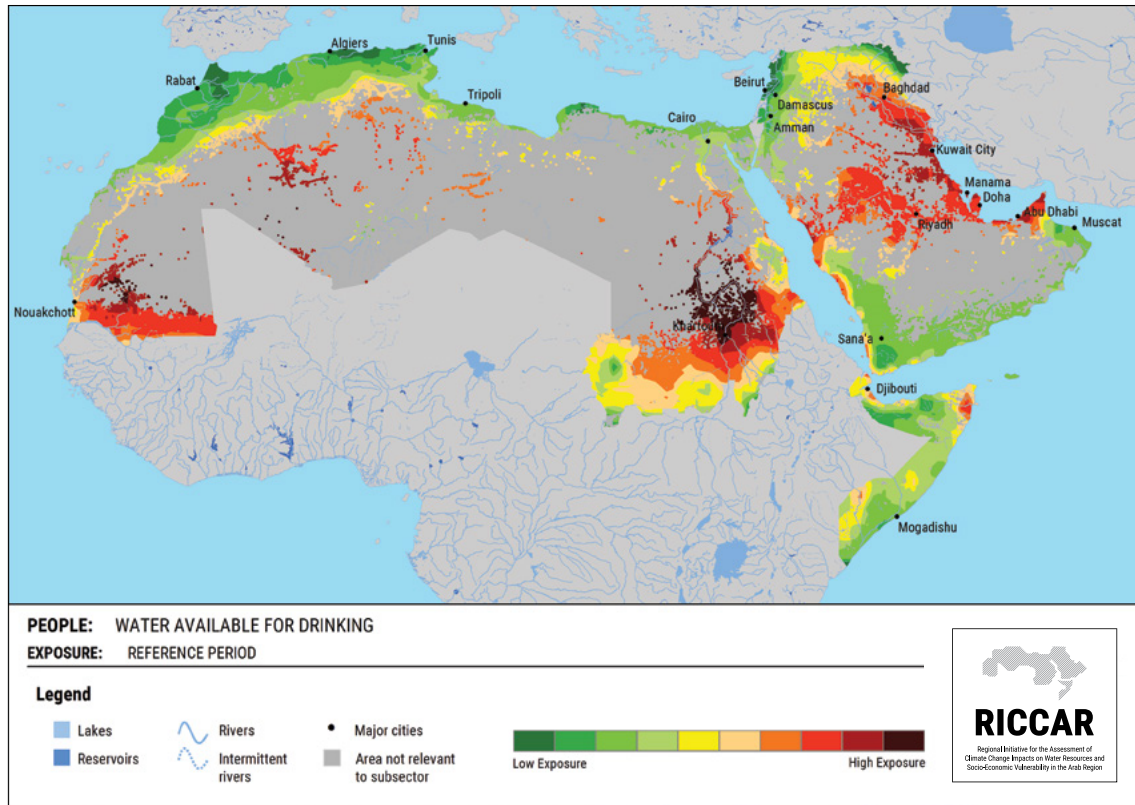
15.1. WATER AVAILABLE FOR DRINKING – 15.1.1. IMPACT CHAIN

FIGURE 378



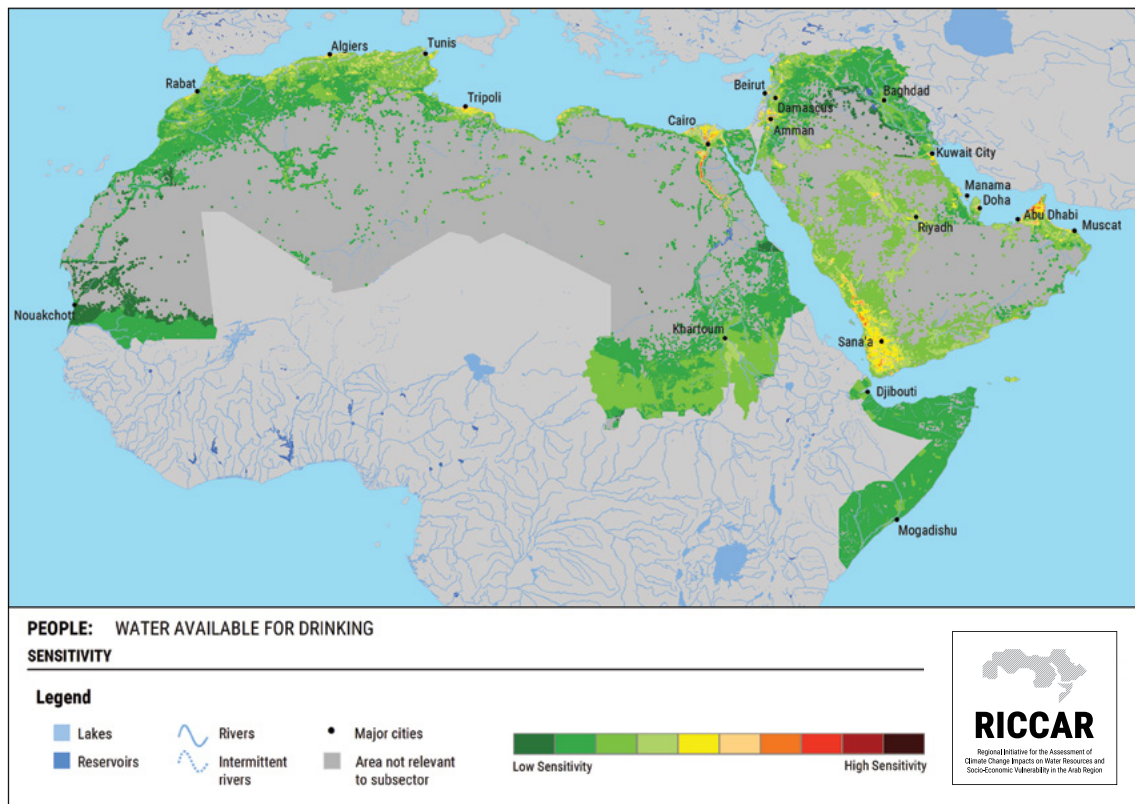
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.1. EXPOSURE

FIGURE 379



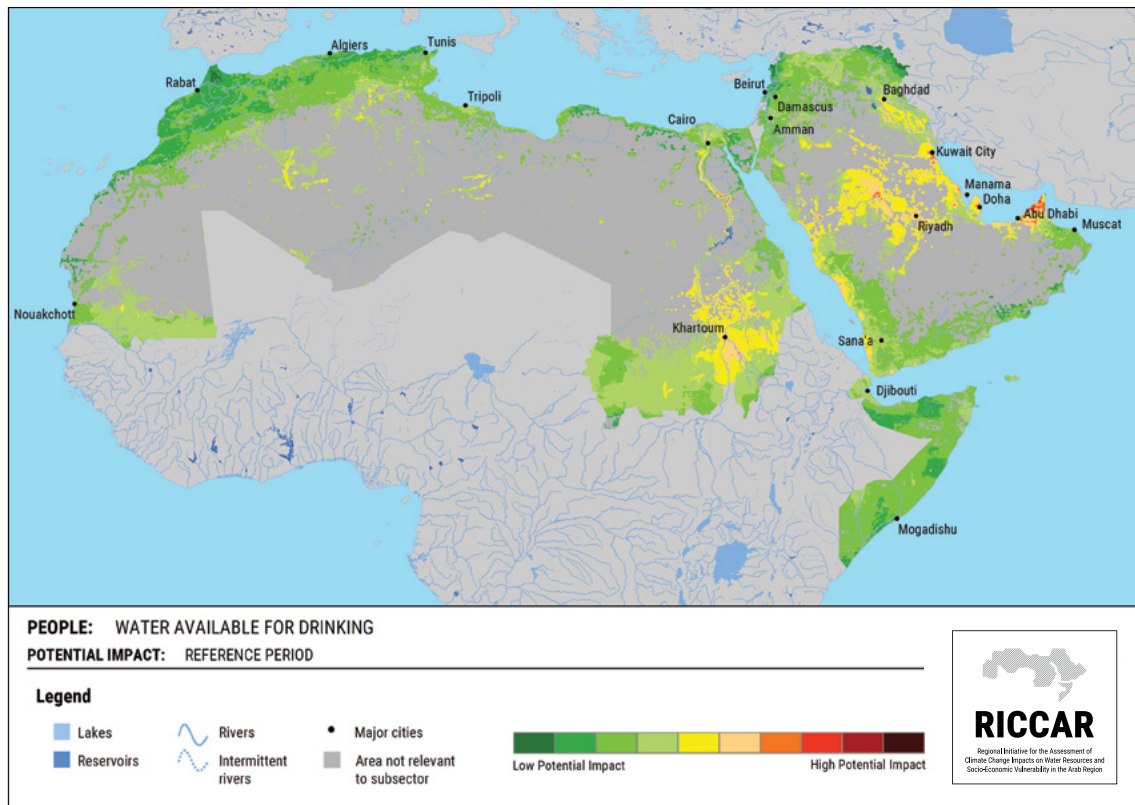
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.2. SENSITIVITY

FIGURE 380



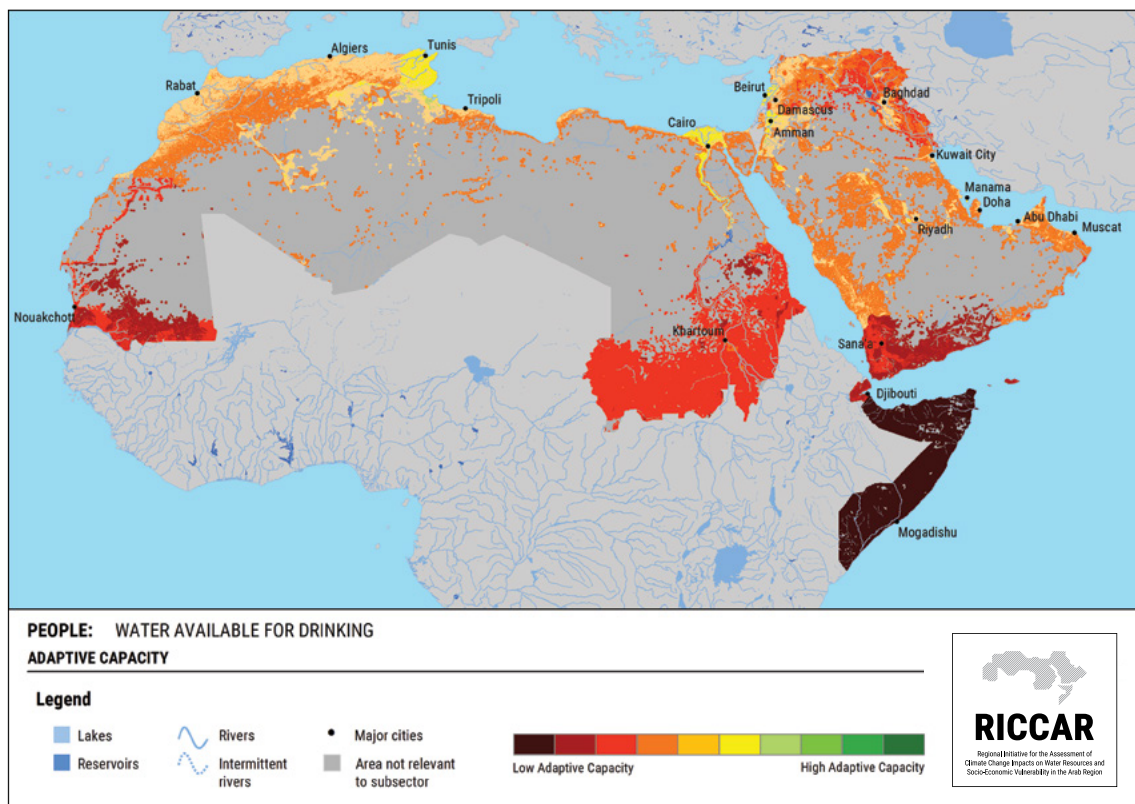
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.3. POTENTIAL IMPACT

FIGURE 381



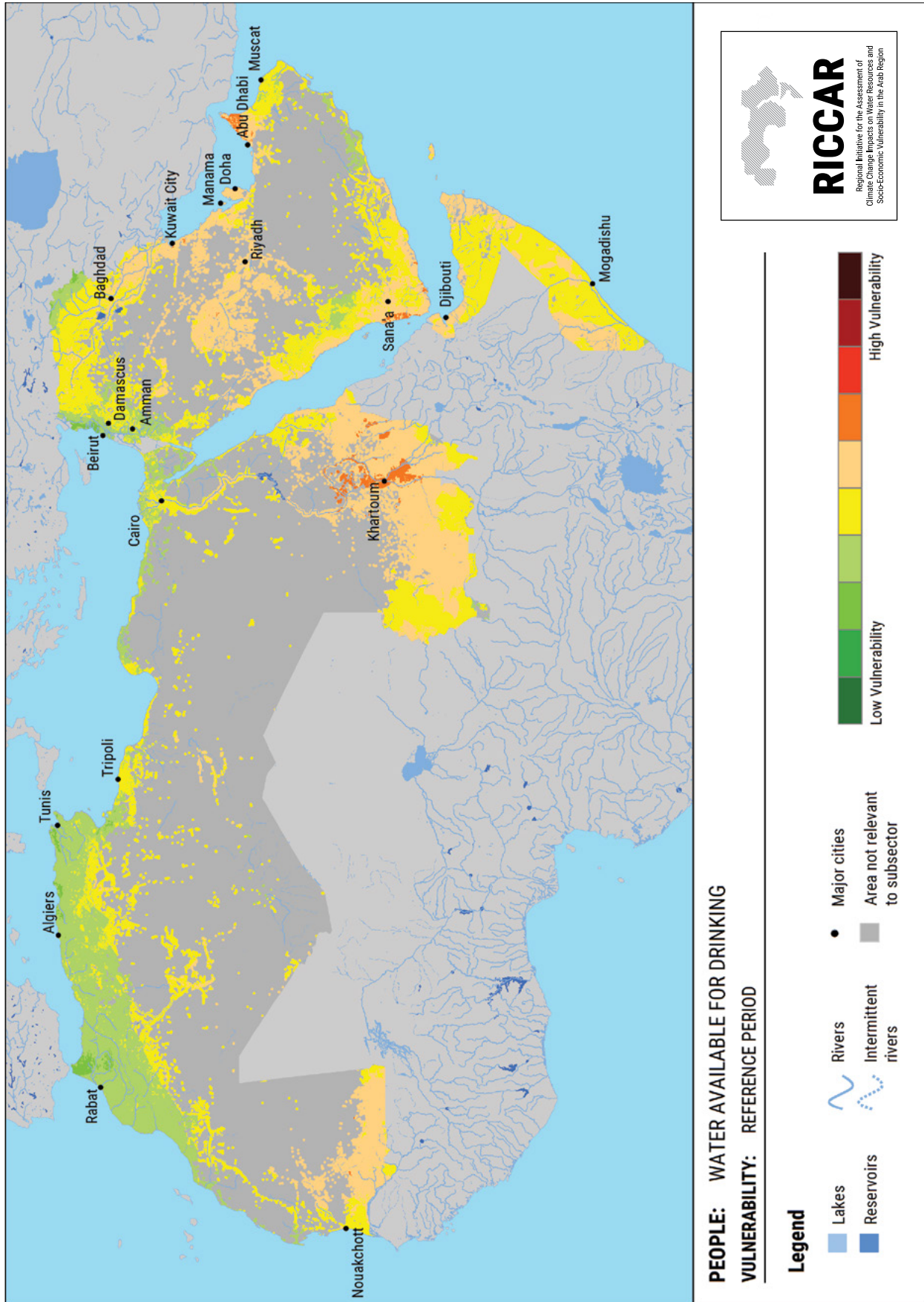
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.4. ADAPTIVE CAPACITY

FIGURE 382



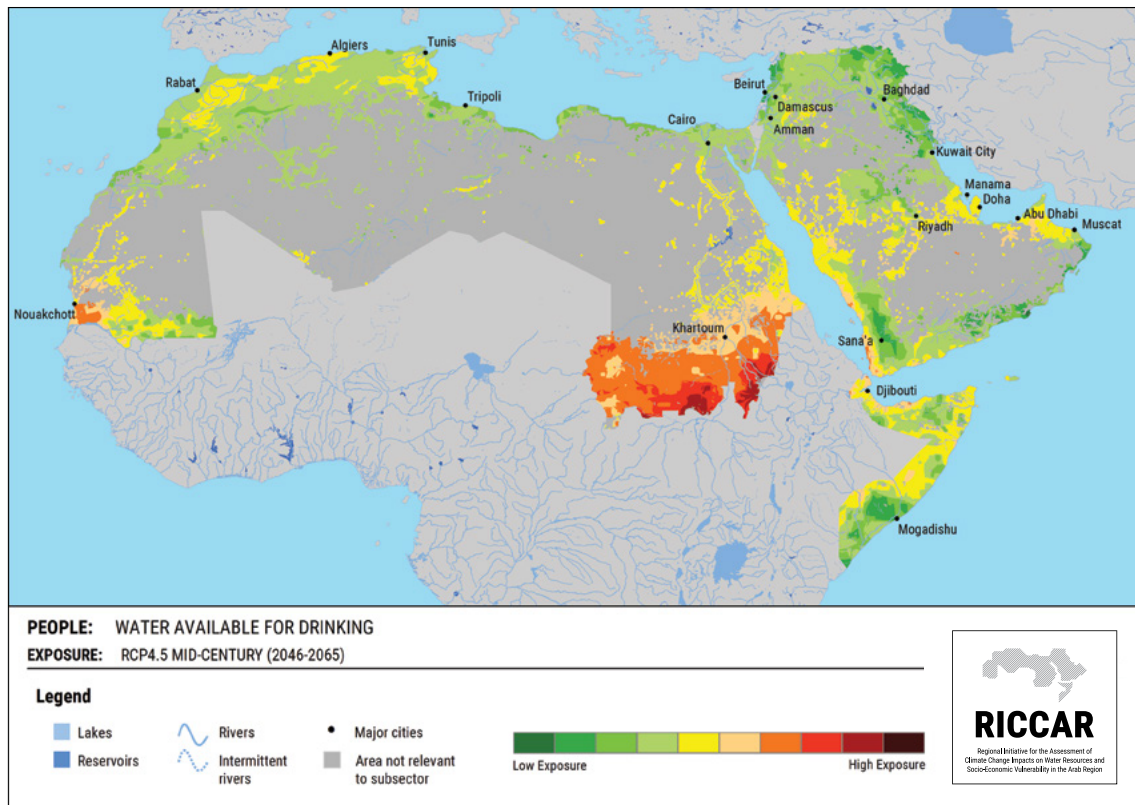
15.1. WATER AVAILABLE FOR DRINKING – 15.1.2. REFERENCE PERIOD – 15.1.2.5. VULNERABILITY

FIGURE 383



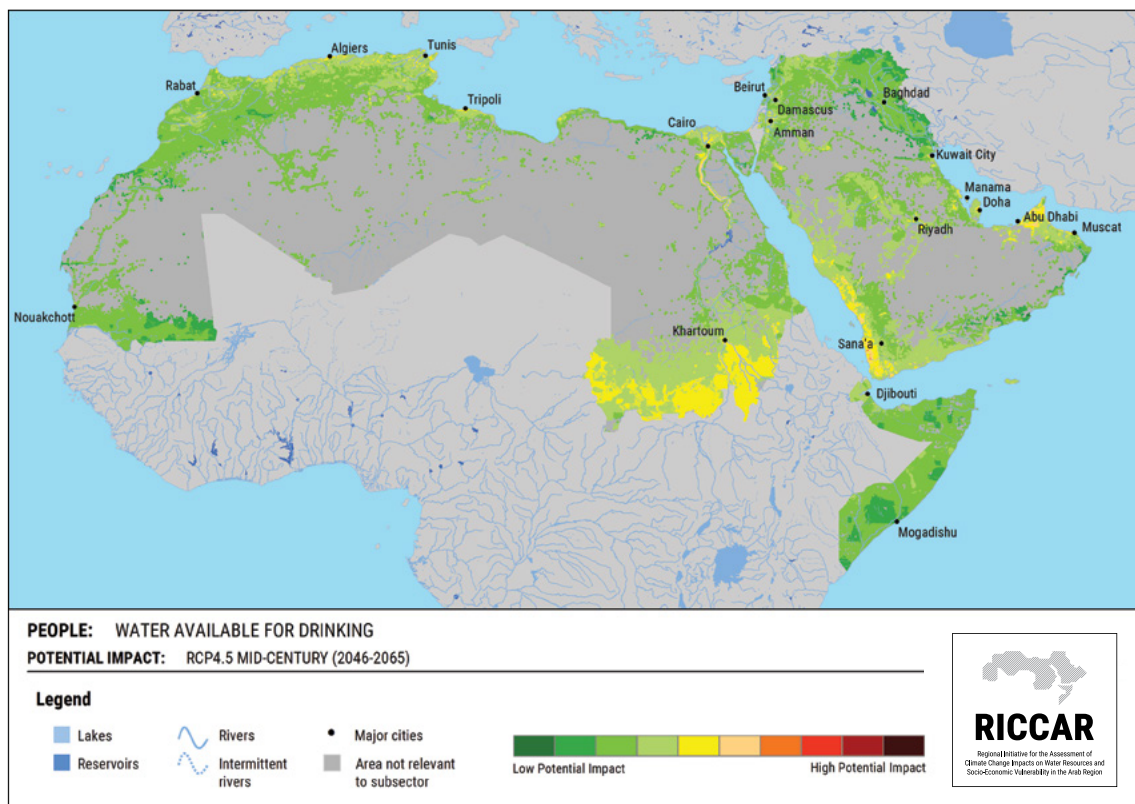
15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – 15.1.3.1. EXPOSURE

FIGURE 384



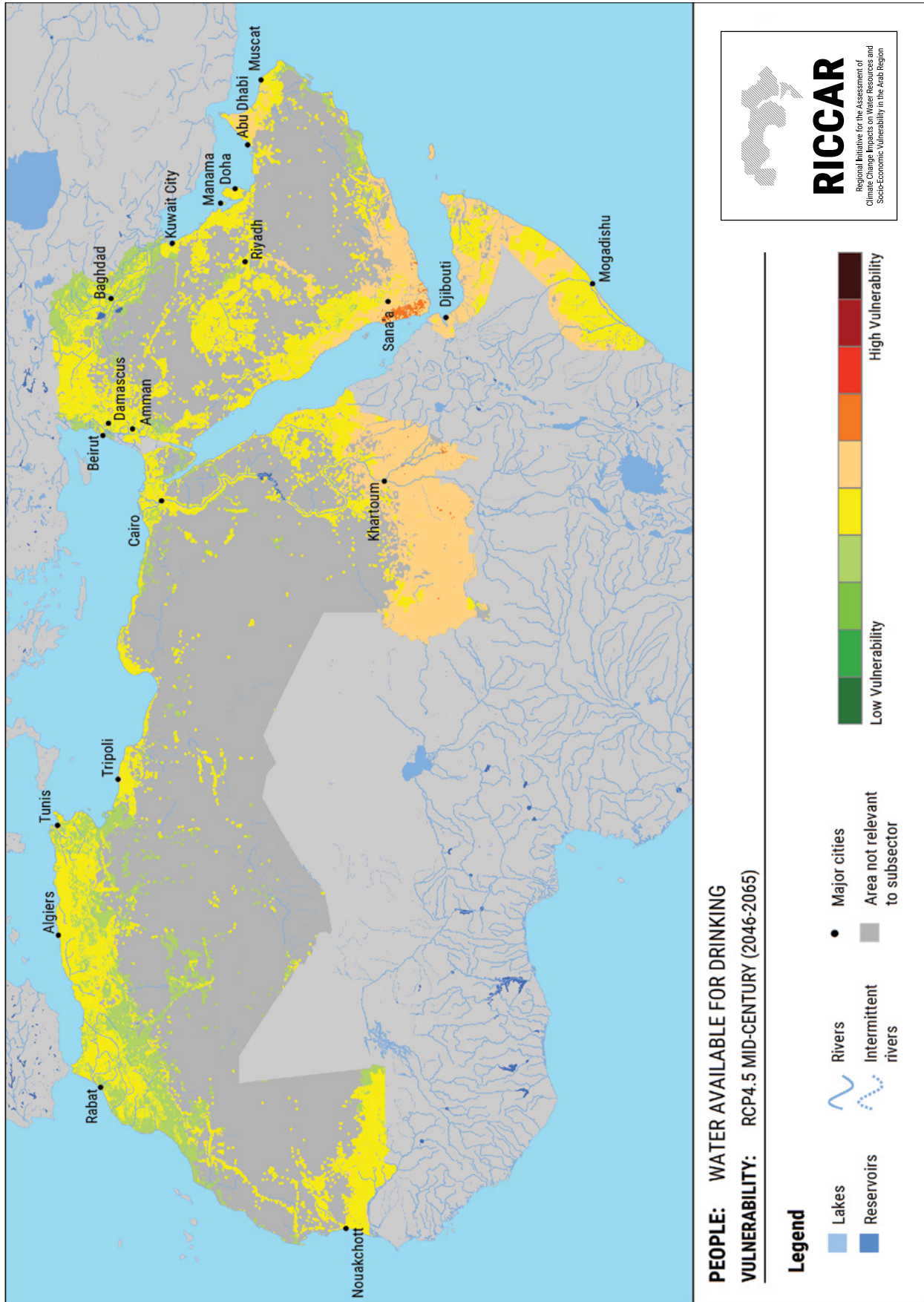
15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – 15.1.3.2. POTENTIAL IMPACT

FIGURE 385



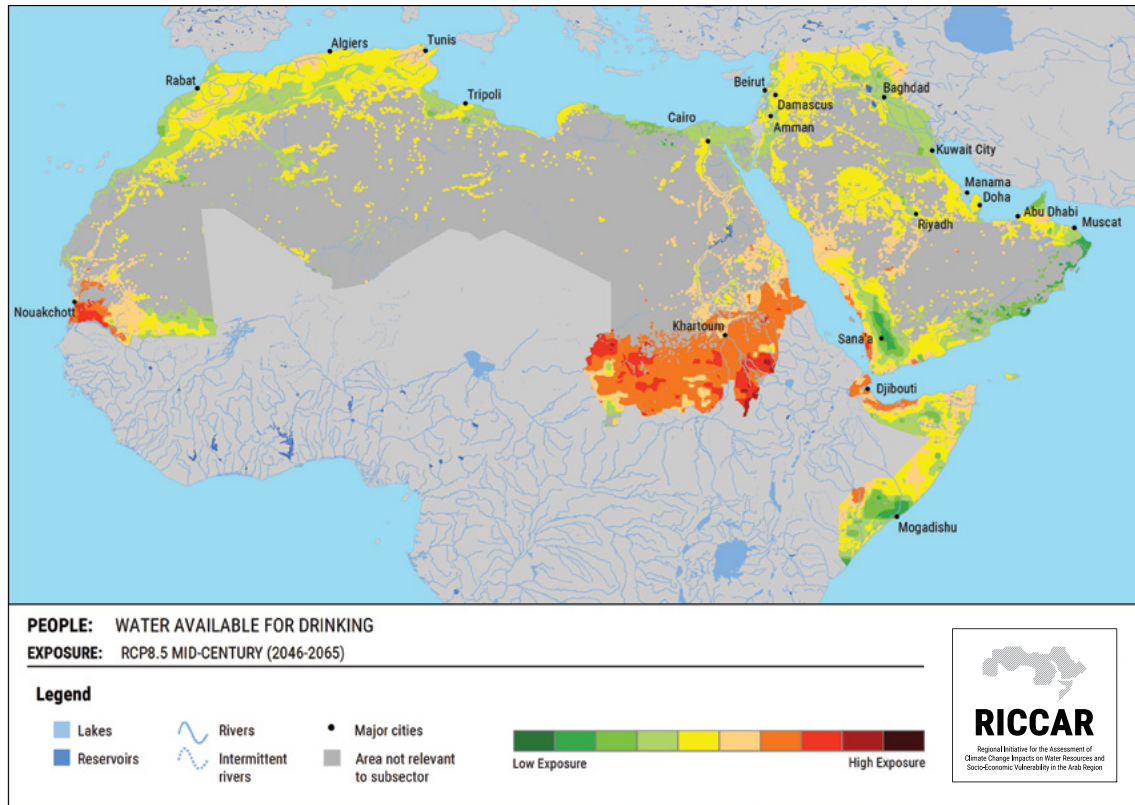
15.1. WATER AVAILABLE FOR DRINKING – 15.1.3. MID-CENTURY RCP 4.5 – 15.1.3.3. VULNERABILITY

FIGURE 386



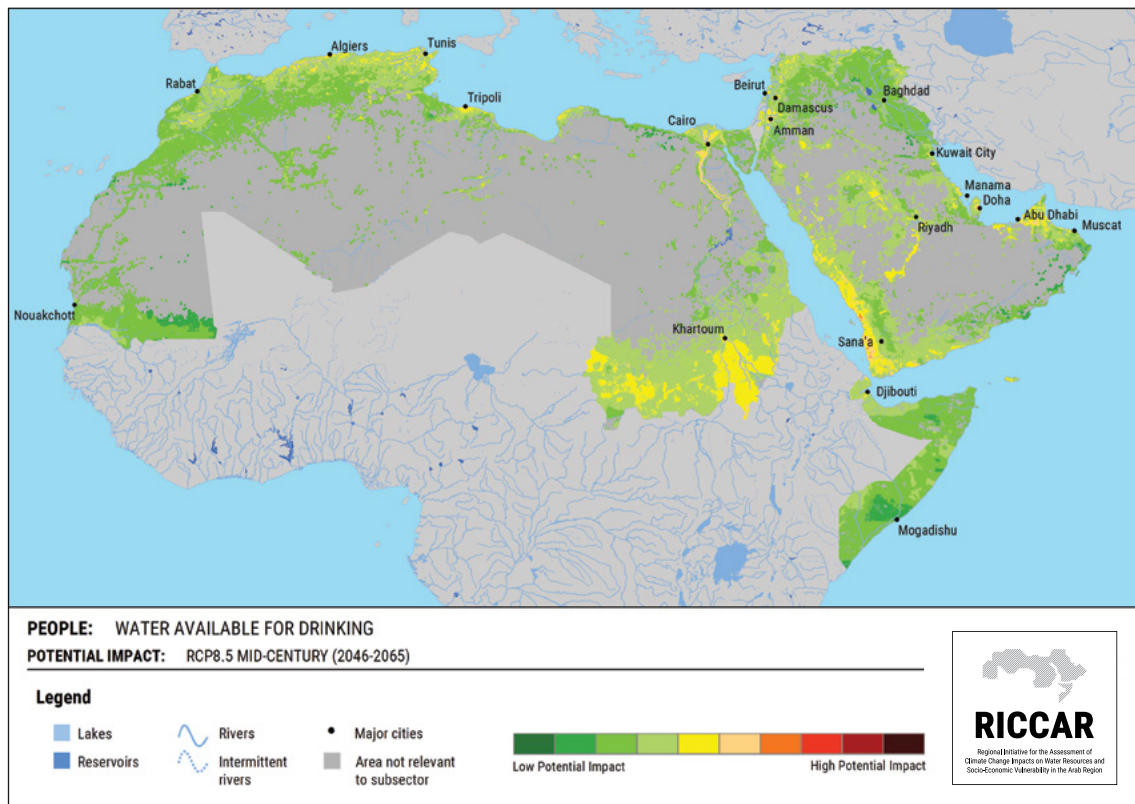
15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – 15.1.4.1. EXPOSURE

FIGURE 387



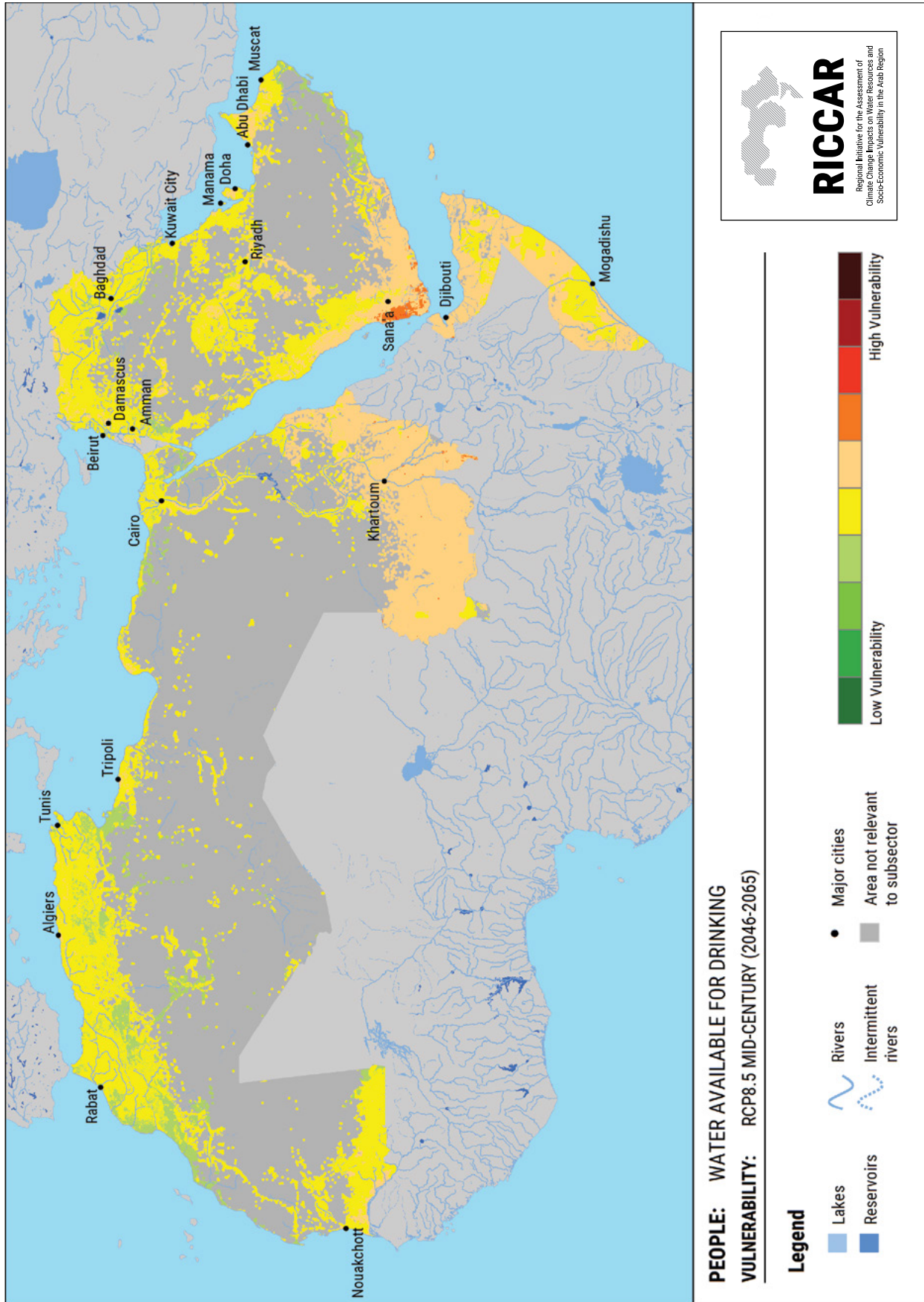
15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – 15.1.4.2. POTENTIAL IMPACT

FIGURE 388



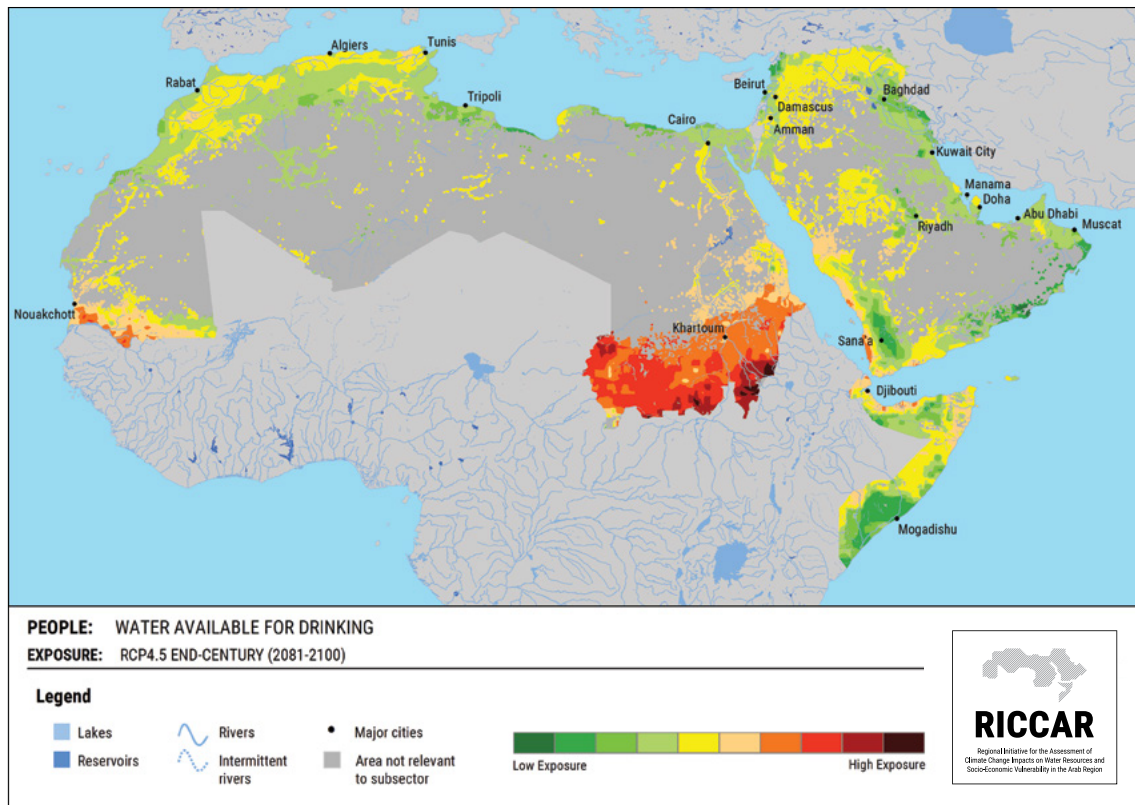
15.1. WATER AVAILABLE FOR DRINKING – 15.1.4. MID-CENTURY RCP 8.5 – 15.1.4.3. VULNERABILITY

FIGURE 389



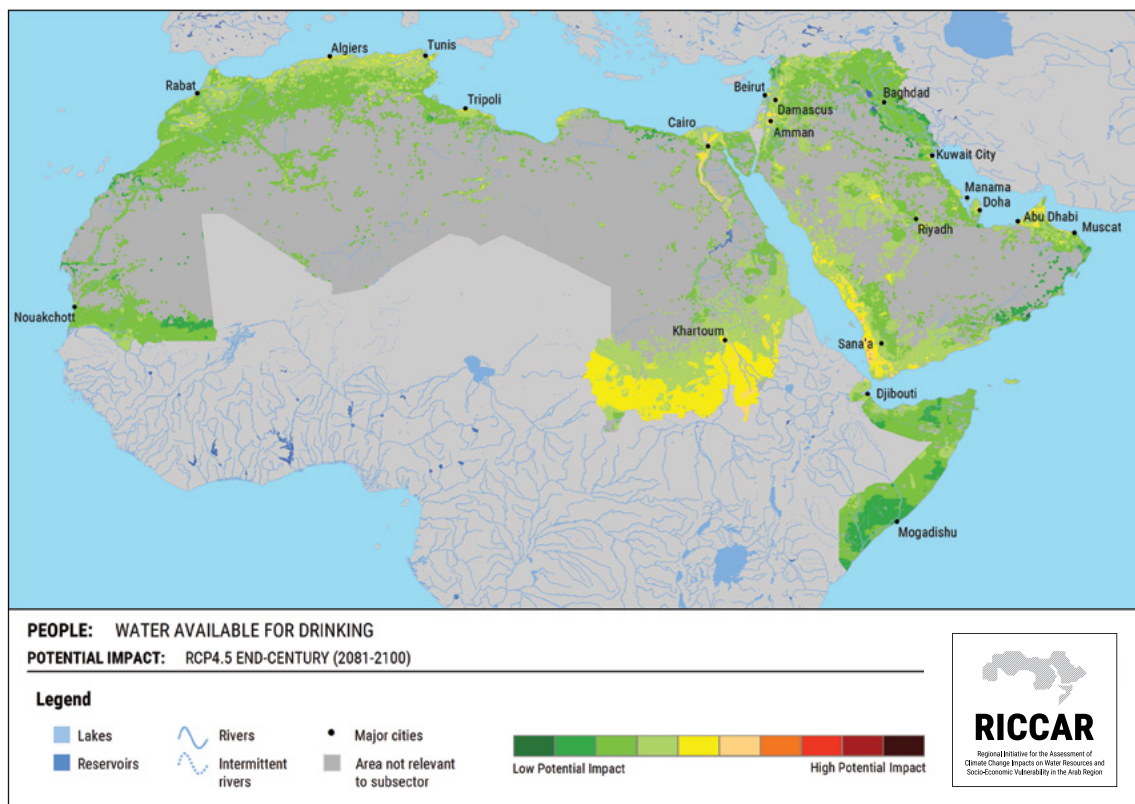
15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – 15.1.5.1. EXPOSURE

FIGURE 390



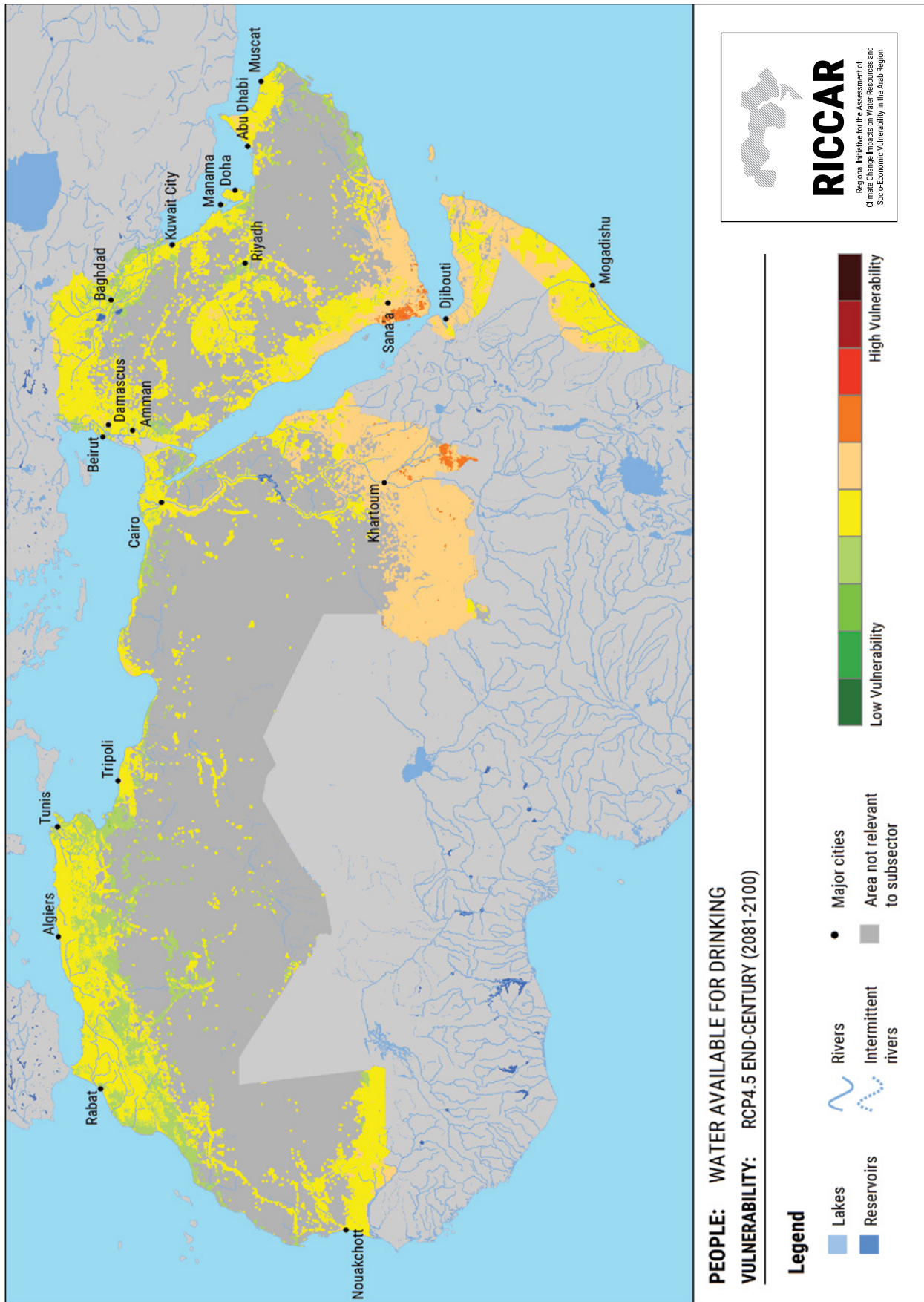
15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – 15.1.5.2. POTENTIAL IMPACT

FIGURE 391



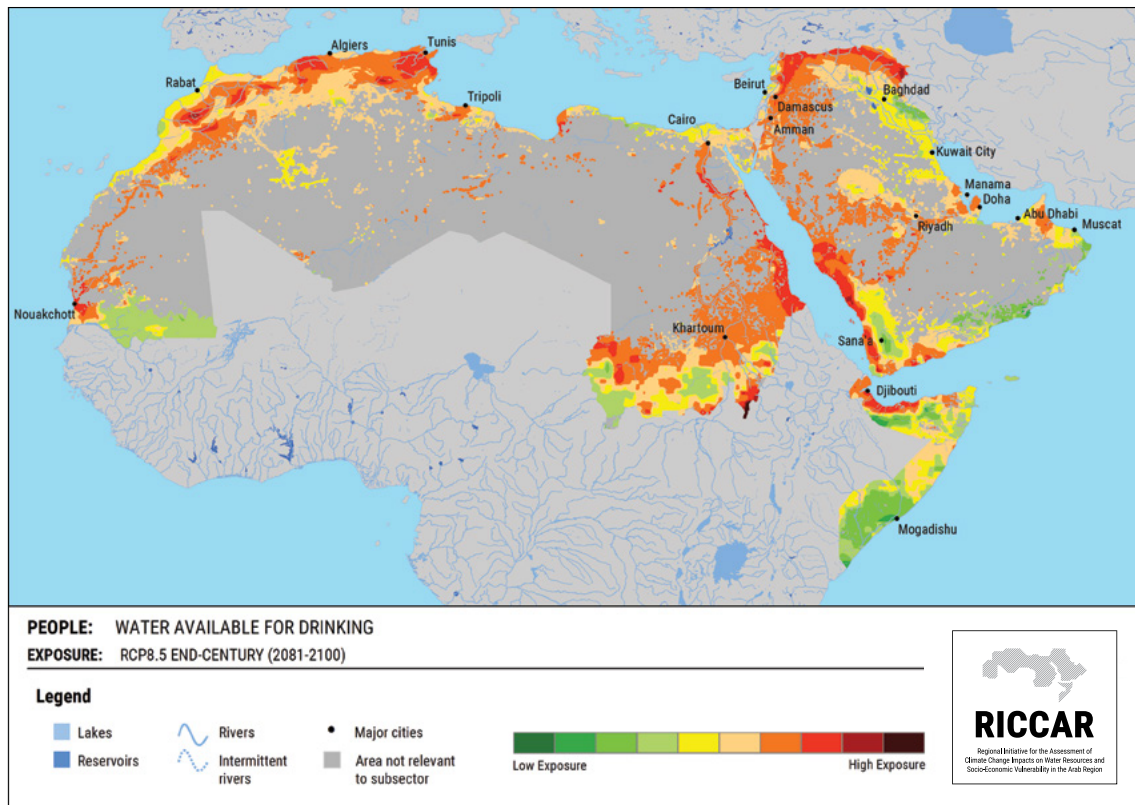
15.1. WATER AVAILABLE FOR DRINKING – 15.1.5. END-CENTURY RCP 4.5 – 15.1.5.3. VULNERABILITY

FIGURE 392



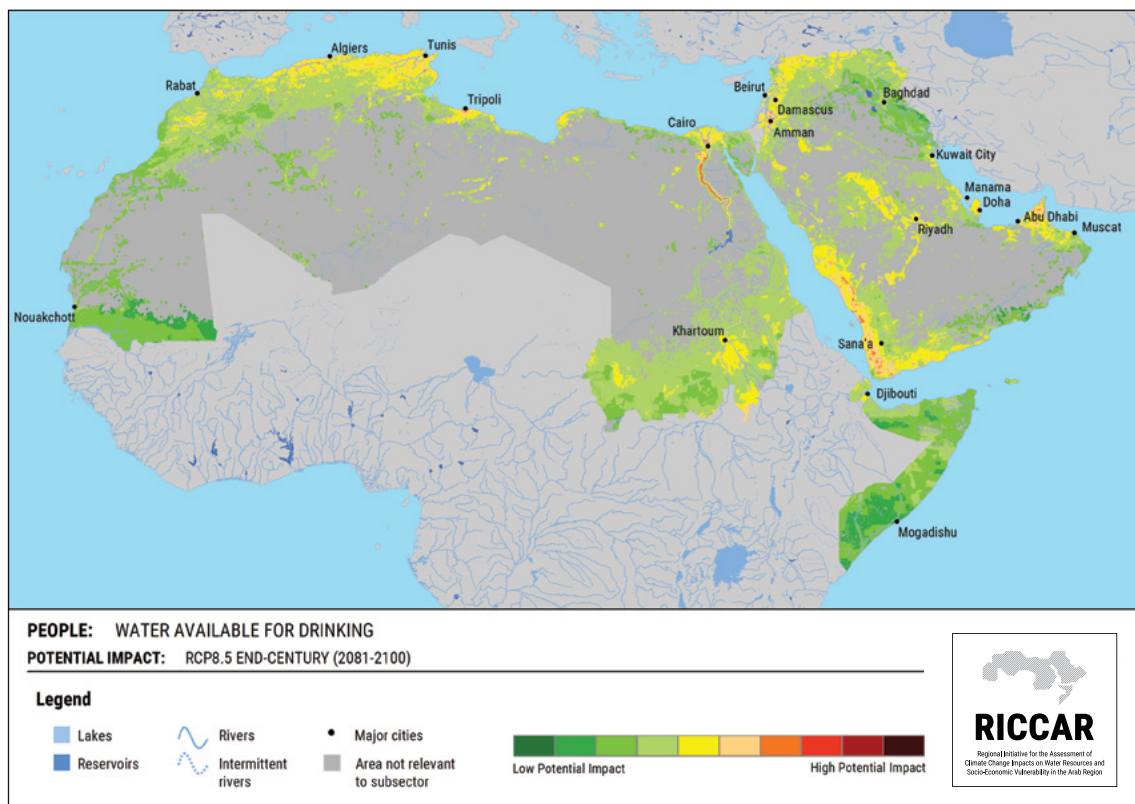
15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – 15.1.6.1. EXPOSURE

FIGURE 393



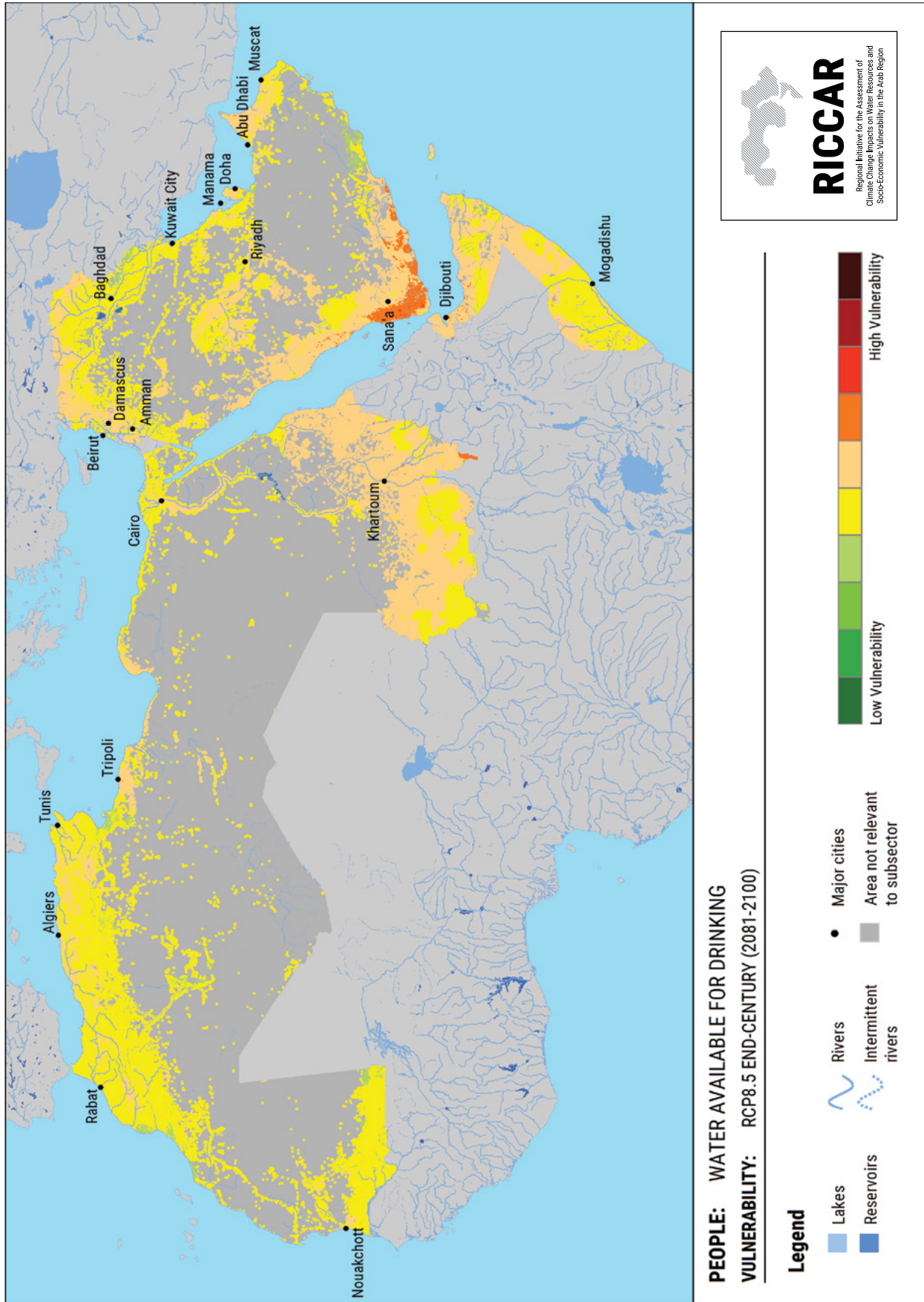
15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – 15.1.6.2. POTENTIAL IMPACT

FIGURE 394



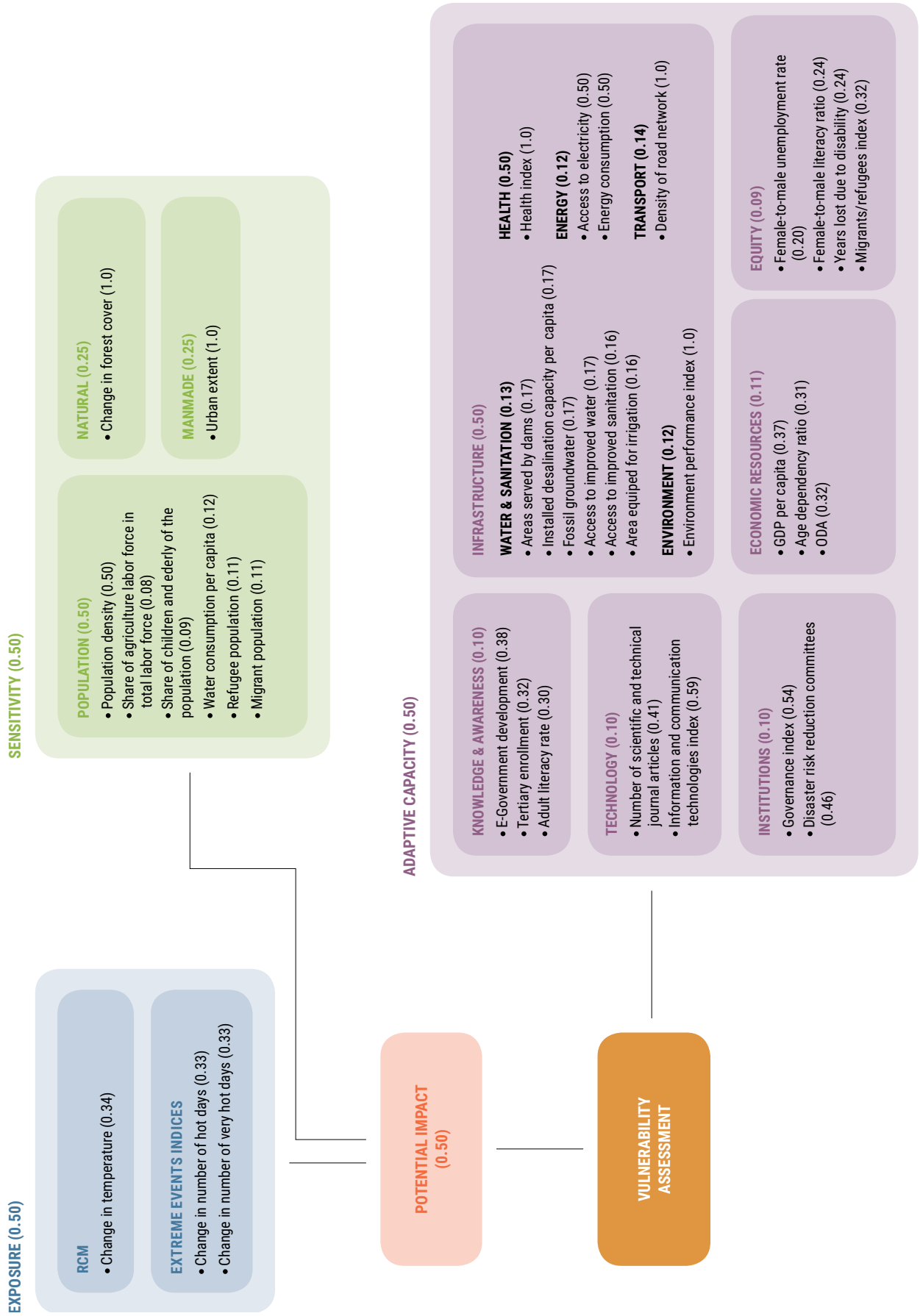
15.1. WATER AVAILABLE FOR DRINKING – 15.1.6. END-CENTURY RCP 8.5 – 15.1.6.3. VULNERABILITY

FIGURE 395



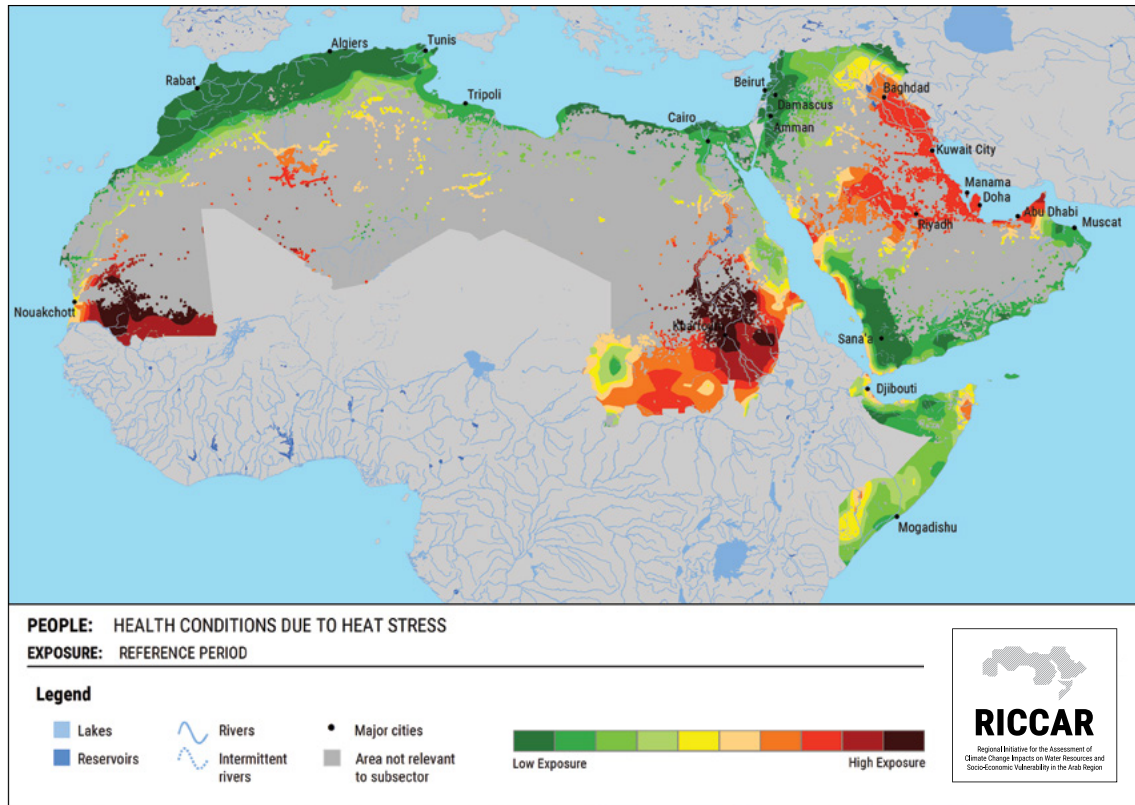
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.1. IMPACT CHAIN

FIGURE 396



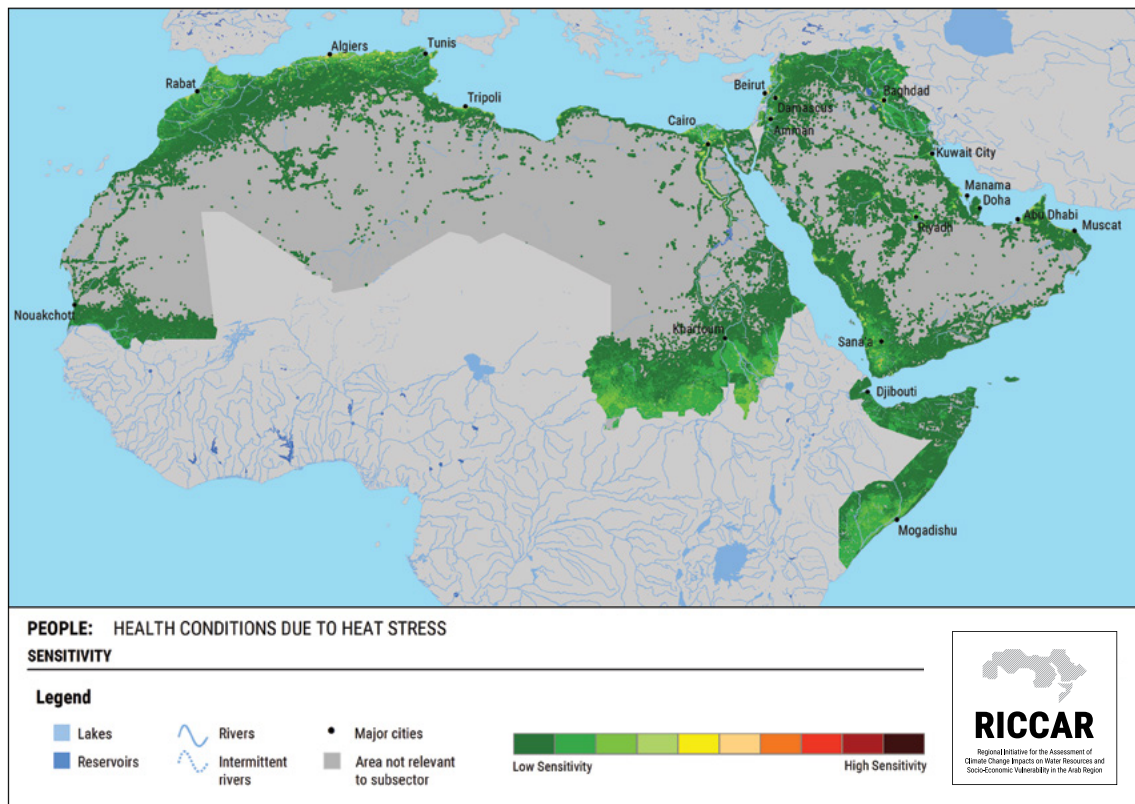
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.1. EXPOSURE

FIGURE 397



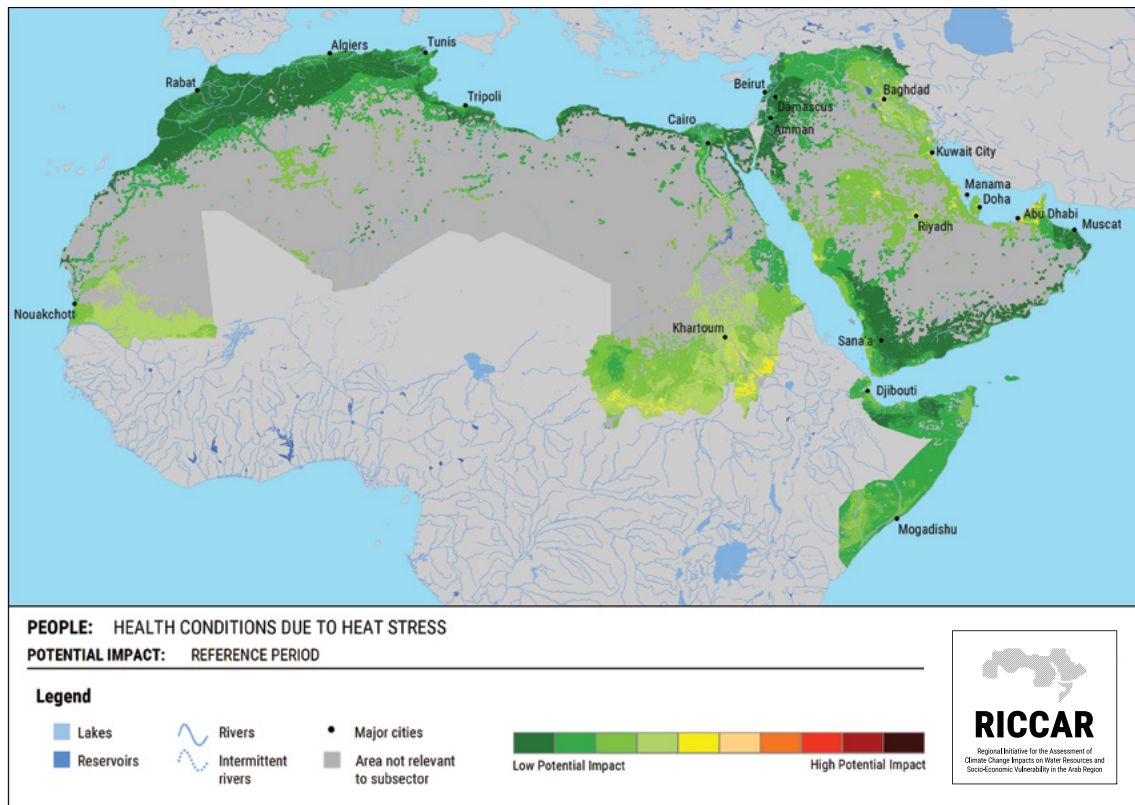
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.2. SENSITIVITY

FIGURE 398



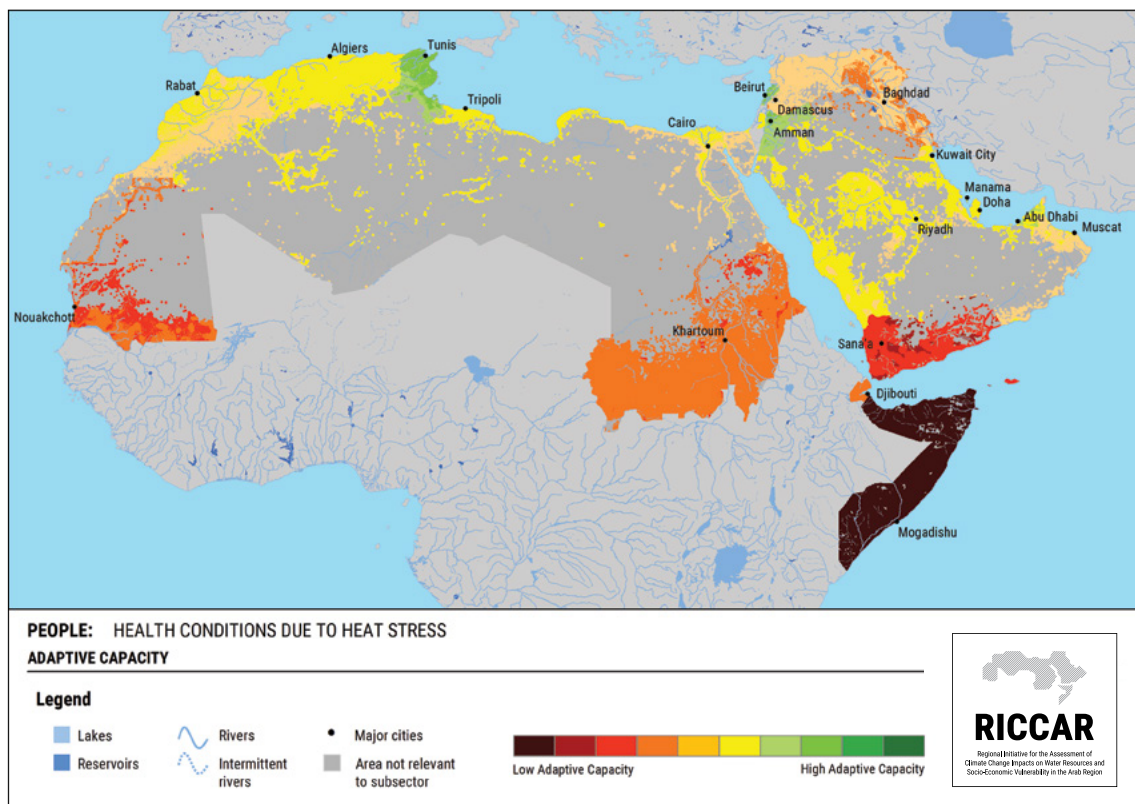
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.3. POTENTIAL IMPACT

FIGURE 399



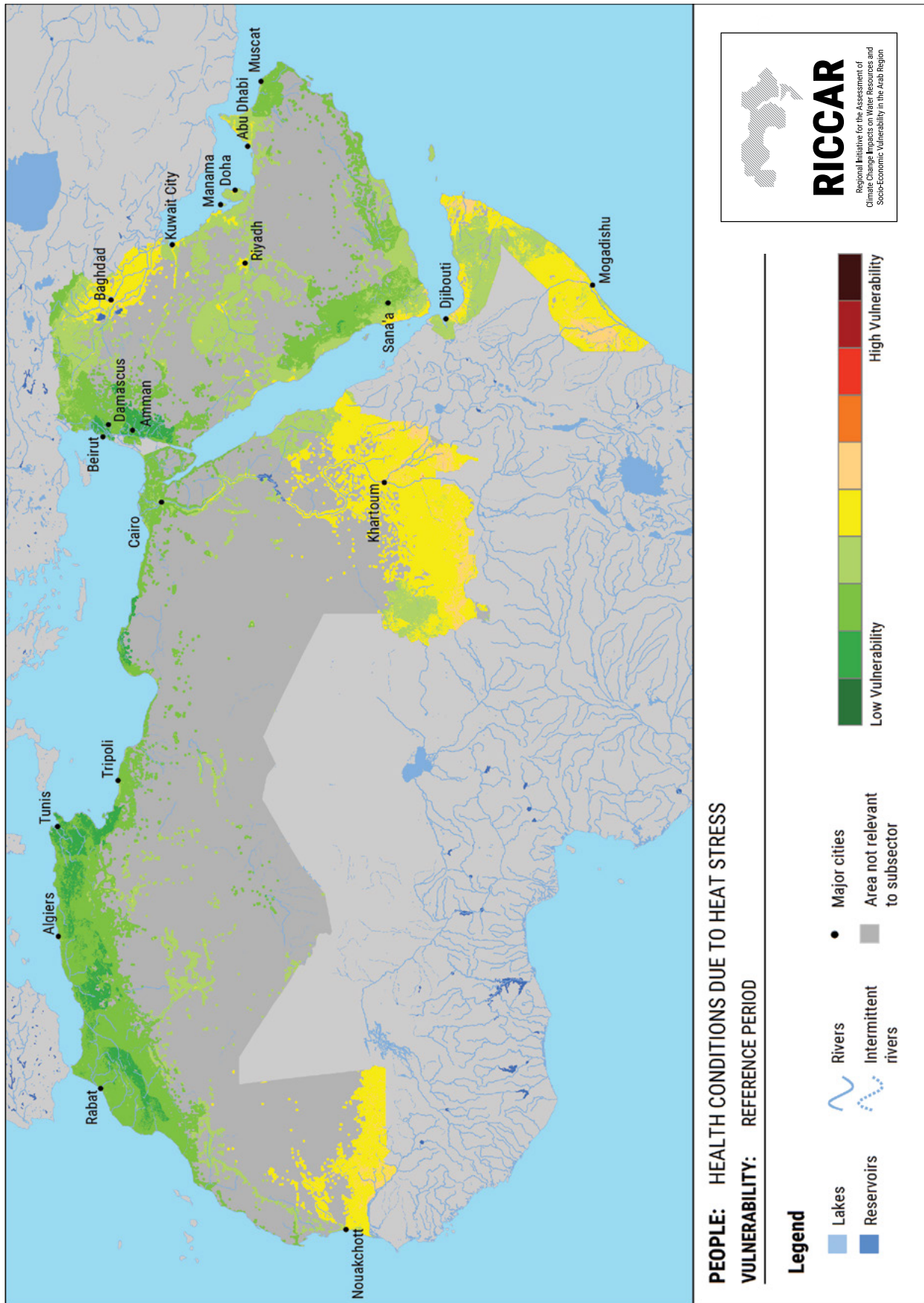
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.4. ADAPTIVE CAPACITY

FIGURE 400



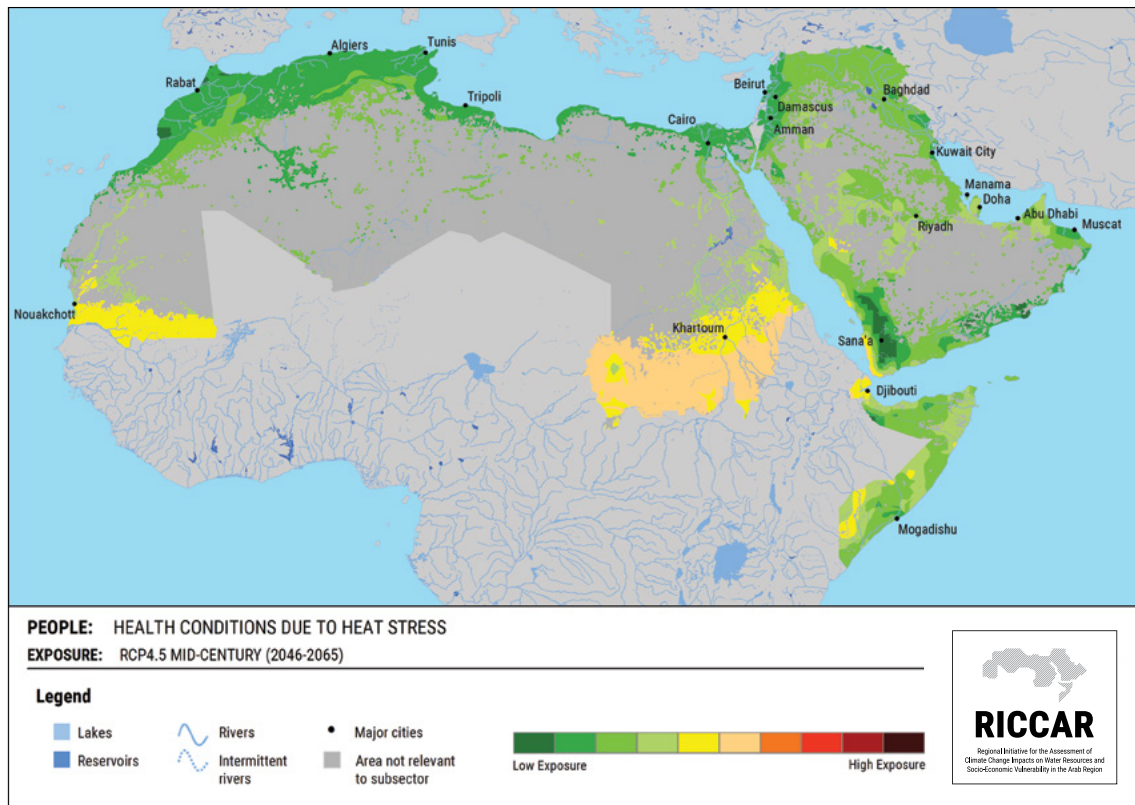
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.2. REFERENCE PERIOD – 15.2.2.5. VULNERABILITY

FIGURE 401



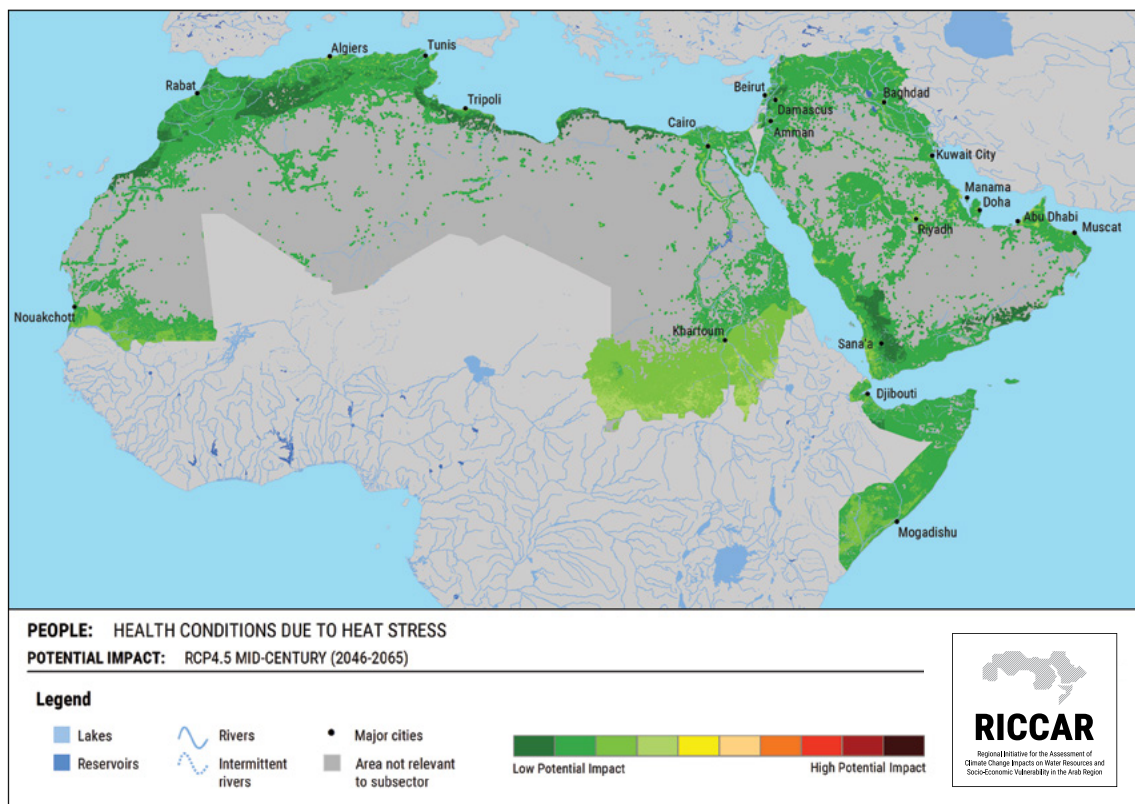
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – 15.2.3.1. EXPOSURE

FIGURE 402



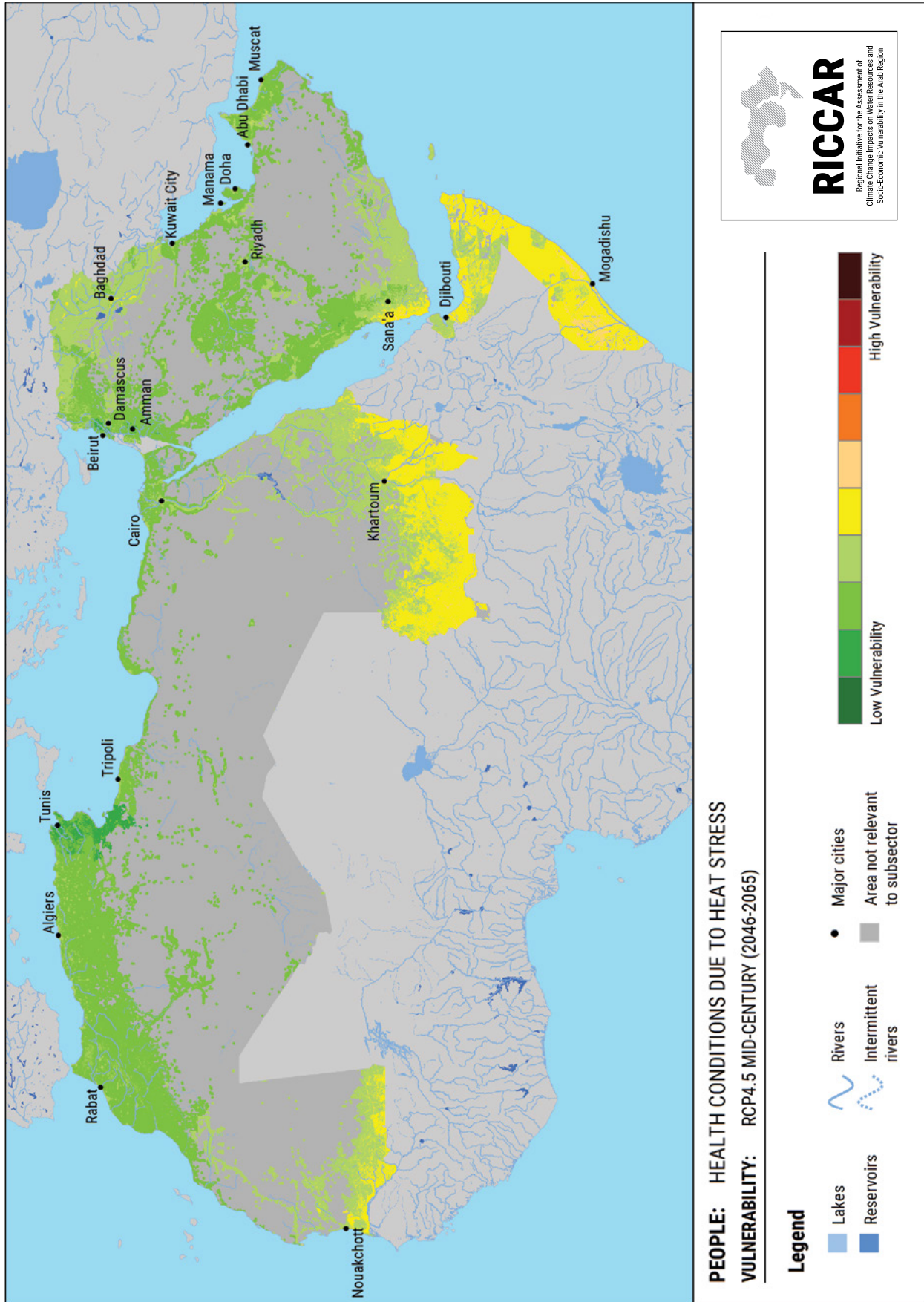
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – 15.2.3.2. POTENTIAL IMPACT

FIGURE 403



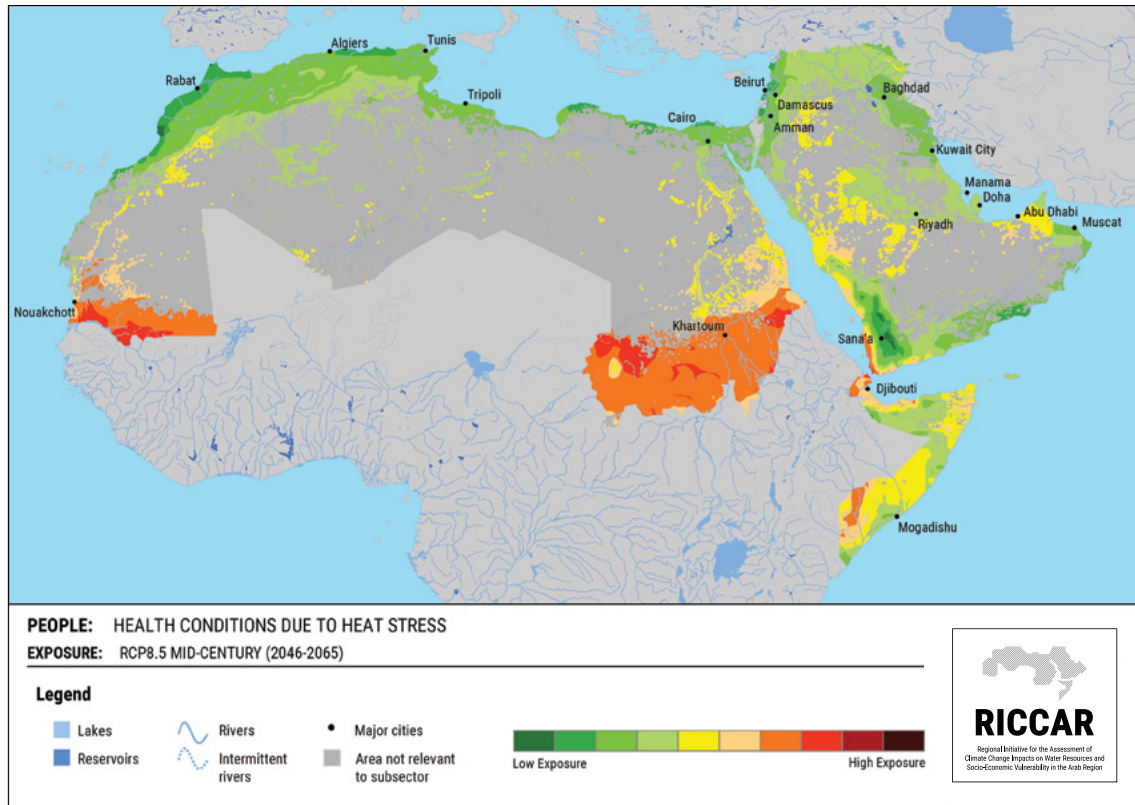
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.3. MID-CENTURY RCP 4.5 – 15.2.3.3. VULNERABILITY

FIGURE 404



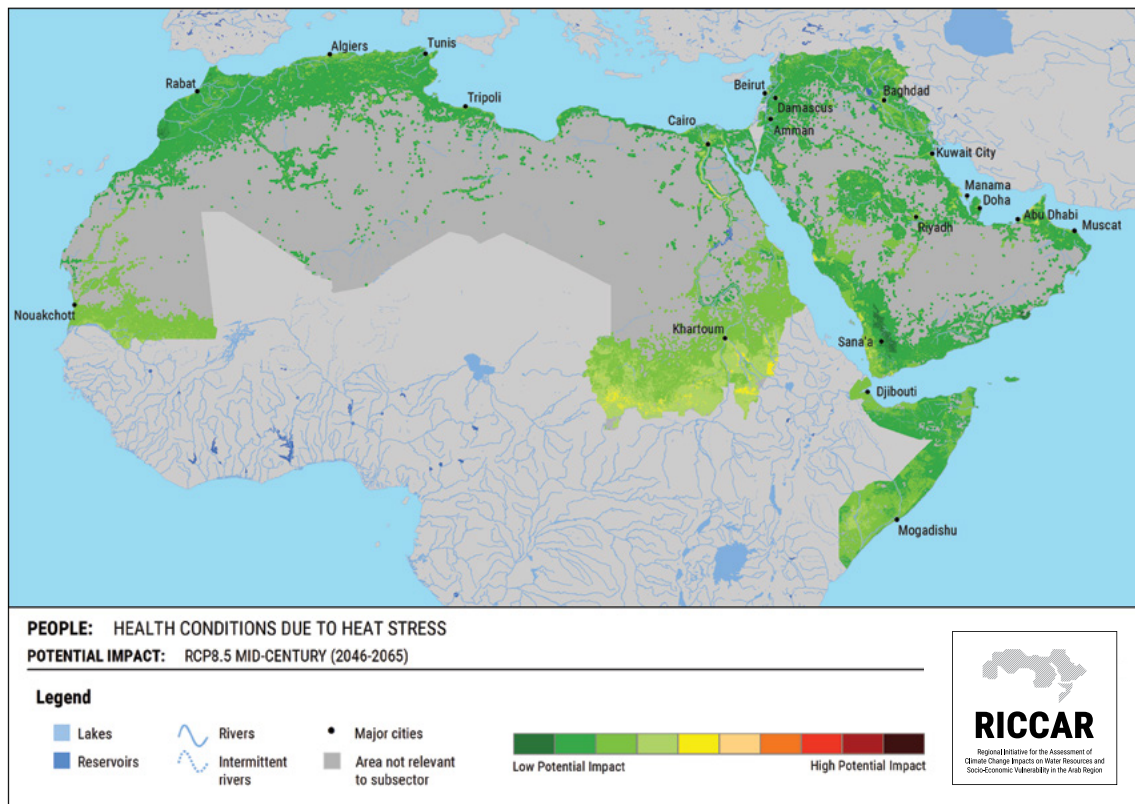
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – 15.2.4.1. EXPOSURE

FIGURE 405



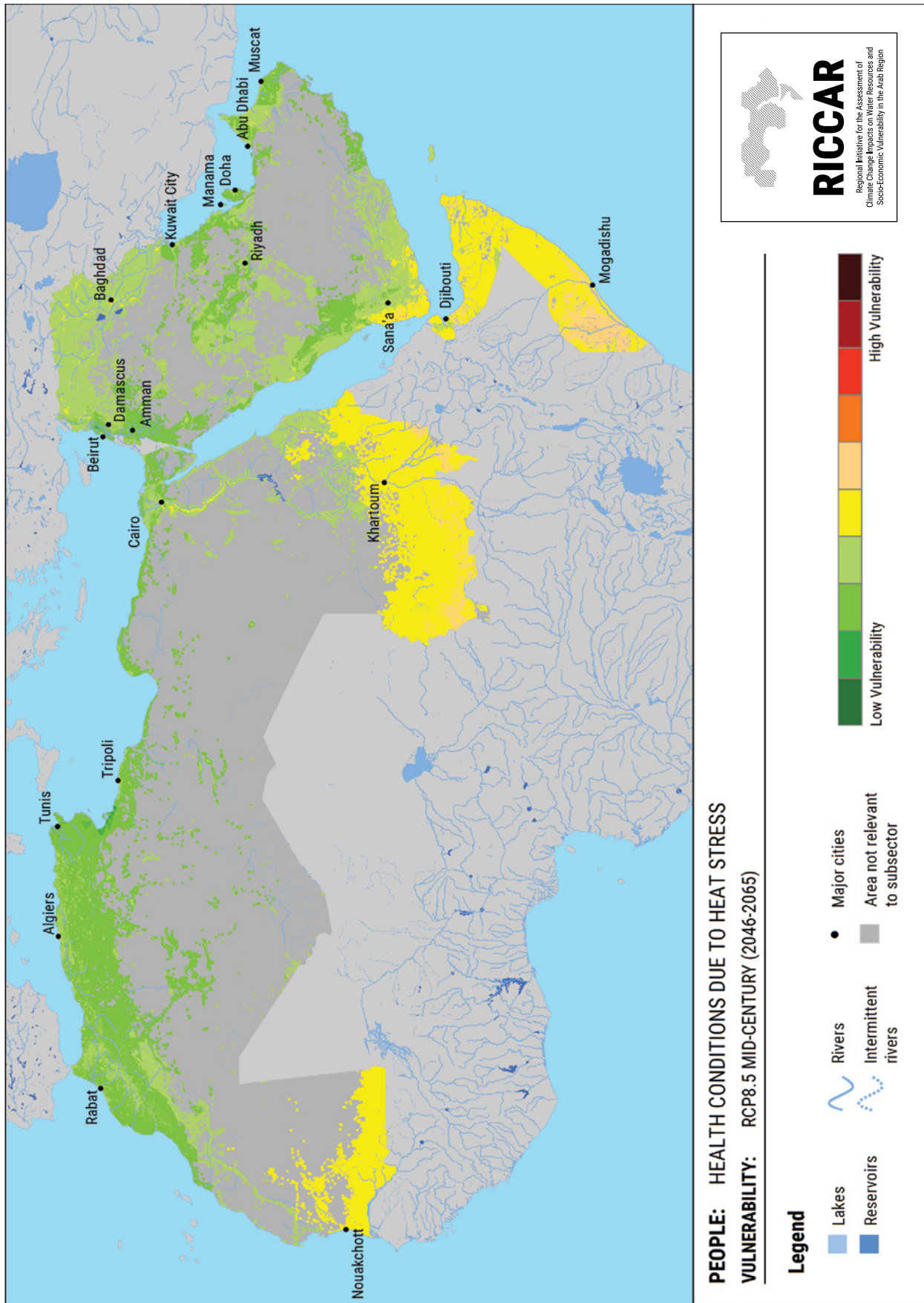
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – 15.2.4.2. POTENTIAL IMPACT

FIGURE 406



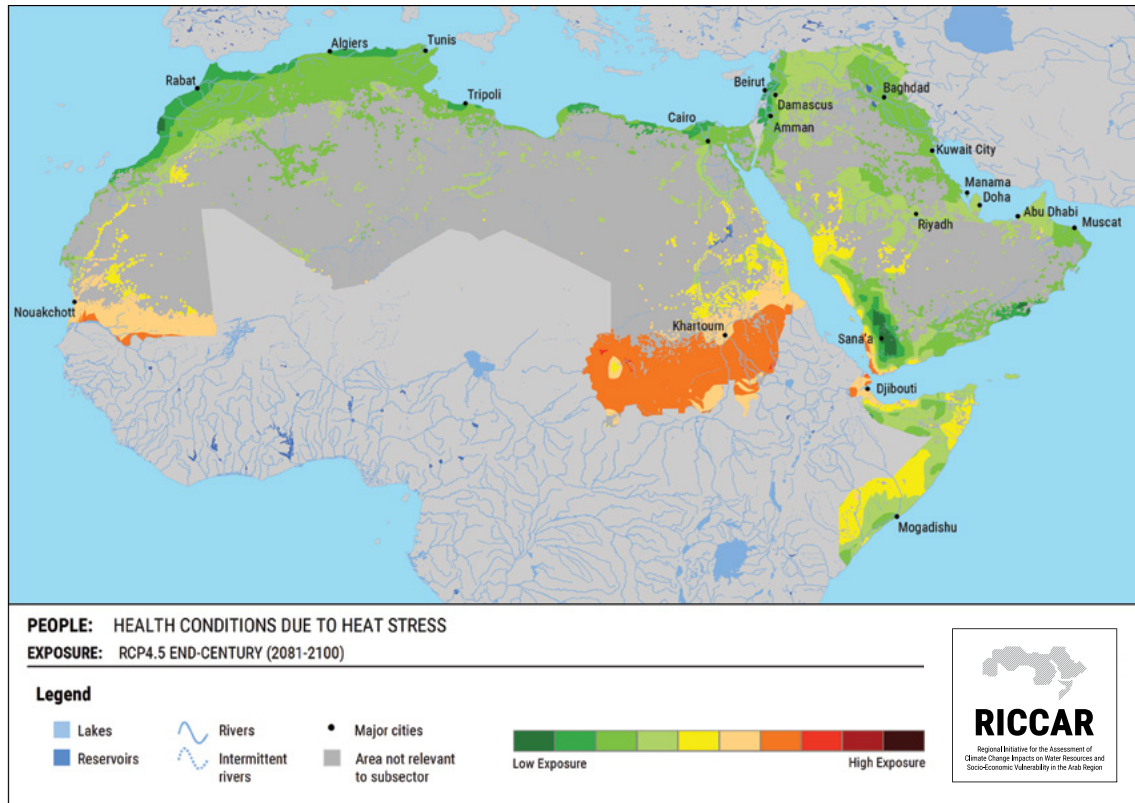
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.4. MID-CENTURY RCP 8.5 – 15.2.4.3. VULNERABILITY

FIGURE 407



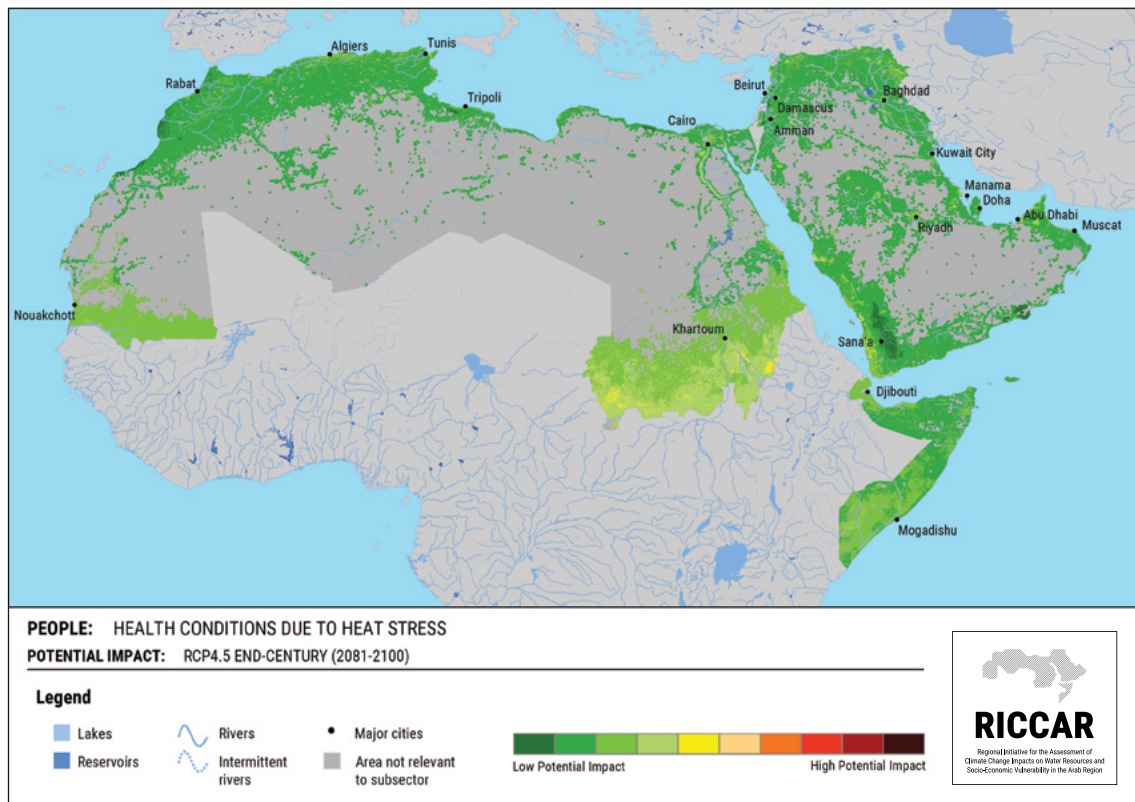
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – 15.2.5.1. EXPOSURE

FIGURE 408



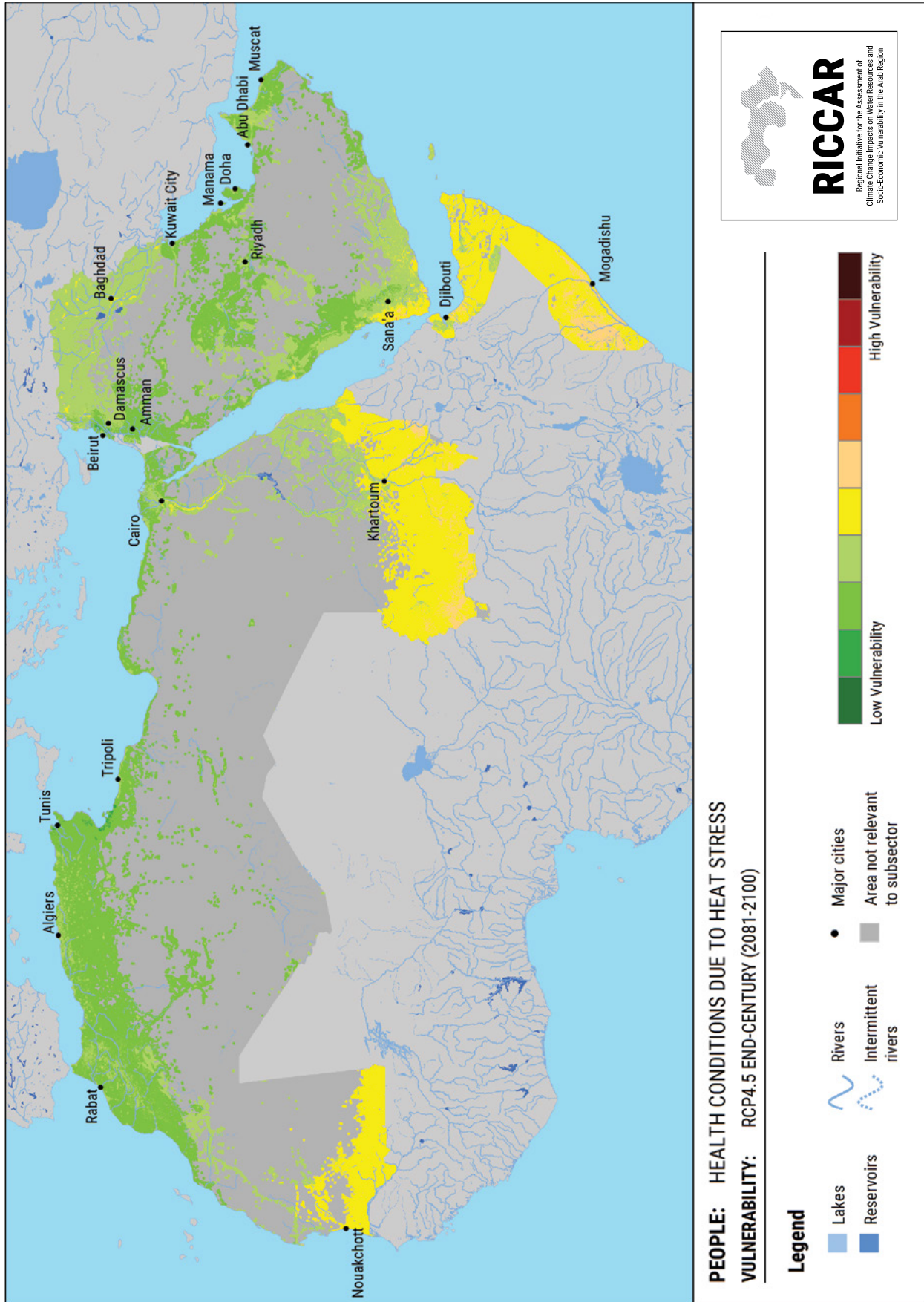
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – 15.2.5.2. POTENTIAL IMPACT

FIGURE 409



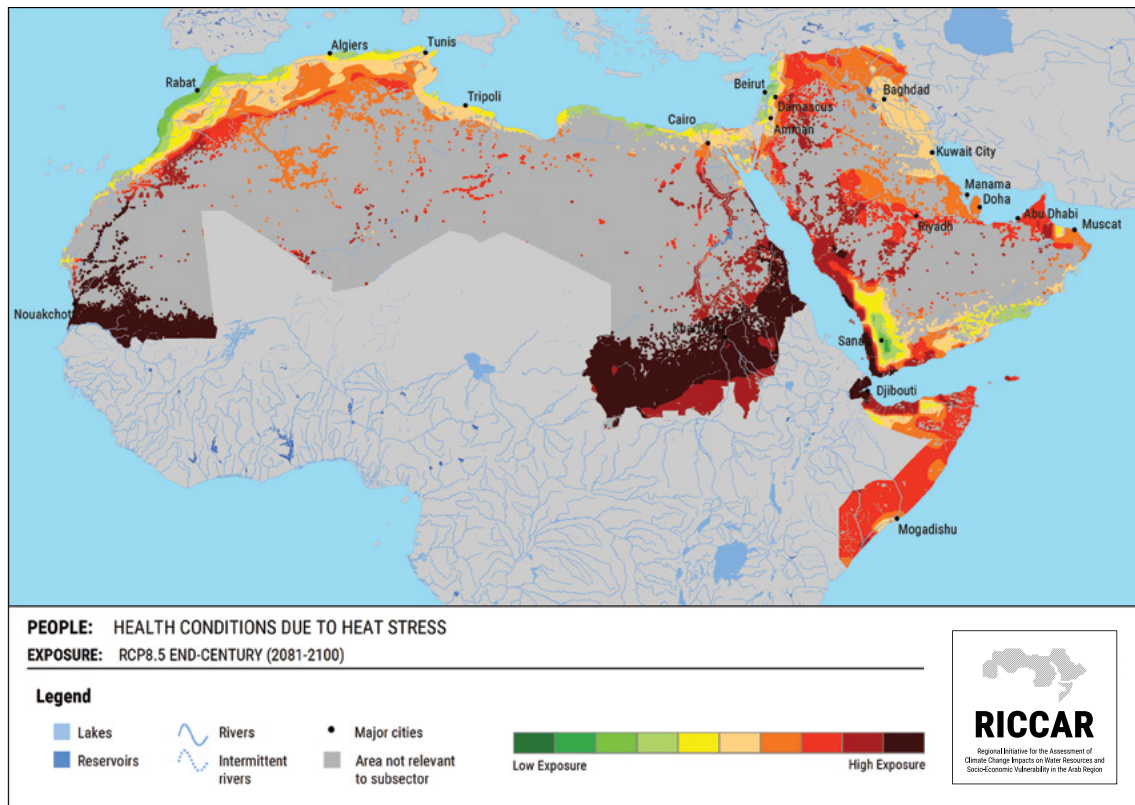
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.5. END-CENTURY RCP 4.5 – 15.2.5.3. VULNERABILITY

FIGURE 410



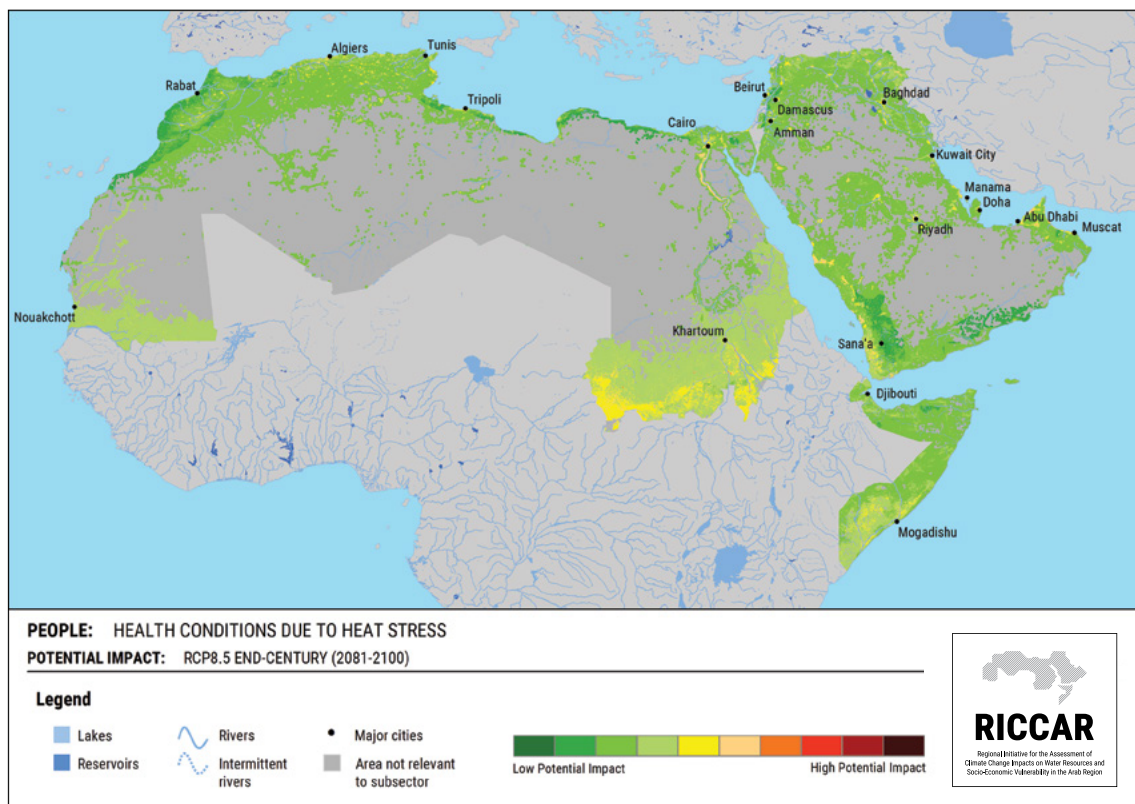
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – 15.2.6.1. EXPOSURE

FIGURE 411



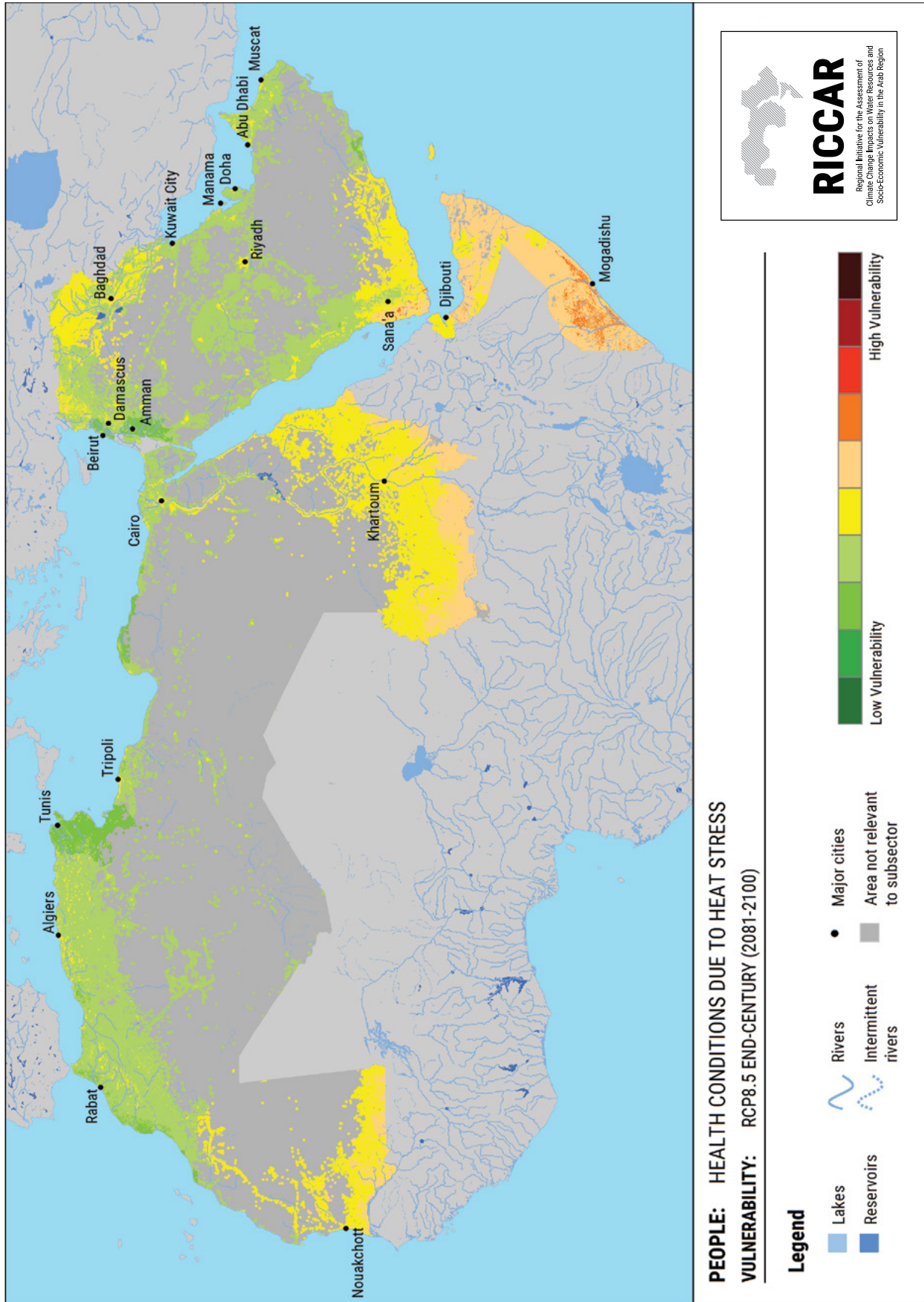
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – 15.2.6.2. POTENTIAL IMPACT

FIGURE 412



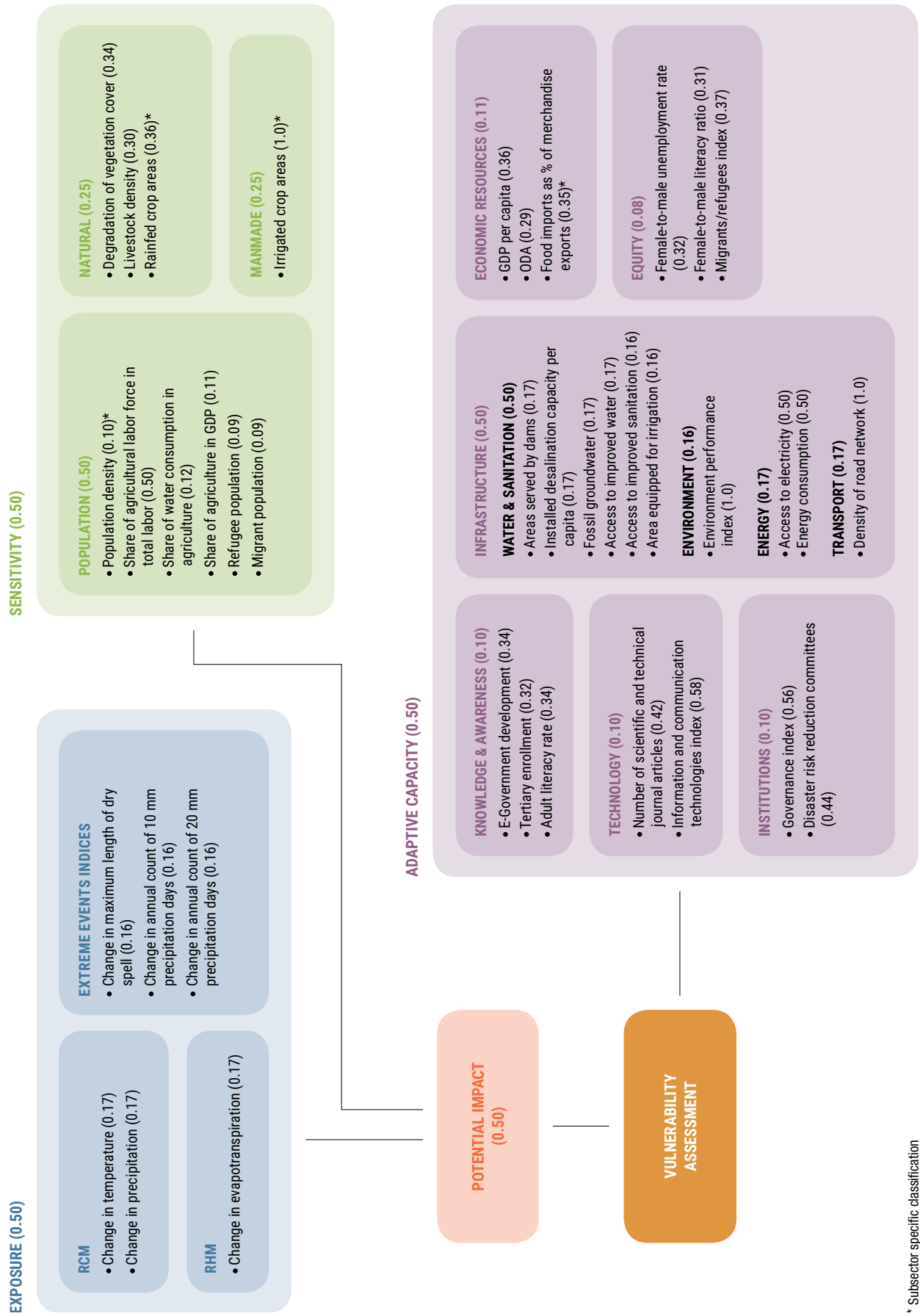
15.2. HEALTH CONDITIONS DUE TO HEAT STRESS – 15.2.6. END-CENTURY RCP 8.5 – 15.2.6.3. VULNERABILITY

FIGURE 413



15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.1. IMPACT CHAIN

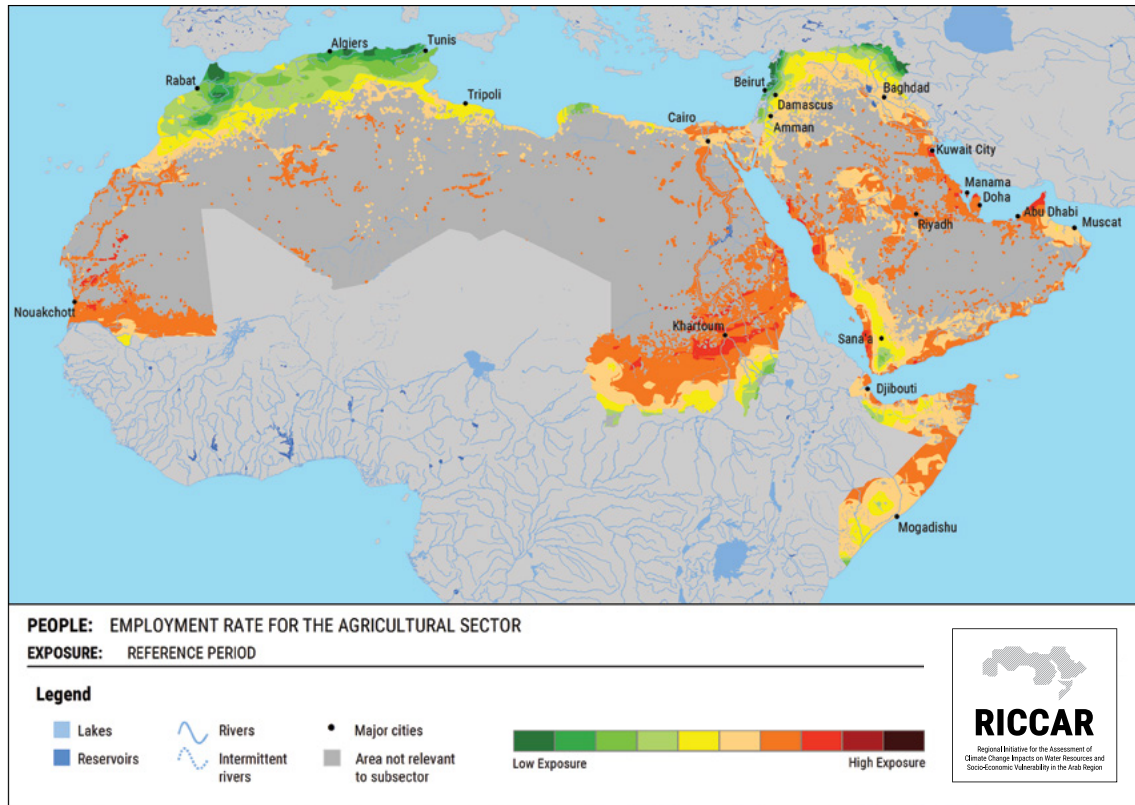
FIGURE 414



* Subsector specific classification

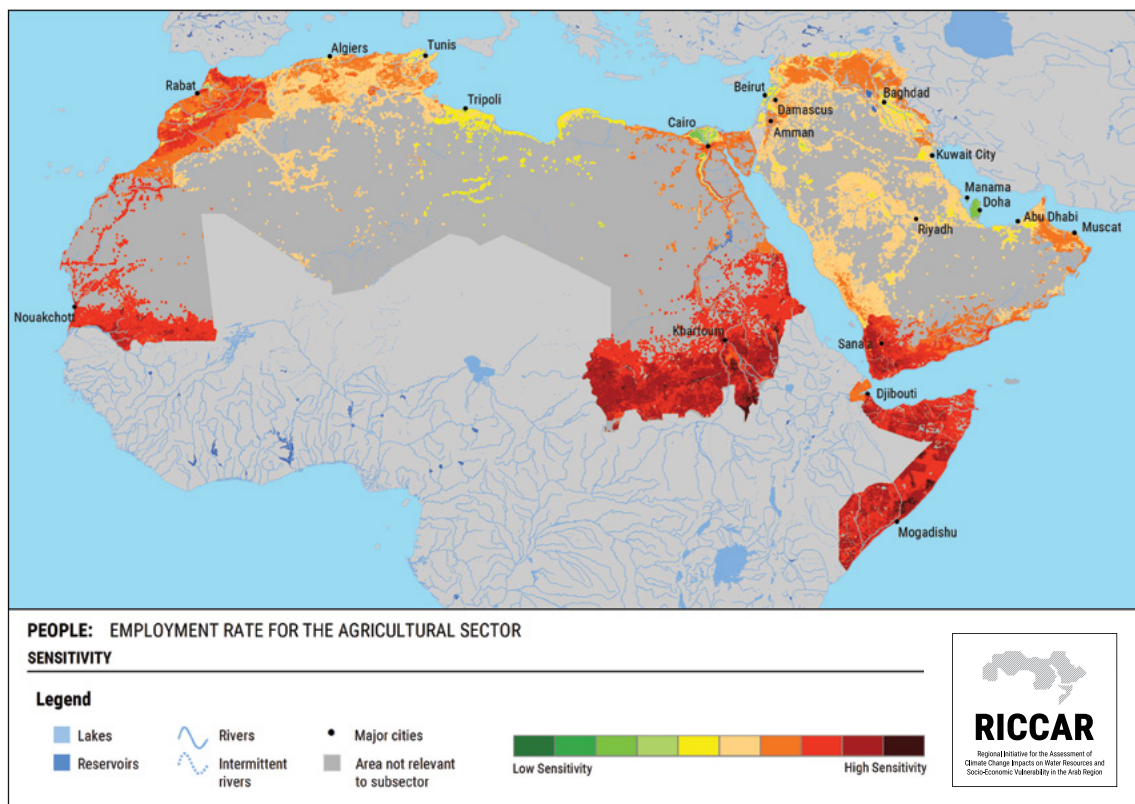
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.1. EXPOSURE

FIGURE 415



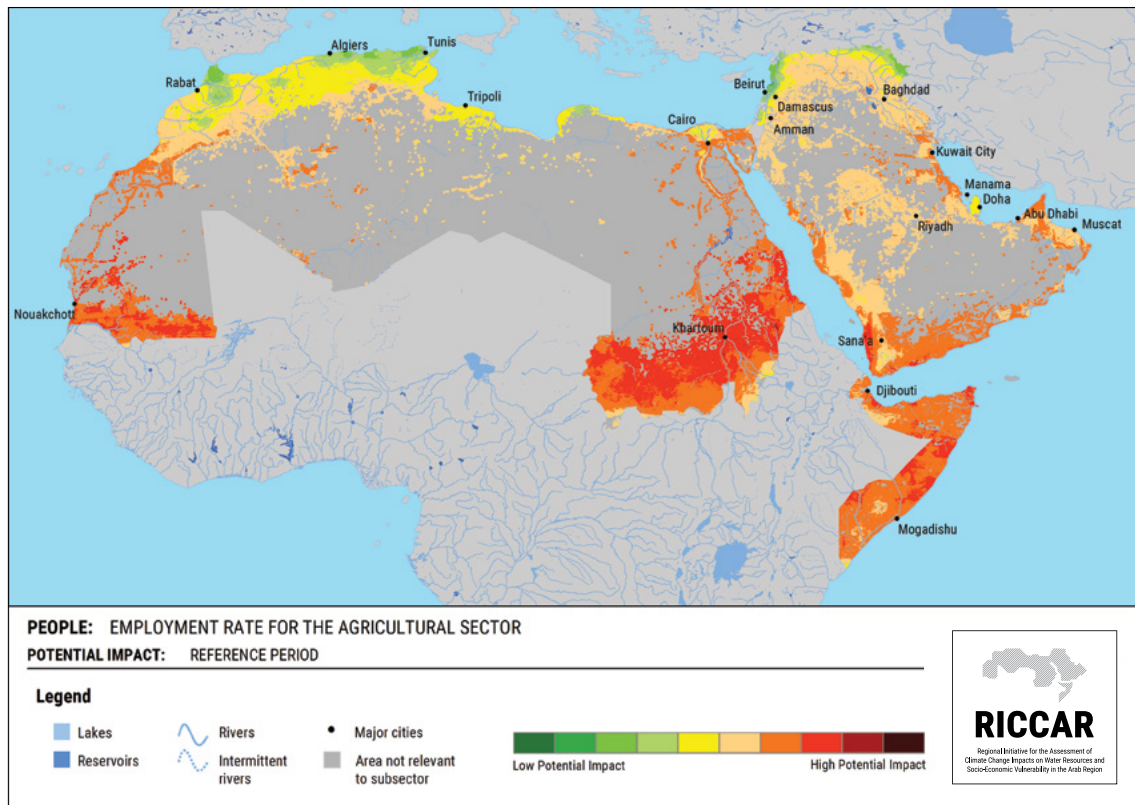
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.2. SENSITIVITY

FIGURE 416



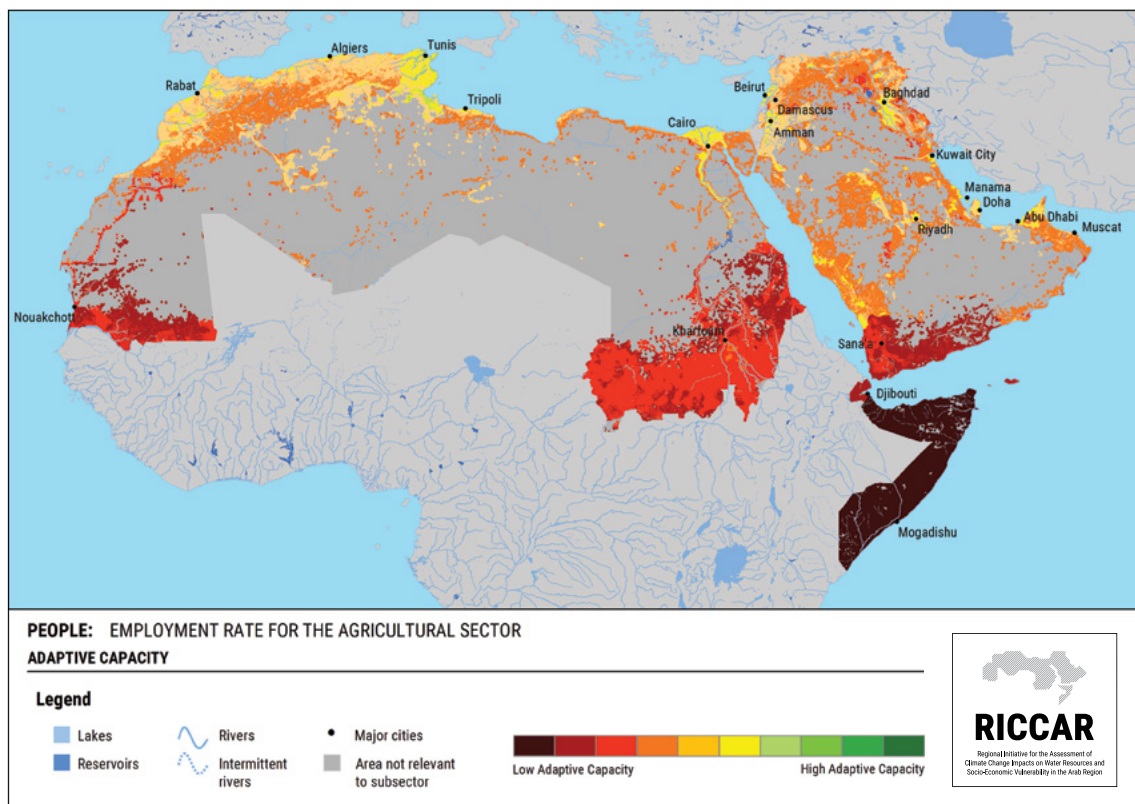
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.3. POTENTIAL IMPACT

FIGURE 417



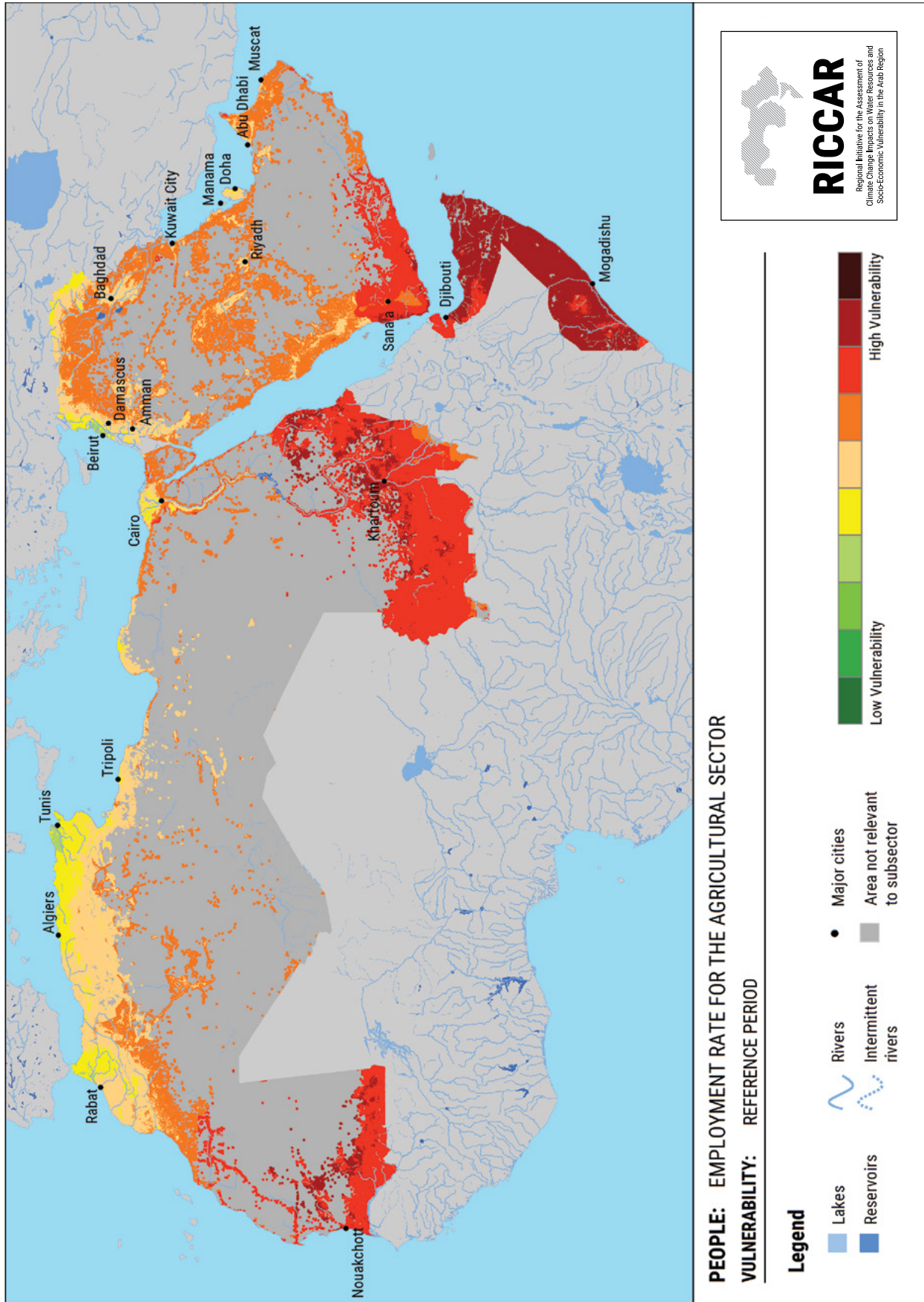
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.4. ADAPTIVE CAPACITY

FIGURE 418



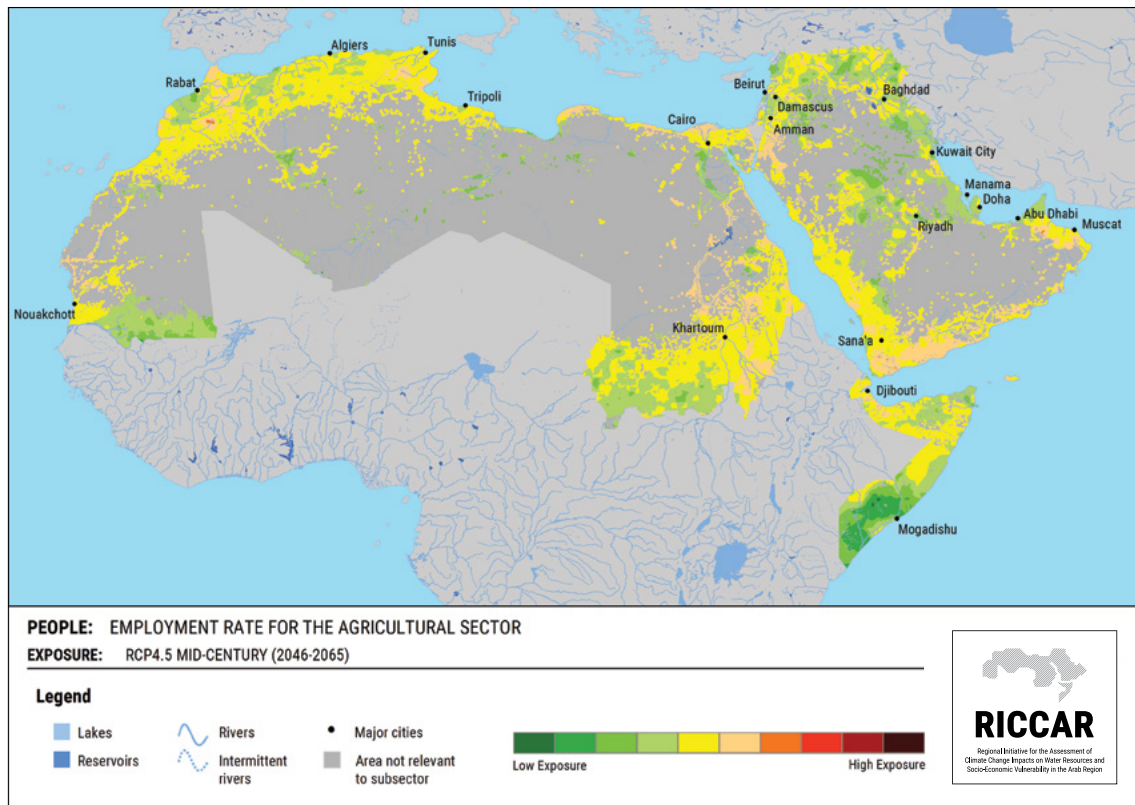
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.2. REFERENCE PERIOD – 15.3.2.5. VULNERABILITY

FIGURE 419



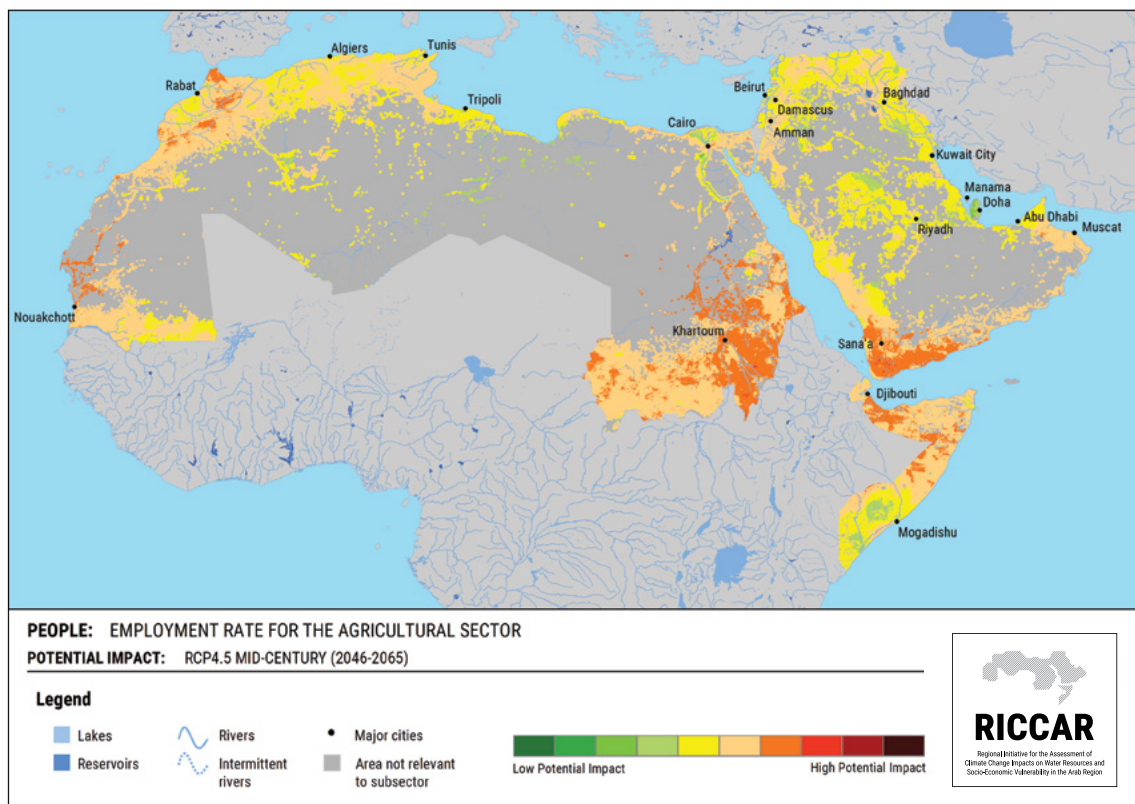
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – 15.3.3.1. EXPOSURE

FIGURE 420



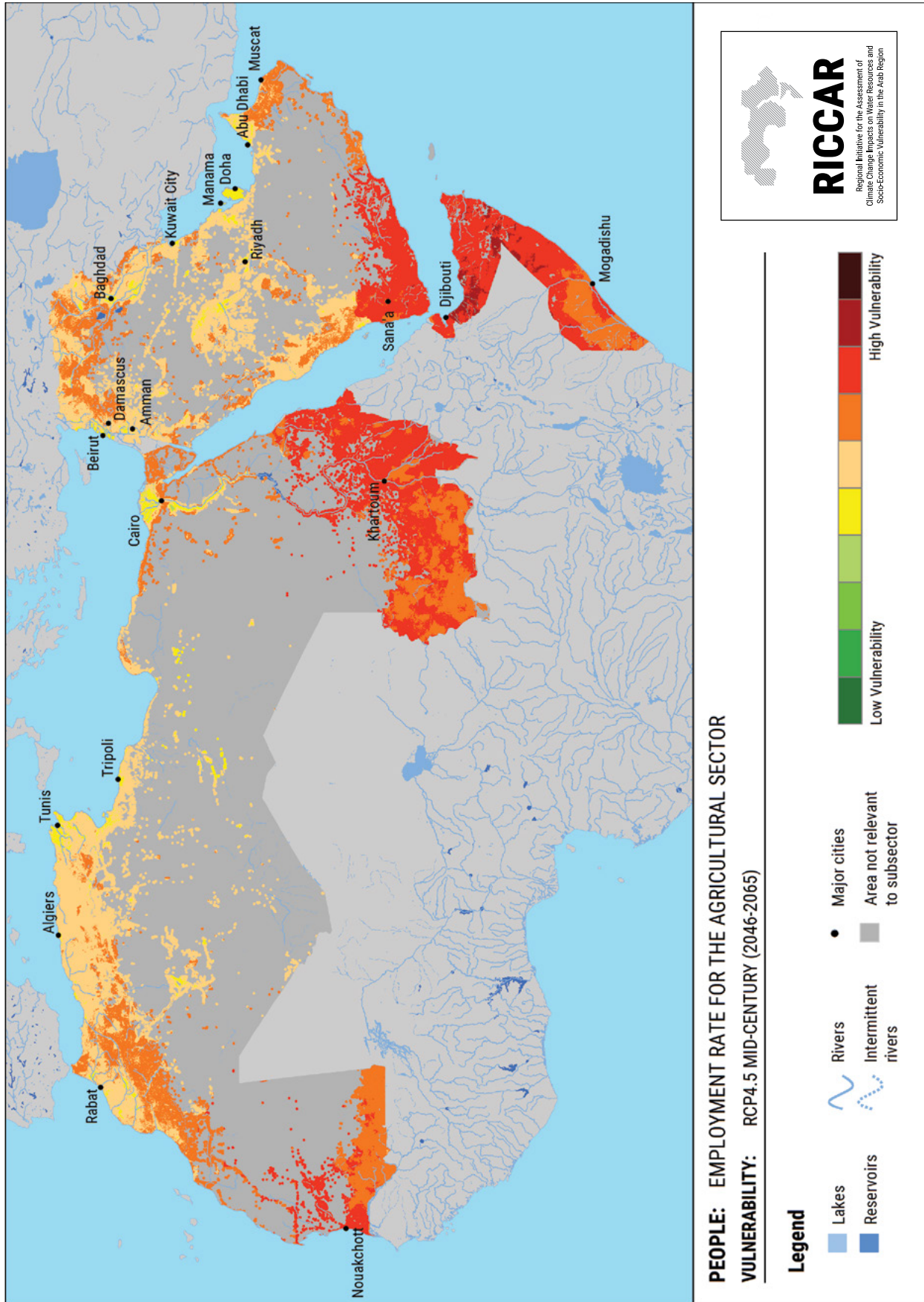
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – 15.3.3.2. POTENTIAL IMPACT

FIGURE 421



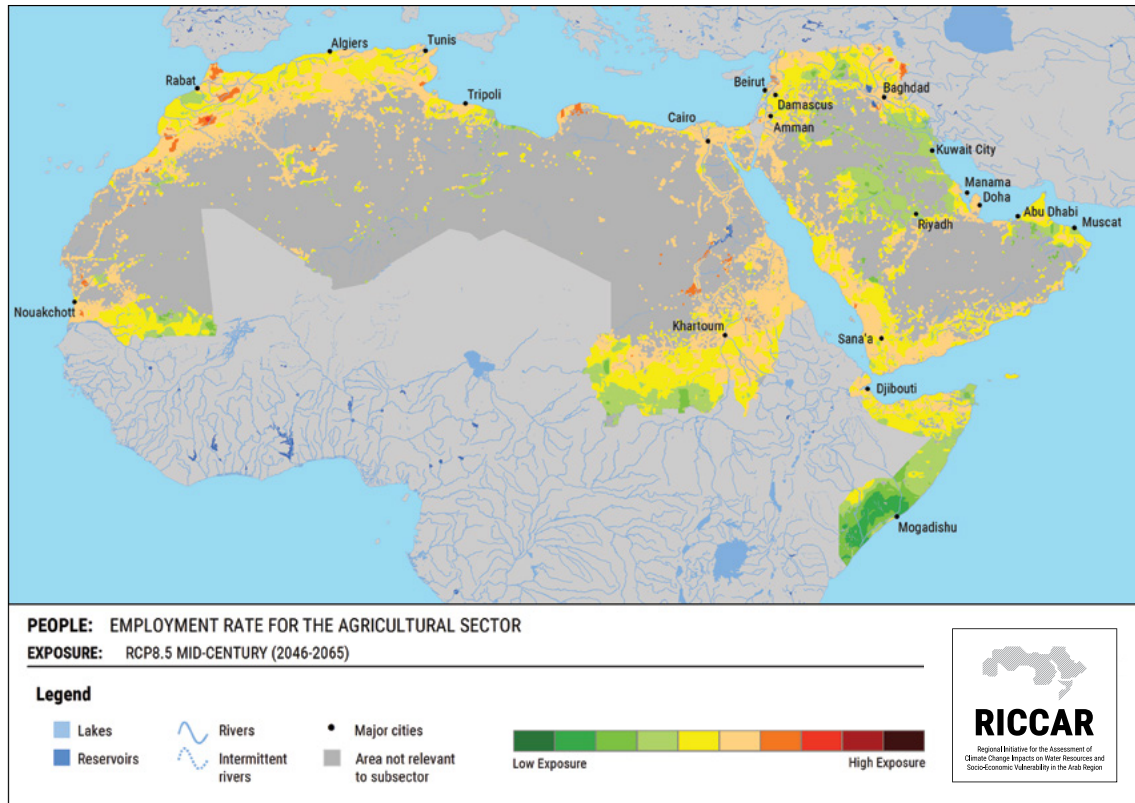
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.3. MID-CENTURY RCP 4.5 – 15.3.3.3. VULNERABILITY

FIGURE 422



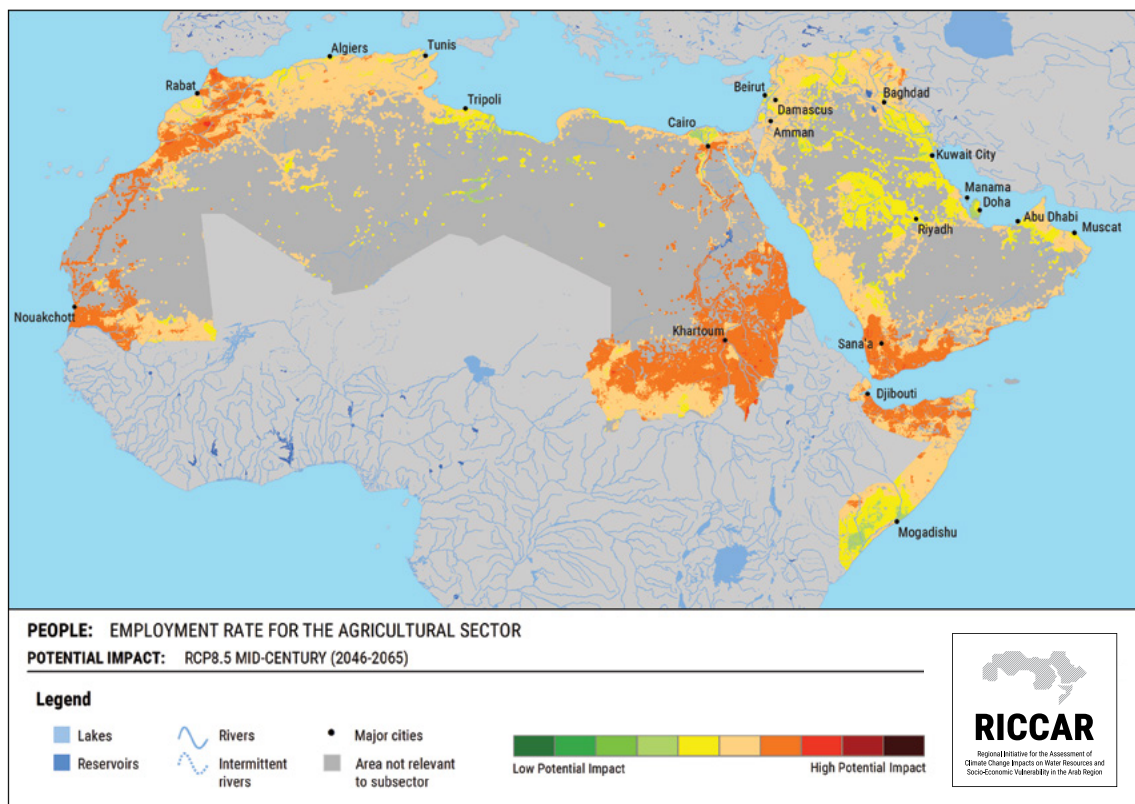
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – 15.3.4.1. EXPOSURE

FIGURE 423



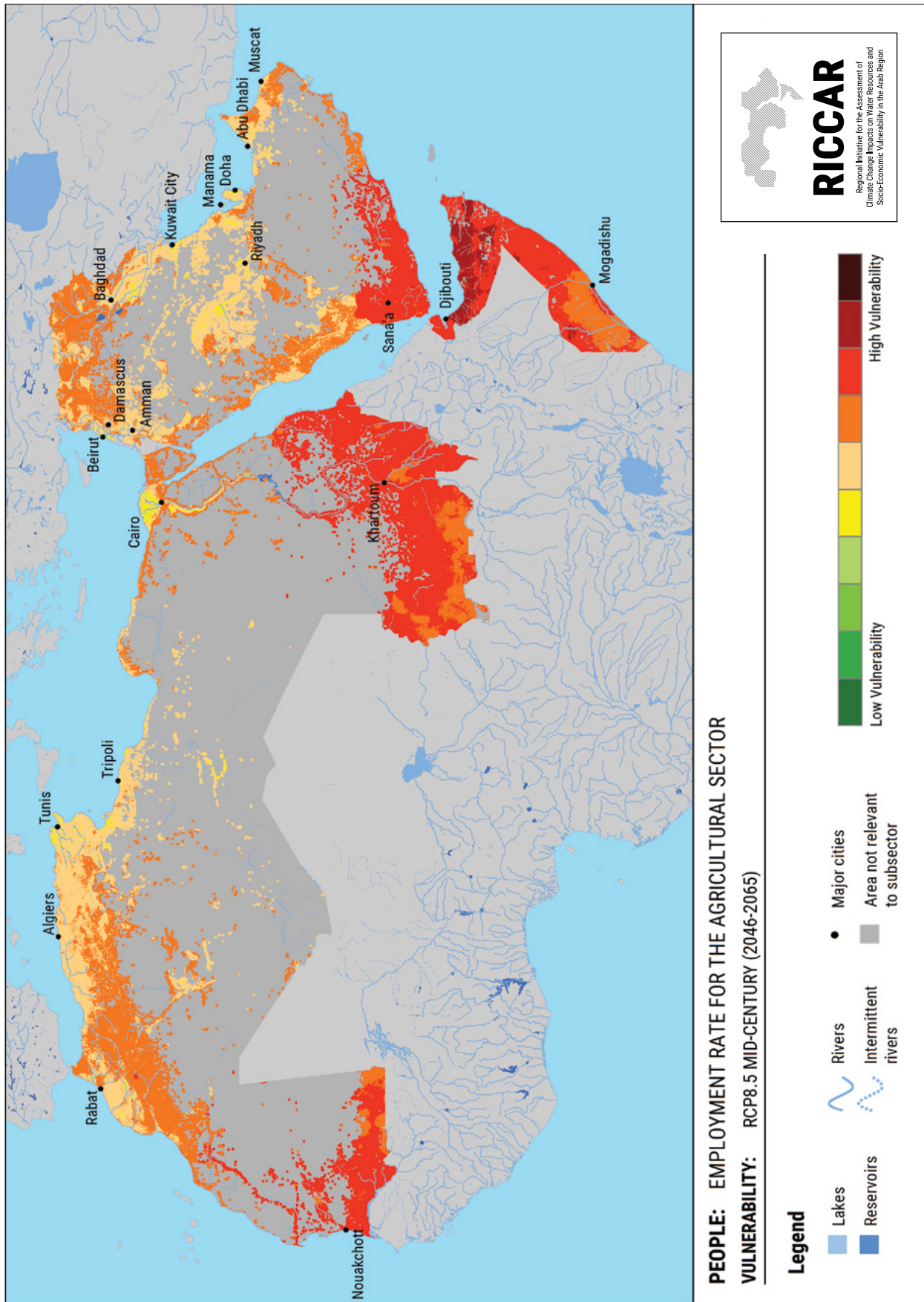
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – 15.3.4.2. POTENTIAL IMPACT

FIGURE 424



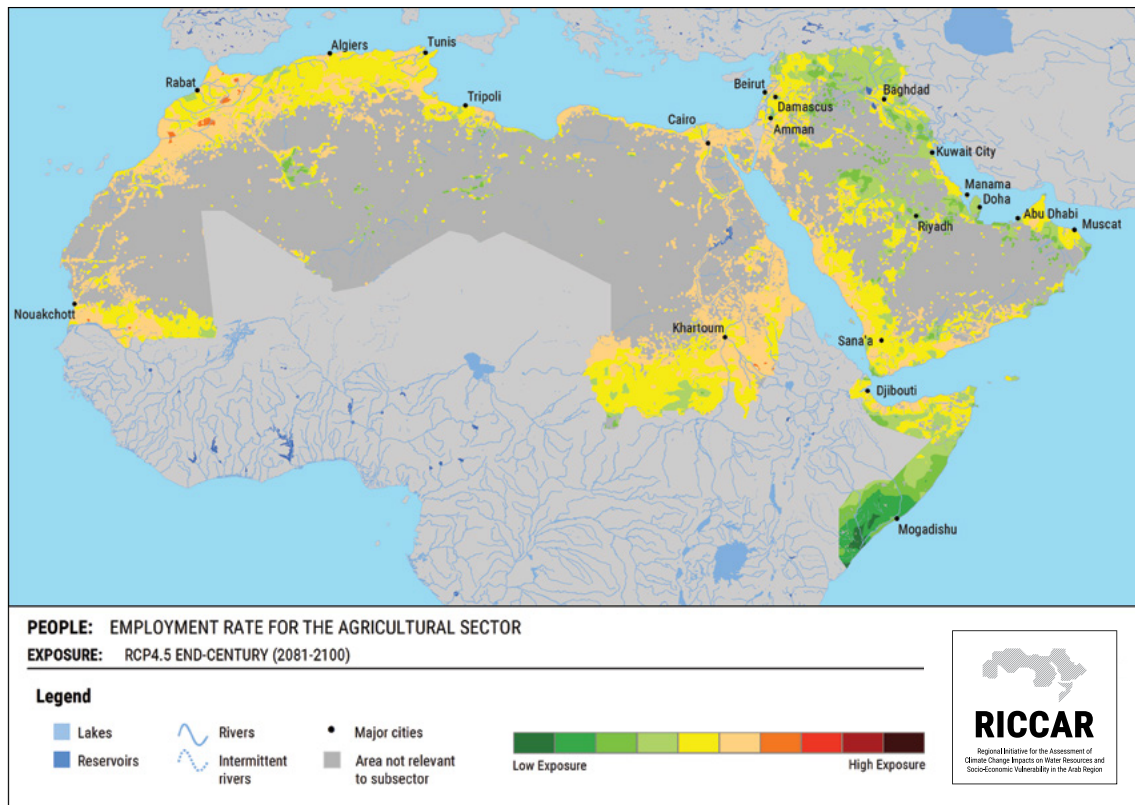
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.4. MID-CENTURY RCP 8.5 – 15.3.4.3. VULNERABILITY

FIGURE 425



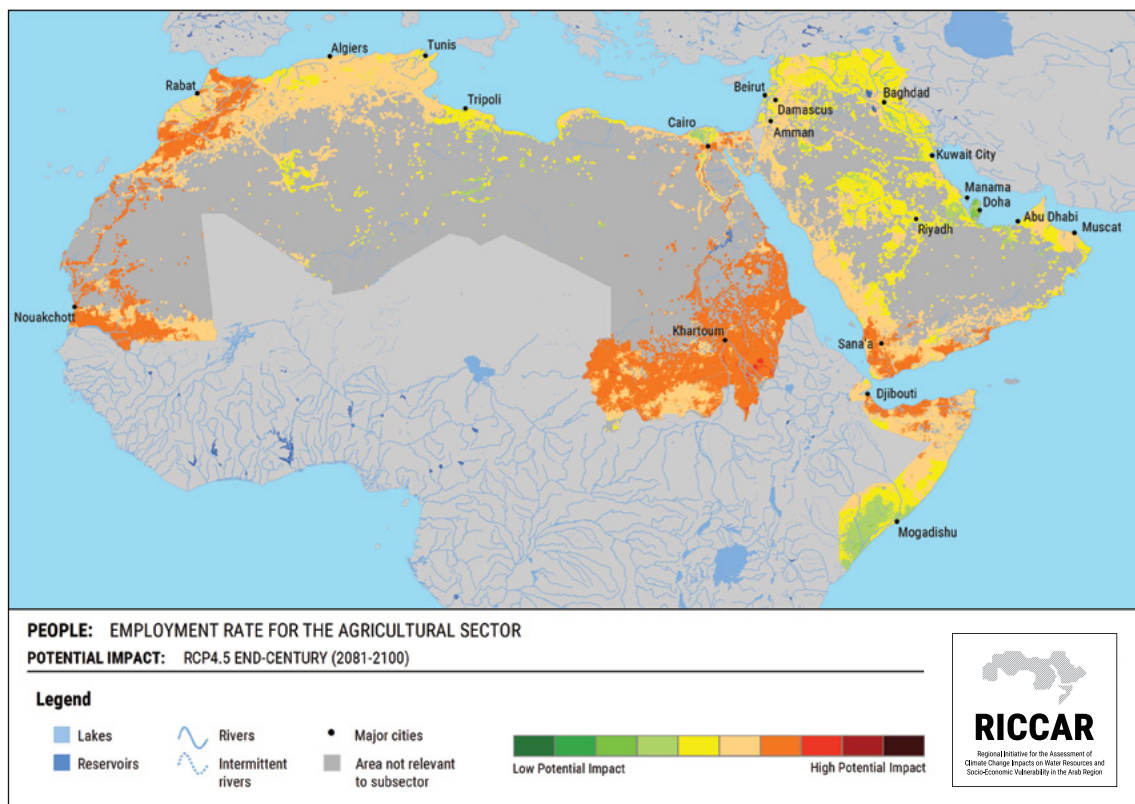
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – 15.3.5.1. EXPOSURE

FIGURE 426



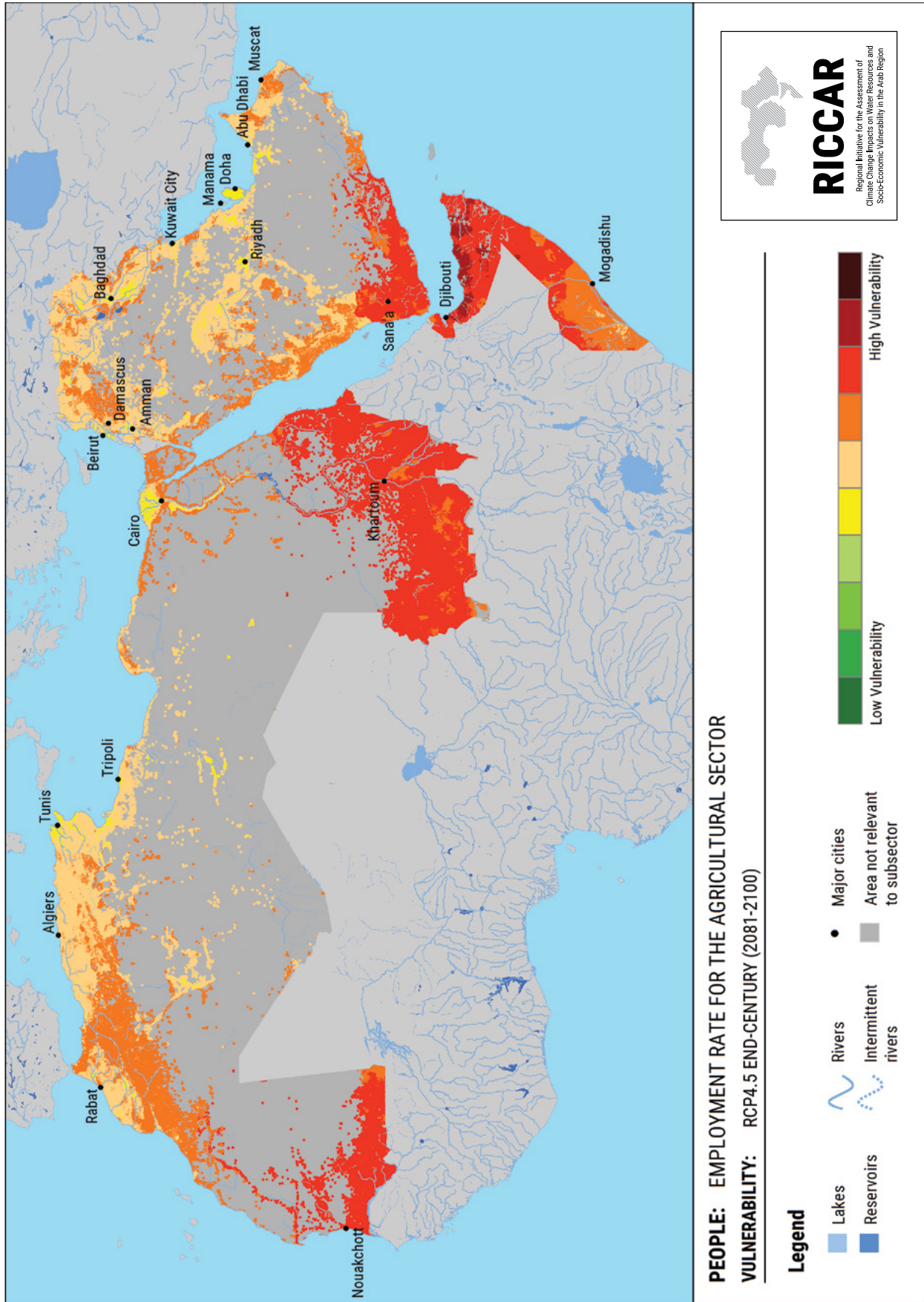
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – 15.3.5.2. POTENTIAL IMPACT

FIGURE 427



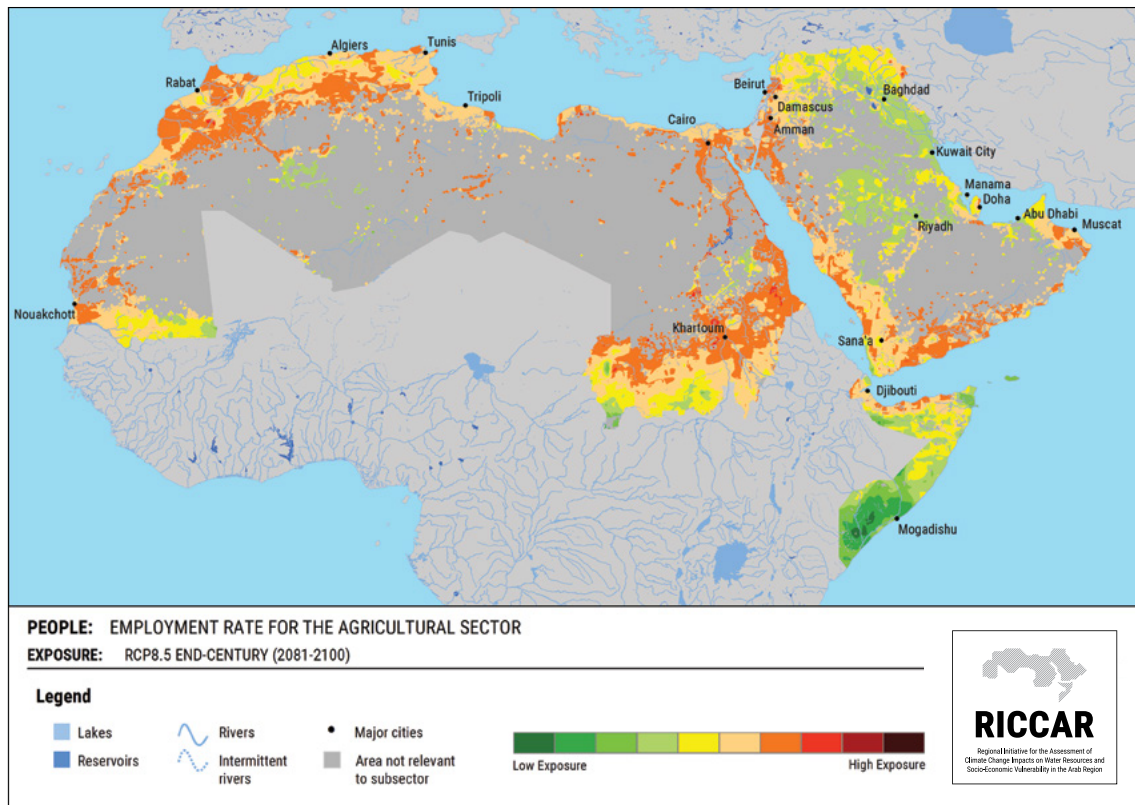
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.5. END-CENTURY RCP 4.5 – 15.3.5.3. VULNERABILITY

FIGURE 428



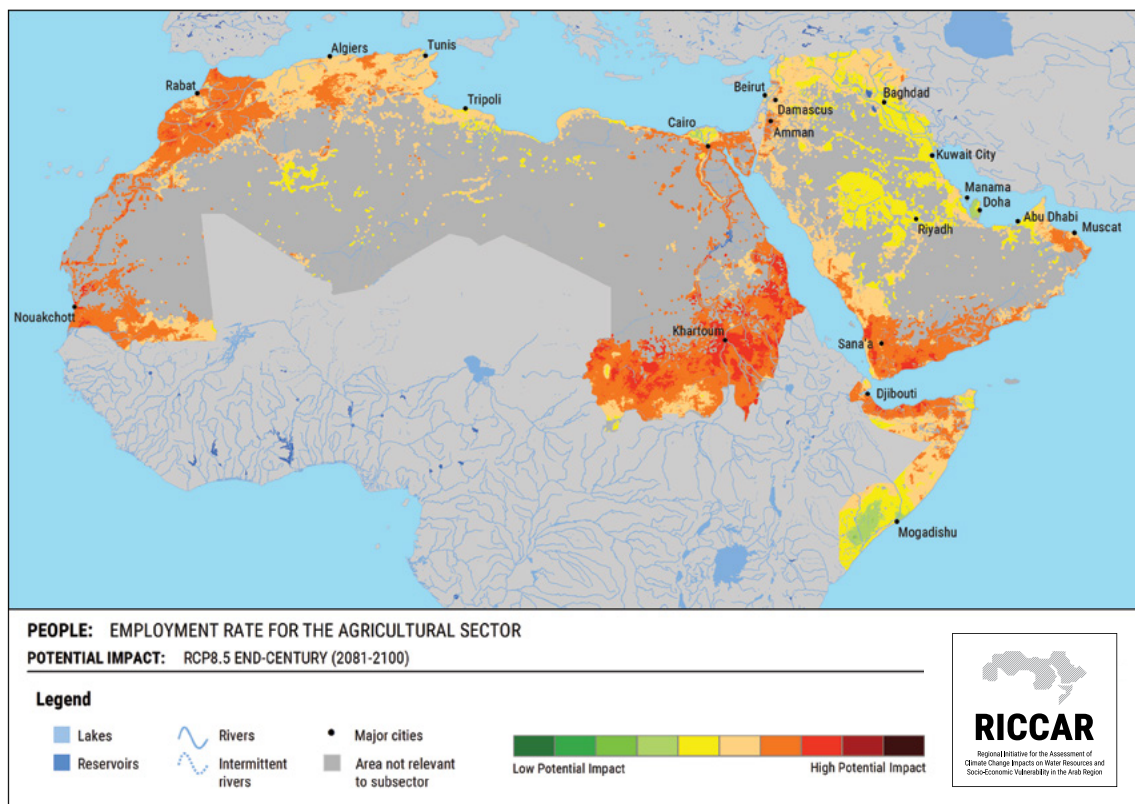
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.6. END-CENTURY RCP 8.5 – 15.3.6.1. EXPOSURE

FIGURE 429



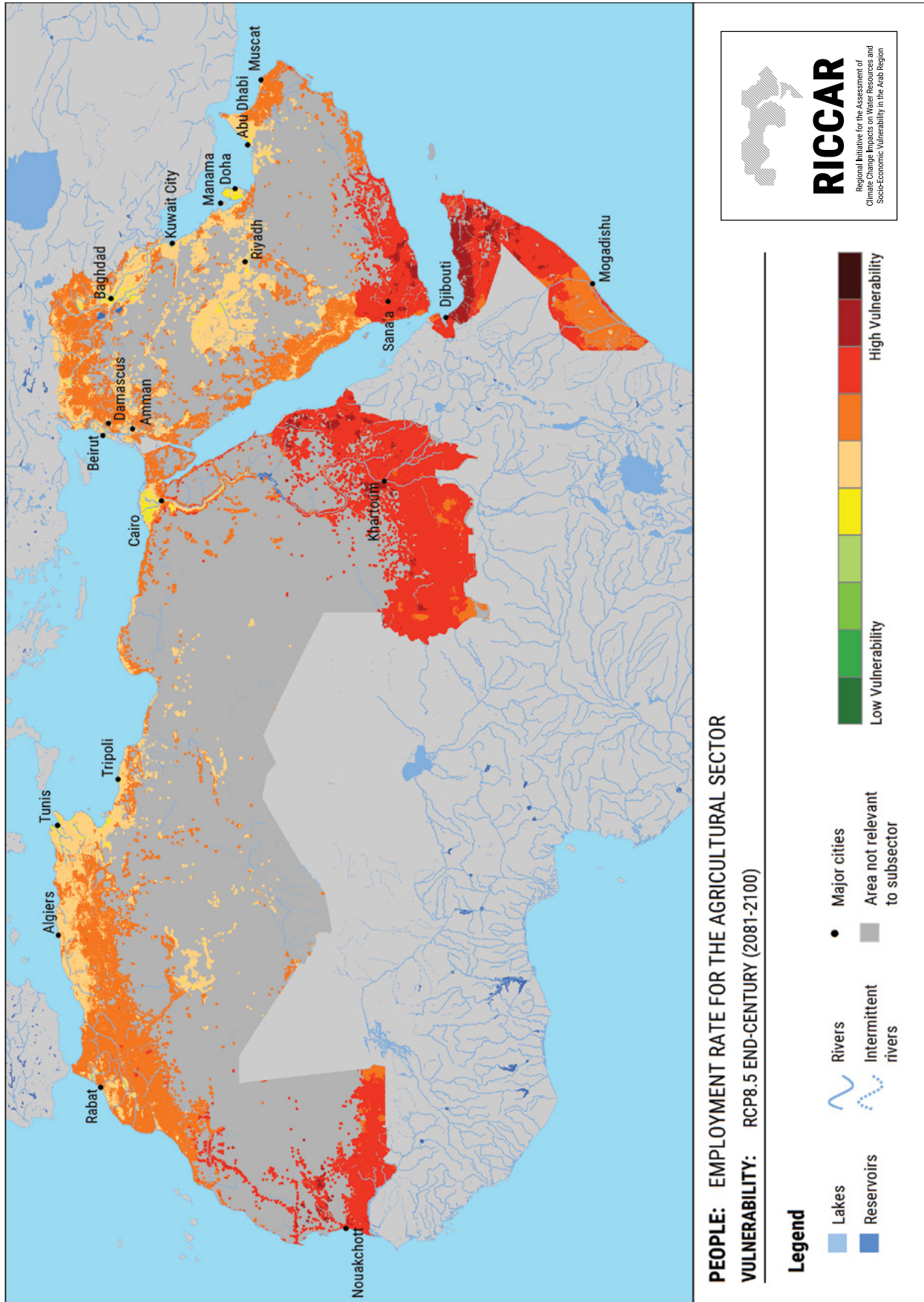
15.3. EMPLOYMENT RATE FOR THE AGRICULTURAL SECTOR – 15.3.6. END-CENTURY RCP 8.5 – 15.3.6.2. POTENTIAL IMPACT

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

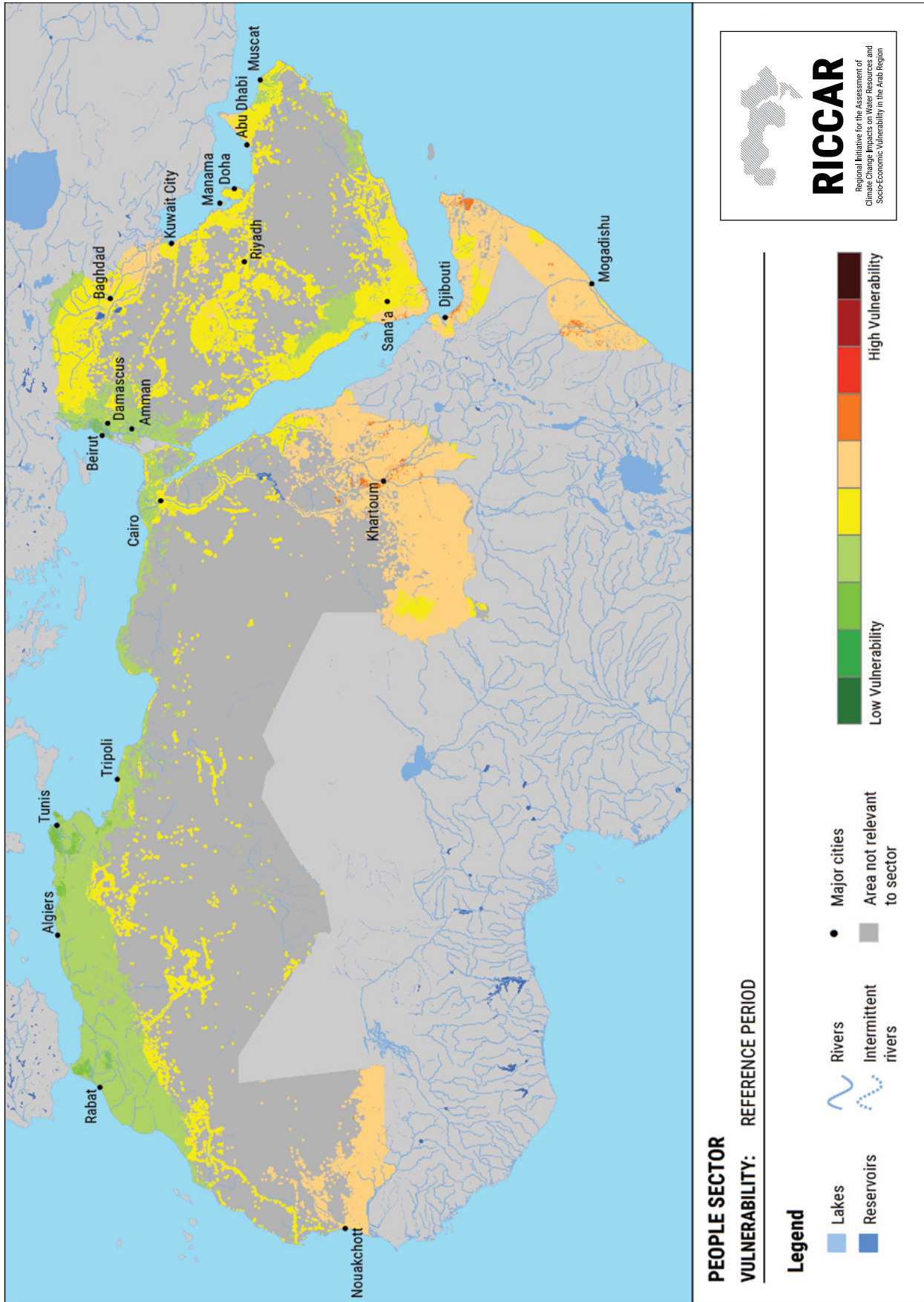
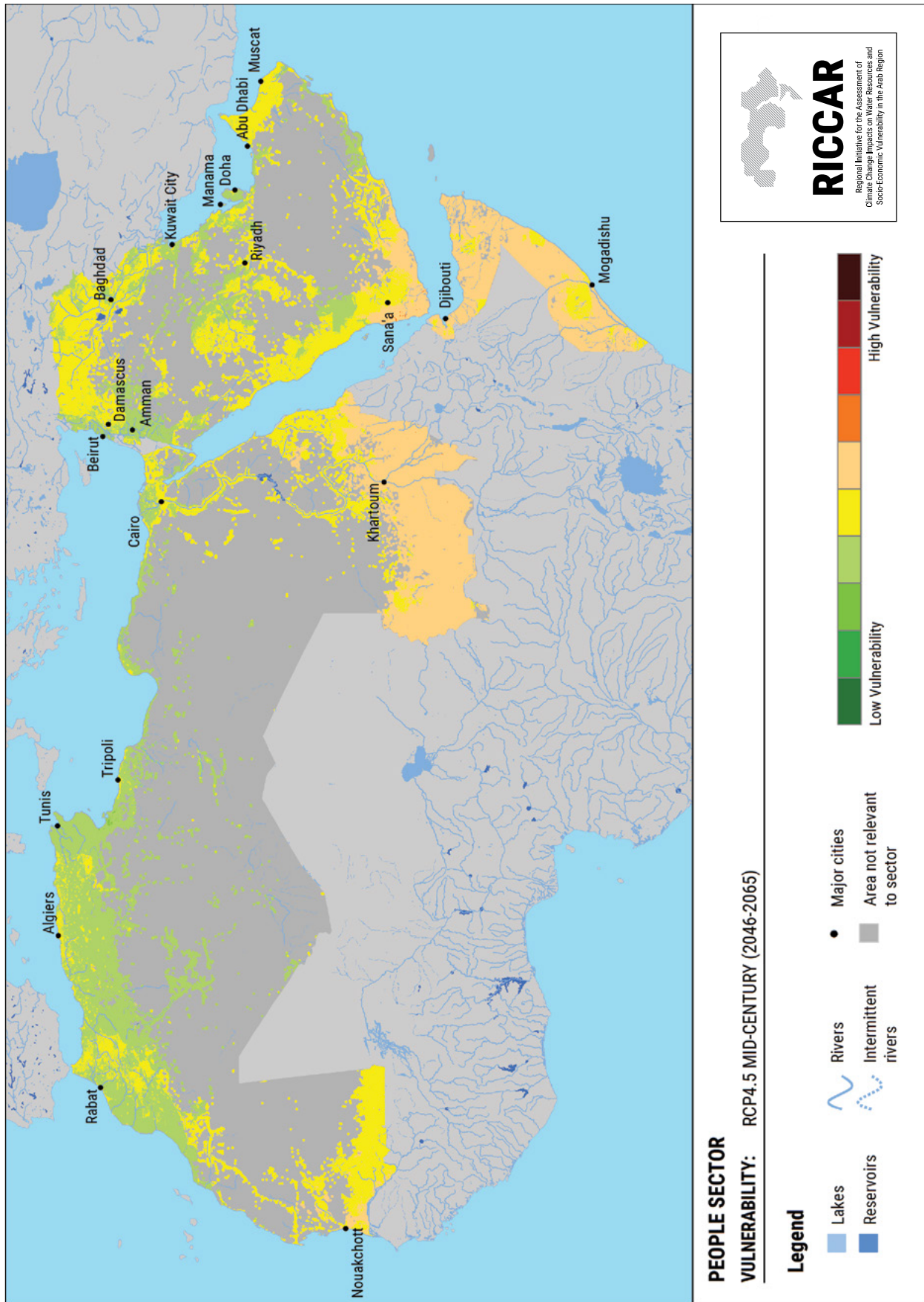


FIGURE 432

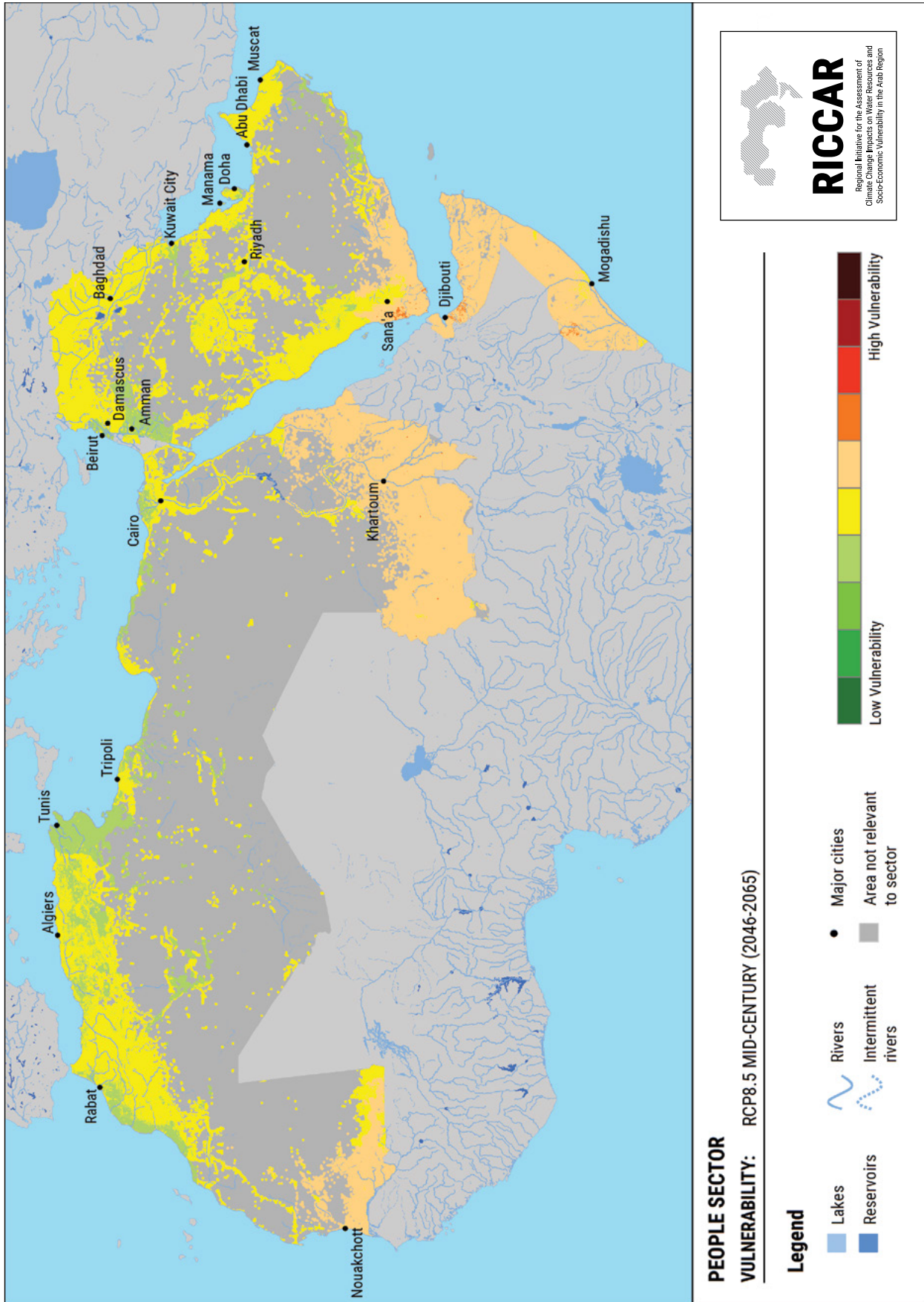
15.4. PEOPLE SECTOR: VULNERABILITY – 15.4.2. MID-CENTURY RCP 4.5

FIGURE 433



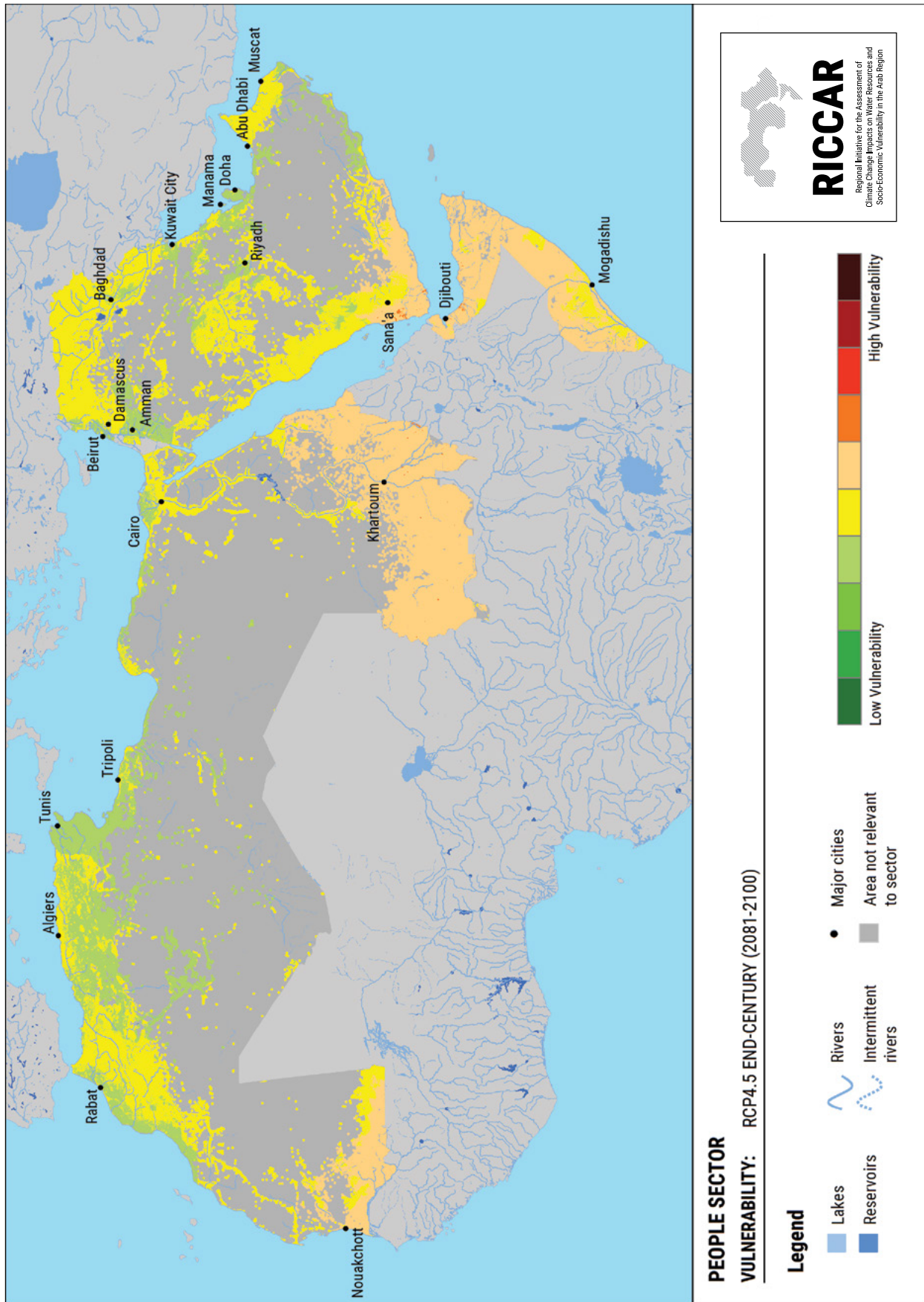
15.4. PEOPLE SECTOR: VULNERABILITY – 15.4.3. MID-CENTURY RCP 8.5

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

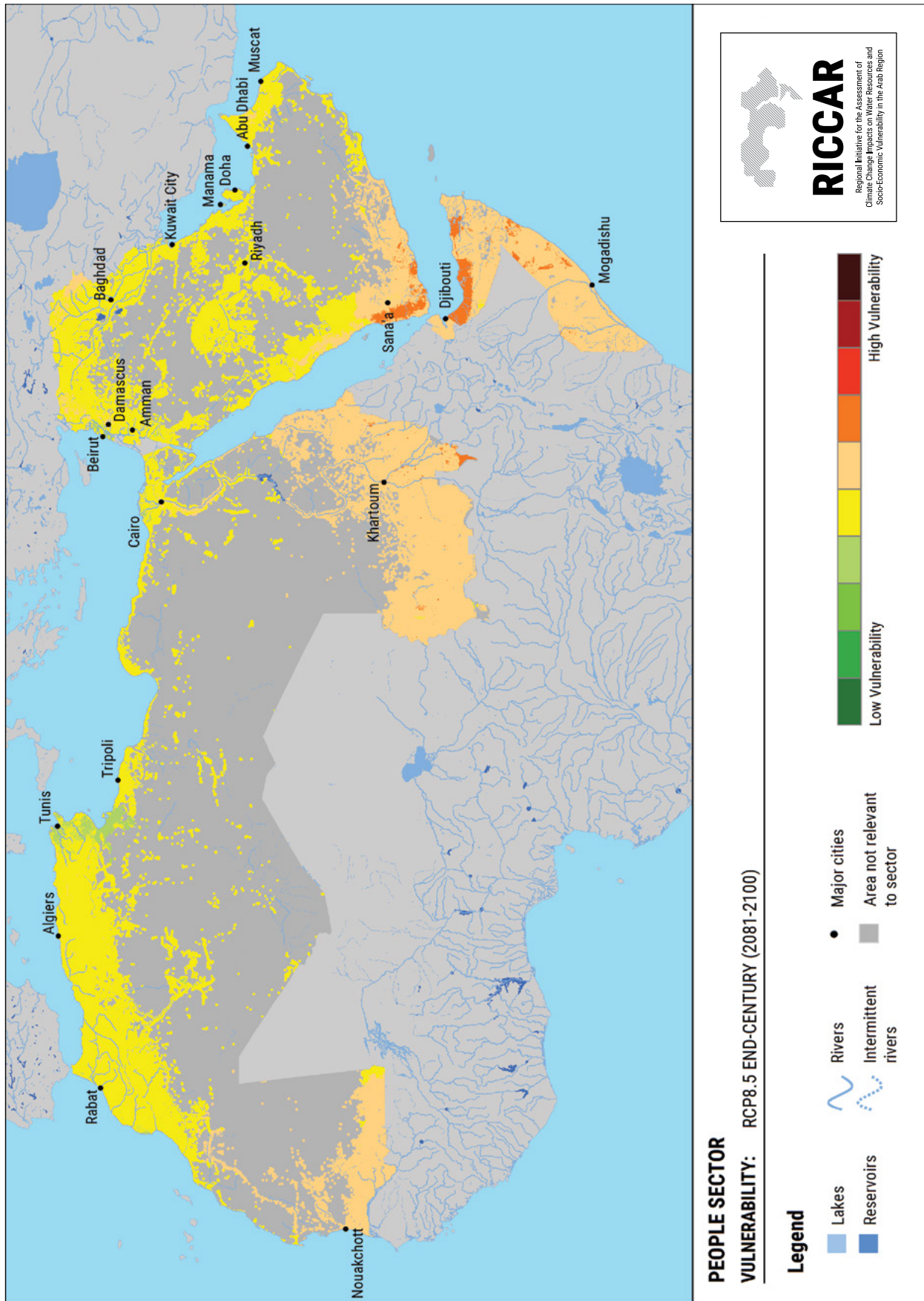


FIGURE 436



RICCAR PARTNERS



UNITED NATIONS
الأمم المتحدة
ESCWA



WORLD
METEOROLOGICAL
ORGANIZATION



Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

DONORS



The United Nations Office for Disaster Risk Reduction



Cairo
Office
مكتب
القاهرة

مكتبة الأمم المتحدة
للترسيب والتعليم والثقافة



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



german
cooperation
DEUTSCHE ZUSAMMENARBEIT