

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



Operationalizing the Science-Policy Interface through RICCAR in the Arab Region

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CORDEX 2016 Stockholm, 17 May 2016

CAMRE – December 2007

Arab Ministerial Declaration on Climate Change CAMRE 2007

Council of Arab Ministers Responsible for the Environment (CAMRE) under League of Arab States

- Issued first inter-governmental Arab Statement on Climate Change in December 2007,

Declaration (excerpts):

- Constitutes the base for future action and reflects the Arab position in dealing with climate change issues,
- Adaptation to ...climate change shall be fully consistent with the economic and social development It shall be implemented through the development and dissemination of methodologies and tools that assess the impacts of climate change and their extent; as well as through improving planning for adaptation, along with its measures and procedures, in addition to its integration in sustainable development policies; besides understanding, developing and disseminating measures, methodologies and tools that achieve economic diversity with the aim of increasing the elasticity of economic sectors vulnerable to climate change.
- Establish studies and research centers for climate change in the regions of developing countries, including the Arab region. These centers should be concerned with examining impacts and challenges facing the citizens and peoples of the developing countries as a result of climatic change.

Subsequent Inter-Governmental Mandates calling for Climate Change Assessment in the Arab Region

Arab Ministerial Declaration on Climate Change CAMRE 2007

Arab
Economic and
Social Summit
Resolution on
Climate Change
& Water Project
2009

Arab
Permanent
Committee for
Meteorology
Resolutions
2012, 2013,
2014, 2015

ESCWA
25th Ministerial
Session
Resolutions on
Climate Change,
Rio+20 follow-up
2008, 2012,
2014

Ministerial
Water Council
Resolutions
2010, 2011,
2012, 2013,
2014, 2015,
2016

Arab

ACSAD
Board of
Directors
Resolution
2013, 2016

Environment

Foreign Affairs & Planning

Water

Met

Agriculture

RICCAR launched in 2009

Aim is to assess the impact of climate change on freshwater resources in the Arab Region through a consultative and integrated regional initiative that seeks to identify the socioeconomic and environmental vulnerability caused by climate change impacts on water resources based on regional specificities.

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

Assessment

Adaptation

Mitigation

Negotiations

RICCAR Partnerships

Implementing Partners











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United Nations Educational, Scientific and Cultural Organization Cairo Office



Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH





UNU-INWEH



Donors





SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

Collaborating Research Institutes

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

RICCAR Implementation Framework: Four Pillars

Regional Knowledge Hub



Integrated Assessment

Climate Change Impact Assessment



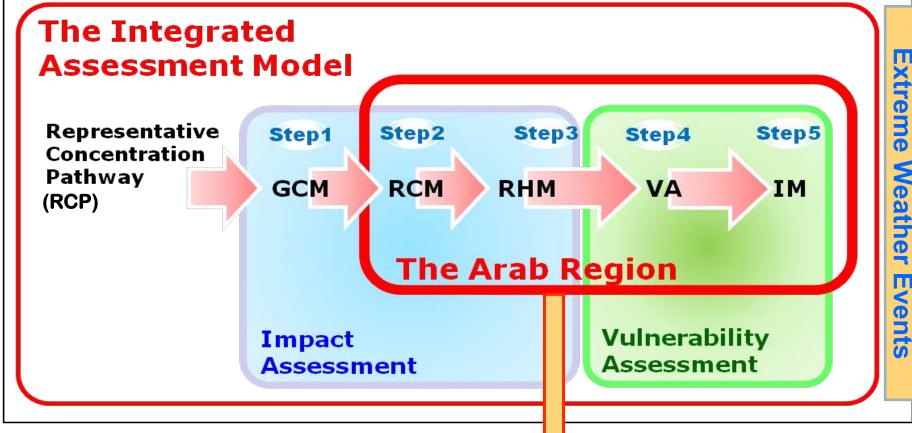
Climate Change Vulnerability Assessment



Capacity Building & Institutional Strengthening

for Water Ministries, Meteorological Services, Agricultural Ministries, Environmental Agencies, Arab Research Centers

Awareness Raising & Information Dissemination



Step 1: Global Climate Model Selection

Step 2: Regional Climate Modeling —>

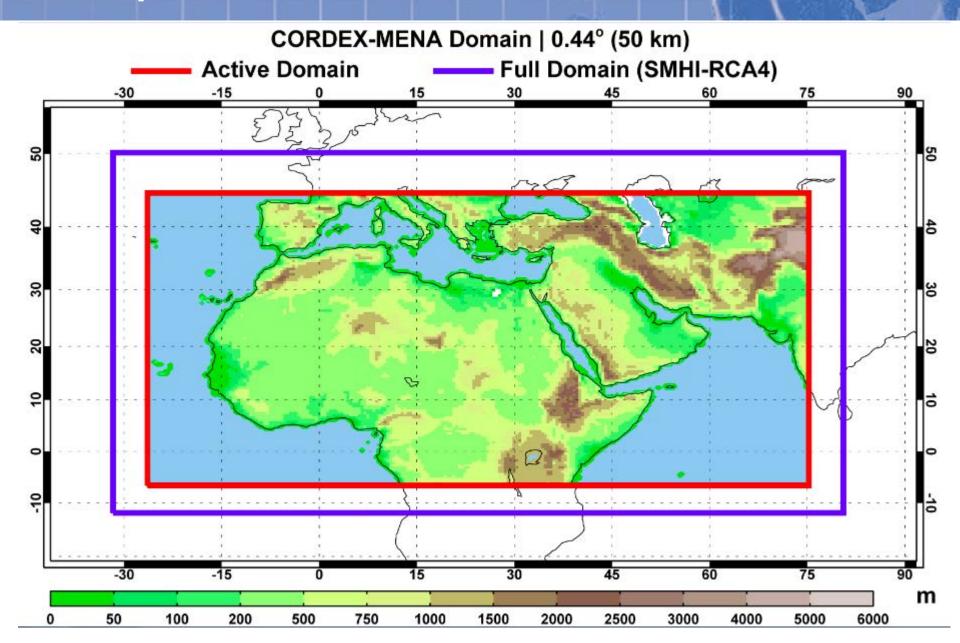
Step 3: Regional Hydrological Modeling

Step 4: Vulnerability Assessment

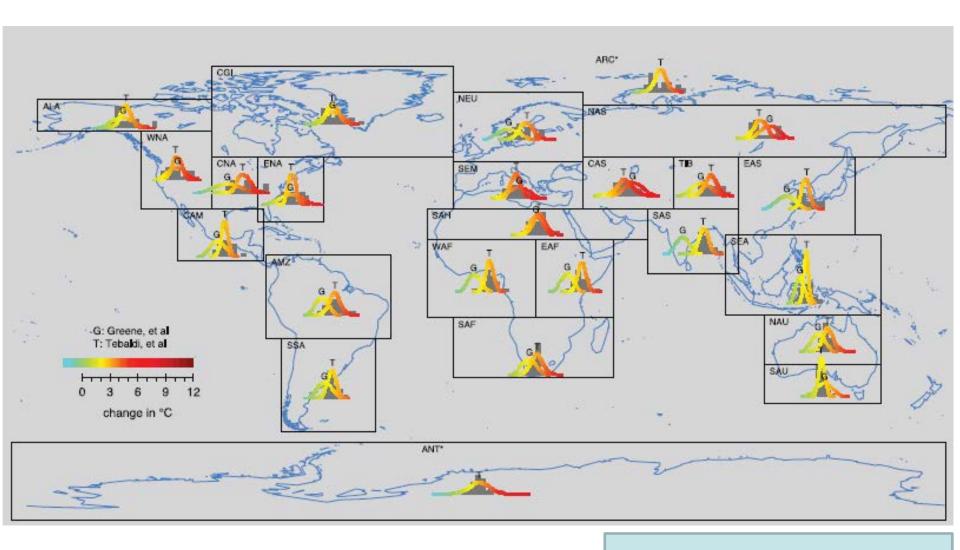
Step 5: Integrated Mapping

Water, Agriculture, Health **Impact Assessments**

Set-up of the Arab/MENA Domain under CORDEX



Inter-Governmental Panel on Climate Change: Areas considered for regional averages in IPCC AR4



From R.K Kolli, WMO RICCAR EGM #2 (Beirut, 2010)

Inter-Governmental Panel on Climate Change: Areas considered for regional averages in IPCC AR5 (2013)

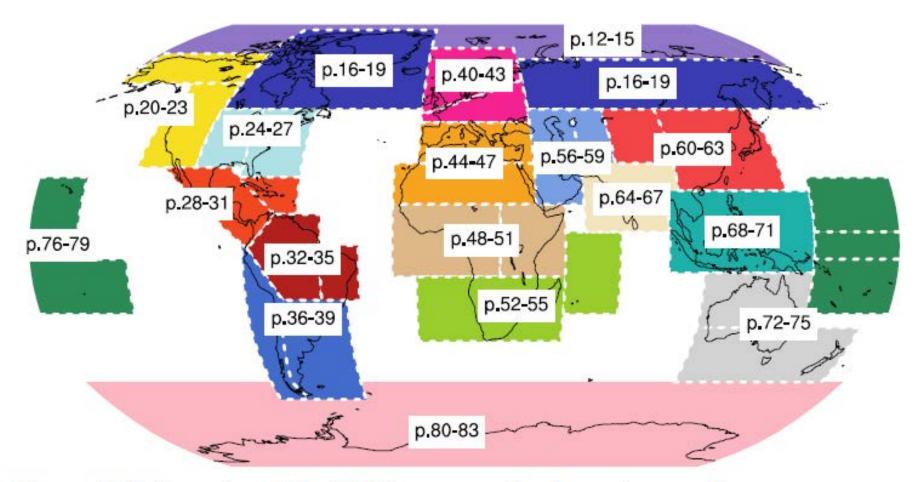
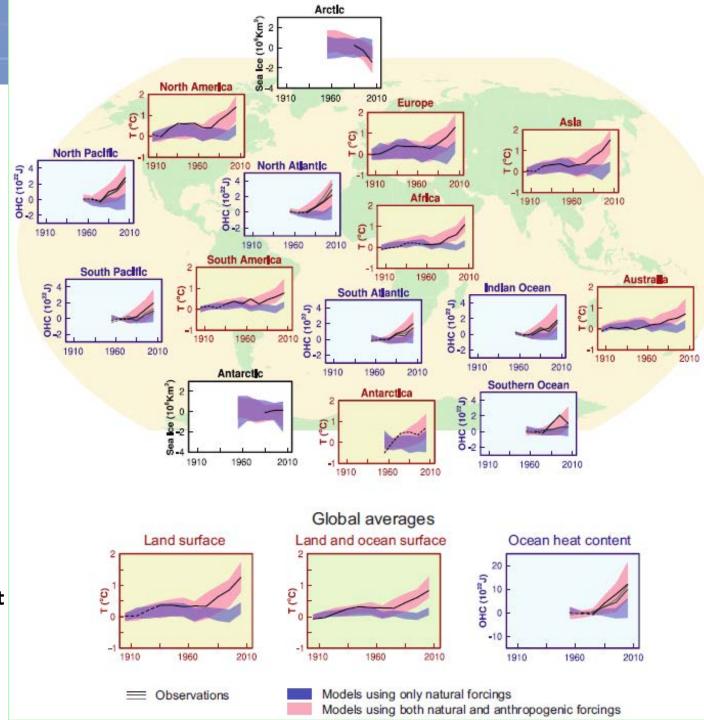


Figure AI.3: Overview of the SREX, ocean and polar regions used.

IPCC Regions for climate change comparisons

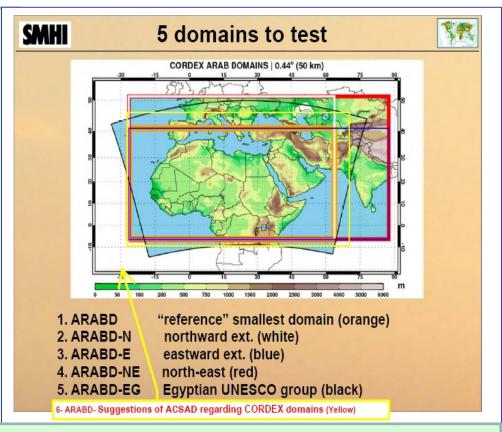
IPCC WGI Assessment Report 5: Summary for Policymakers, October 2013 (p.16)



RCM Ensemble Task Force

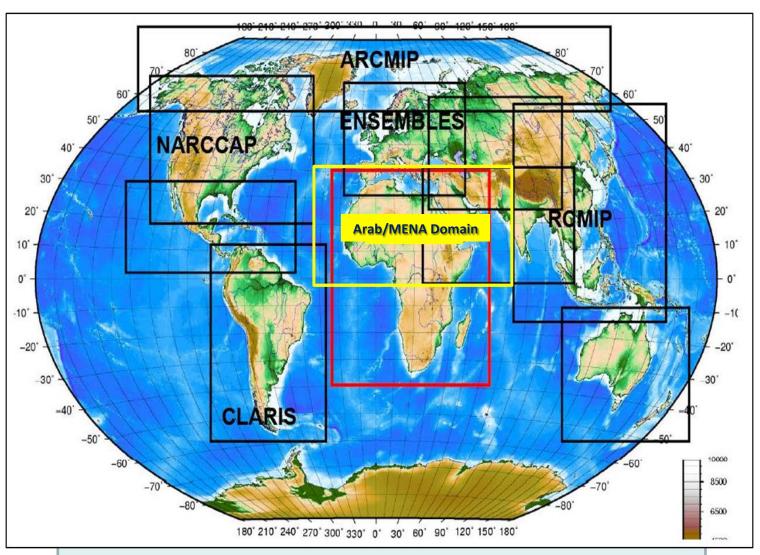
RICCAR EnsembleTask Force

- SMHI led working group
- SMHI conducted sensitivity analysis to set Limiting Boundary Conditions for an Arab Domain in 2011
- Supported by:
 - ACSAD
 - UNESCO / Cairo Office
 - King Abdulaziz University Center of Excellence for Climate Change Research/Saudi Arabia
 - ESCWA
 - Sida funding



- ➤ Domain set-up had to be scientifically tested, and also respond to political interest to assess climate change impacts on freshwater resources, including shared river basins (i.e., Tigris/Euphrates, Nile)
- Resulting Arab/MENA Domain thus larger than some researcher may initially prefer, but responds to political mandates

Arab Domain adopted by CORDEX as MENA Domain in 2013

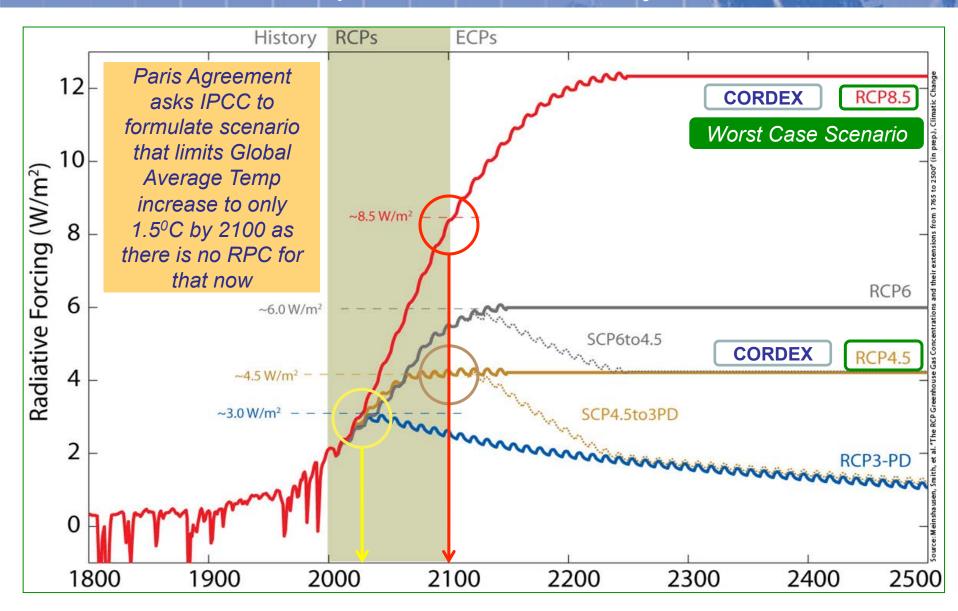


* Arab Domain shown here only for illustrative & comparative purposes; domain is larger

Illustration adapted from Giorgi et al., 2009, p.178, as drawn from collective CORDEX effort displayed at: http://www.meteo.unican.es/en/projects/CORDEX.

Representative Concentration Pathways (RCPs)

As first represented in IPCC AR5 Projections



Graph adapted from: Meinshausen et al.,2010



ESCWA





LAS









CORDEX-MENA/Arab Ensemble Matrix

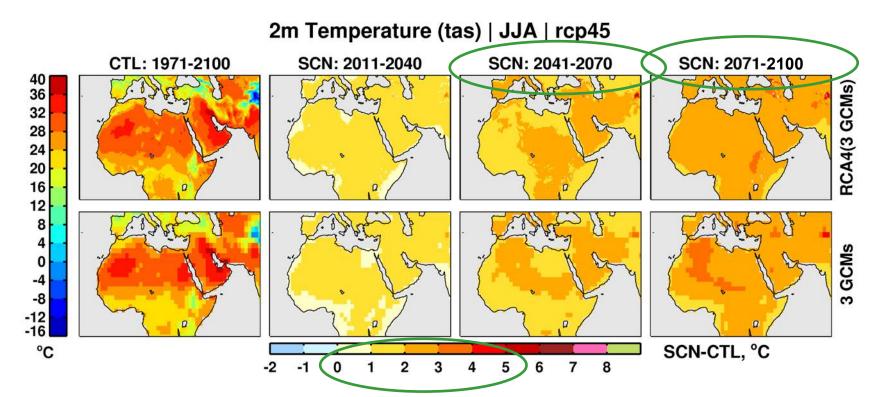
RCM (Institute)	GCM	Historical 1950-2005	RCP2.6 2006-2100	RCP4.5 2006-2100	RCP8.5 2006-2100
RCA4 (SMHI)	EC-Earth 50km	~	~	V	~
RCA4 (SMHI)	EC-Earth 25km	V			V
RCA4 (SMHI)	CNRM 50km	~		V	~
RCA4 (sмні)	GFDL-ESM 50km	V		V	~
KCA4 (SMHI)	GFDL-ESM 25km	V			V
na (Kaust)	GFDL-ESM-1 25km	V	umat	e	AP
na (Kaust)	GFDL-ESM-2 25km GFDL-ESM-2 25km MPI-ESM	regional	d unde	er RICC	AR
Remo (csc)	MPI-ESM	complet	ed un	V ad	~
Reg pro	GFDL-ESM-1 25km GFDL-ESM-2 25kr13 MPI-ESM jections jections 50km	i ble	for de	ownload	-
RegCM4	jections g	zvailabil		V	V
RegCM4 (Kau)	GFDL-ESM 50km	~		V	~



Source: P. Graham, SMHI, RICCAR EGM 6 (Cairo, Dec 2014)

Projected changes in temperature: RCP4.5

global - GCMs and regional – RCA4(GCMs) ensembles **SUMMER**



- similar patterns in both global and regional ensembles
- some differences on regional scale









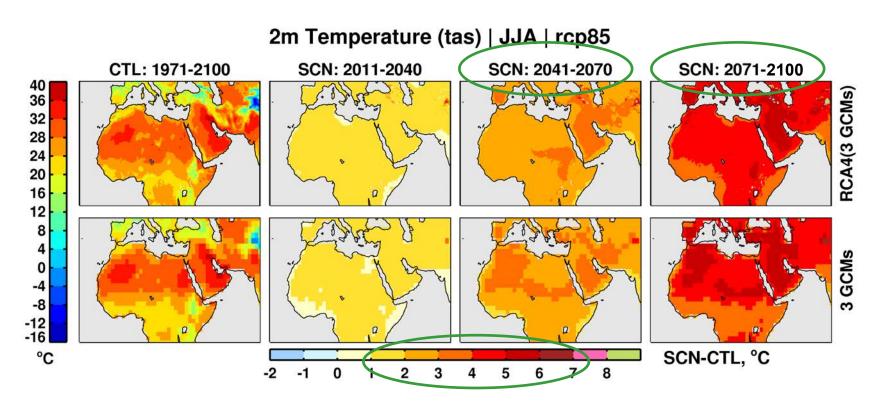






Projected changes in temperature: RCP8.5

global - GCMs and regional – RCA4(GCMs) ensembles SUMMER



- in coming decades both RCP4.5 and RCP8.5 are similar
- larger warming from 2041 on for RCP8.5 than for RCP4.5
- ➤ Average global temperature has already risen by 1°C since pre-industrial times.
- ➤ INDCs submitted pre-Paris Agreement puts the world on a 3-4°C pathway

Earth System Grid Federation: CORDEX MNA Results

Welcome, Guest. | Login | Create Account

ESGF@LiU in cooperation with SMHI

You are at the ESG-DN1.NSC.LIU.SE node

Technical Support

Welcome to the ESGF Node @ LiU

About Us Contact Us



The Earth System Grid Federation (ESGF) maintains a global system of federated data centers that allow access to the largest archive of climate data worldwide. The ESGF datanode at the National Supercomputer Centre, Linköping, is Sweden's first datanode in the ESGF framework. It is a joint activity of NSC and the Swedish Meteorological and Hydrological Institute (SMHI). NSC is an independent organization within Linköping University (LiU), and is funded by the Swedish Research Council via SNIC (Swedish National Infrastructure for Computing).



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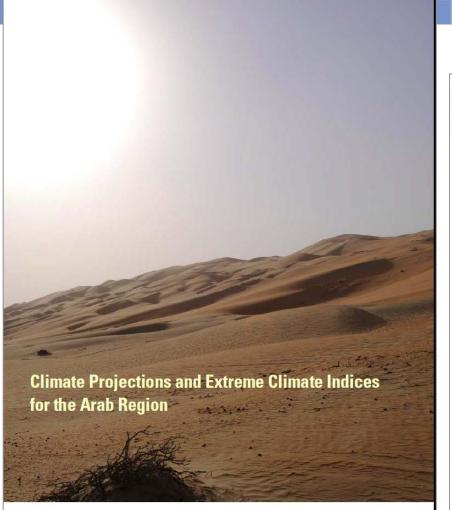
Last Update: April 13, 2016, 10:55 a.m. by Admin User

https://esg-dn1.nsc.liu.se

CORDEX Archive Design used for files & for RICCAR Ensembles Thanks extended to Ole B. Christensen, Bill Gutowski and Grigory Nikulin

RICCAR: Incorporating Climate Extremes for DRR

80 40







Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) Figure 10. Change in the Maximum Length of Dry Spell (CDD) for the time period 2081-2100 from the baseline period 1986-2005 for RCP 4.5 and RCP 8.5. **RCP 4.5** Maximum length of dry spell (CDD) | ANN | CTL: 1986-2005 | SCN: 2081-2100 | rcp45 CTL nr of days SCN-CTL 160 120 80 **RCP 8.5** Maximum length of dry spell (CDD) | ANN | CTL: 1986-2005 | SCN: 2081-2100 | rcp85 nr of days SCN-CTL nr of days 200 160 120

> Issued November 2015 Available in Arabic & English

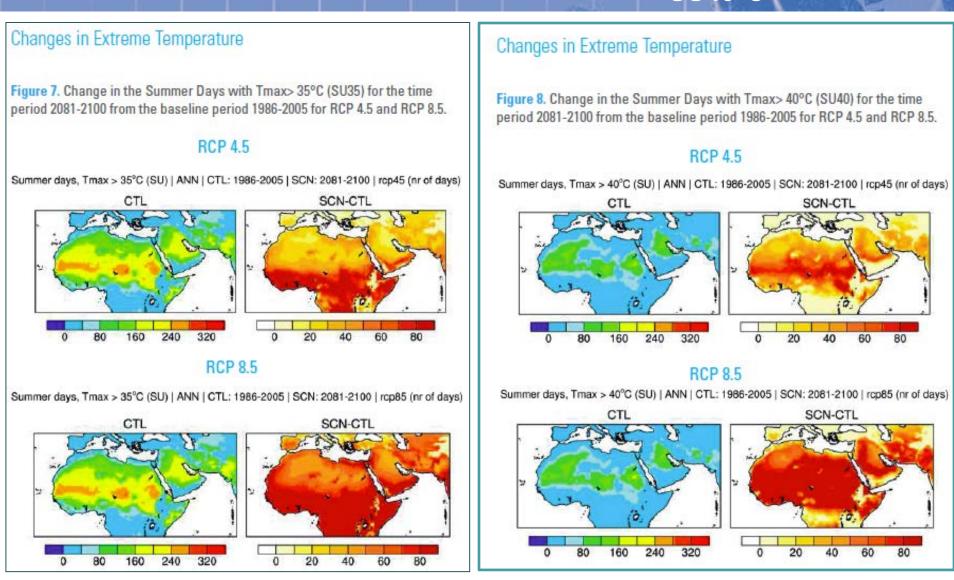
Climate Change Indices: Regional Specificities

Table 1. Climate Change Inc	lices	
Indices	Code	Definition
Changes in Temperature Indices		
Cold spell duration index	CSDI	Annual number of days with at least 6 consecutive days when Tmin < 10 th percentile
Summer days with Tmax > 35°C	SU35	Annual number of days when Tmax > 35°C
Summer days with Tmax > 40°C	SU40	Annual number of days when Tmax > 40°C
Tropical nights	TR	Annual number of days when Tmin > 20°C
Changes in Precipitation Indices		
Maximum length of dry spell	CDD	Maximum annual number of consecutive dry days (i.e. when precipitation < 1.0 mm)
Heavy precipitation days	R10mm	Annual number of days when precipitation ≥ 10 mm)
Very heavy precipitation days	R20mm	Annual number of days when precipitation ≥ 20 mm)

SU35 and SU40 added to better reflect regional specificities associated with warmer temperatures in the Arab region, as the global indicator for summer days adopted by WMO/ETCCDI was limited to measuring the number of summer days (SU) when the daily maximum temperature (TX) exceeds 25°C.

Number of days with TX over SU35°C

Number of days with TX over SU40°C



Source: RICCAR, Climate Projections and Extreme Climate Indices for the Arab Region (2015)

Change in Number of days with more than 10 mm of rainfall

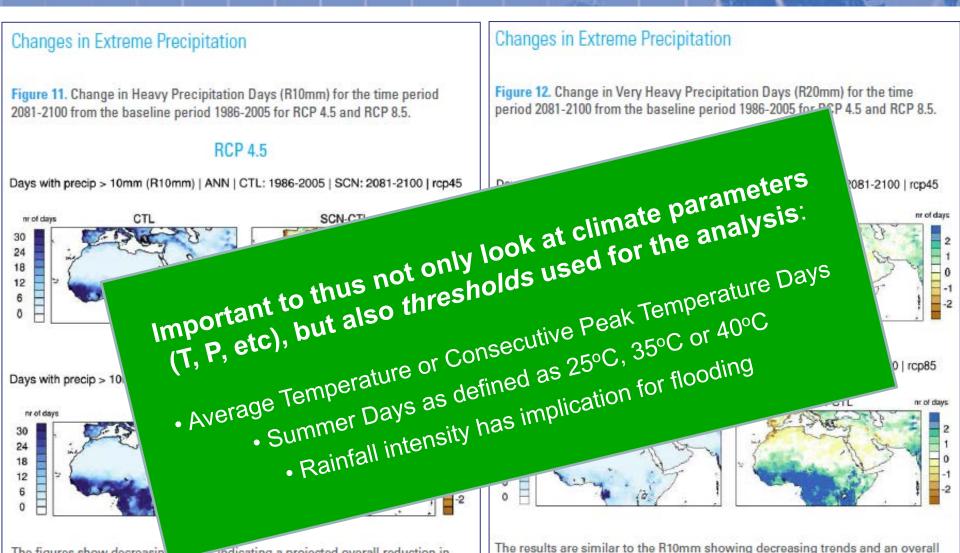
as, indicating a projected overall reduction in

The figures show decreasin

rainy days with intensity greater than 10 mm for the Arab region.

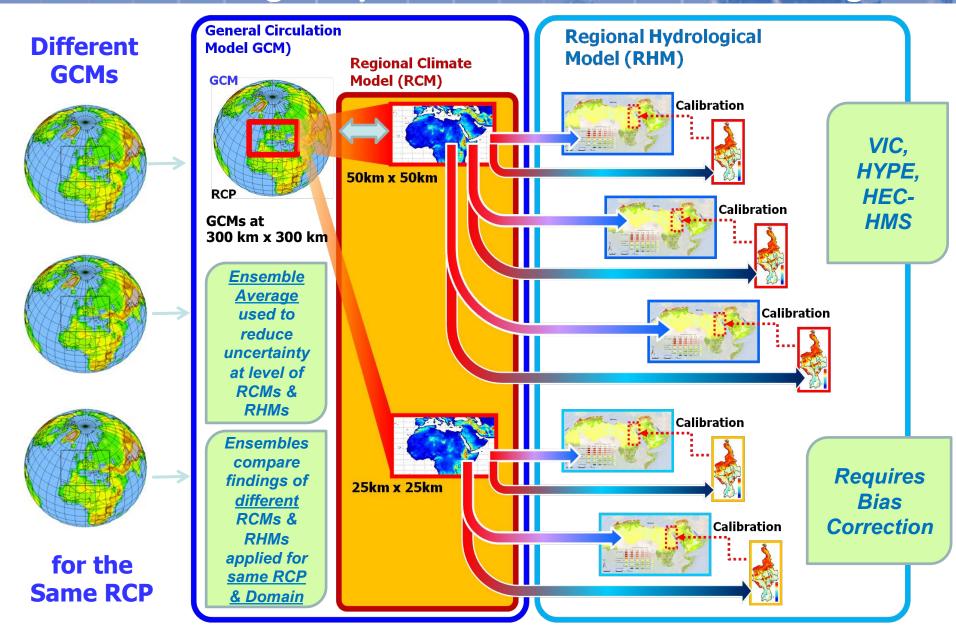
Change in Number of days with more than 20 mm of rainfall

reduction in rainy days with an intensity greater than 20 mm for the Arab region.



Source: RICCAR, Climate Projections and Extreme Climate Idices for the Arab Region (2015)

Regional Climate and Hydrological Modeling for Climate Change Impact Assessment in Arab Region









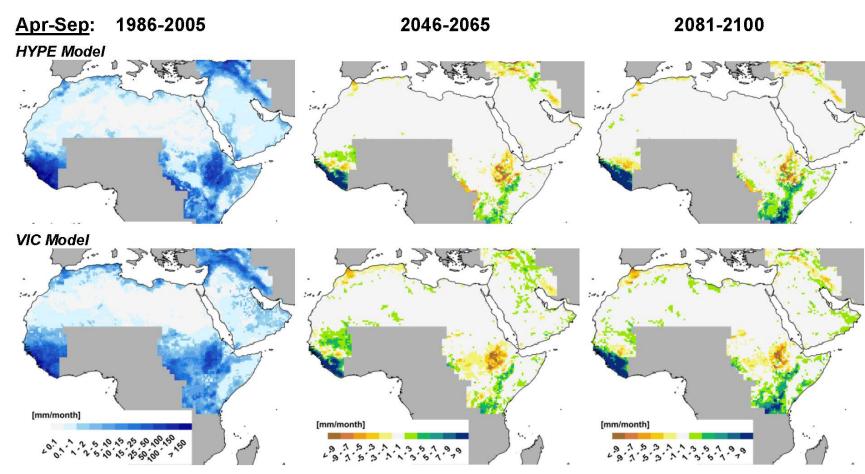




Future Hydrological Projections

Runoff – Summer – (RCP 4.5)



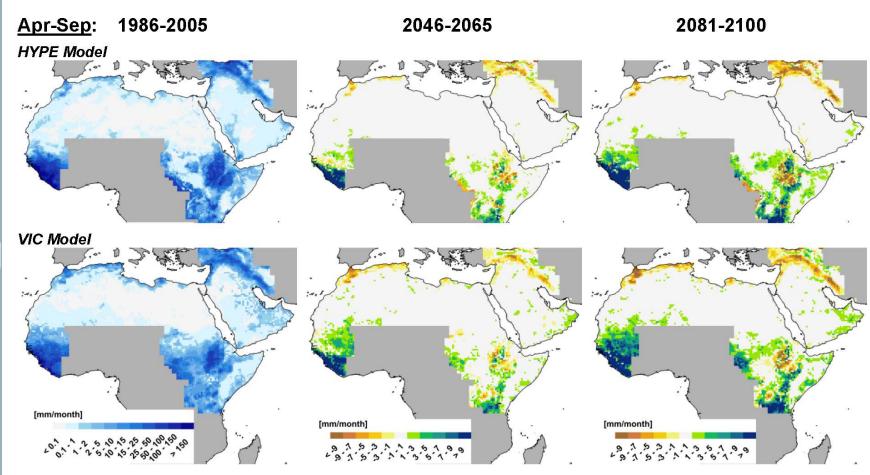


Hydro Models: 3-member ensemble Preliminary findings

SWEDEN

Future Hydrological Projections

Runoff – Summer – RCP 8.5



Hydro Models: 3-member ensemble Preliminary findings











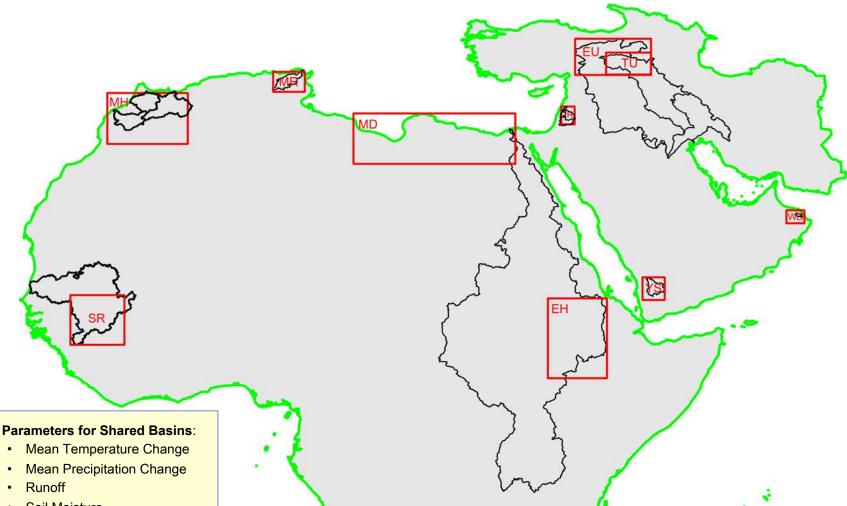






RICCAR

RCM projections used to generate hydrological modeling projections for **Arab Region, Sub-regions & Shared Water Basins**



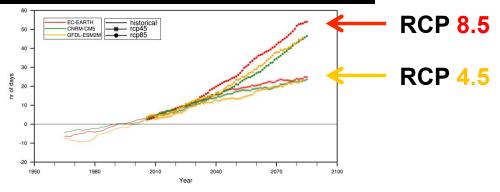
- Soil Moisture
- Evapotranspiration
- Groundwater interaction with surface water

Source: P. Graham (SMHI), based on AWMC & Sida Partners Consultations, RICCAR Scoping Meeting for the Establishment of an ArabCOF, 15 Oct 2014

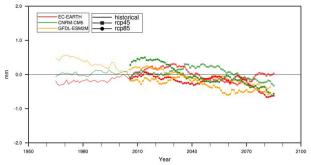
Moroccan Highlands (Atlas)

Temperature

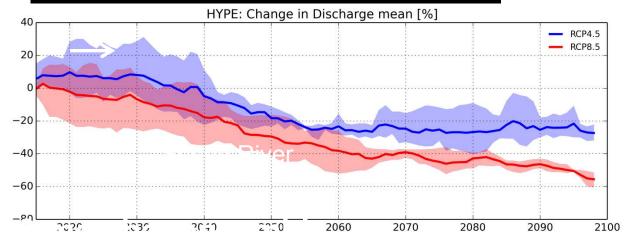
Change in number of days > 35°C



Precipitation Intensity - SDII



% Change in mean annual river discharge



RCP 4.5

← RCP 8.5

From P. Graham, SMHI PPT to RICCAR Event at WWW 2016 (Stockholm)

12 Nominated Hydrological Focal Points

Country	Focal Point	Title	IV	/linistry
1-Iraq	Mr. Jaafar Zamel	Head of Environmental Policy Dept	Ministry of Water F	Resources
	Mr. Abdul Jabar Khalaf	Expert, National Center for the		
	Fench	Management of Water Resources		
2-Jordan	Ms. Rania Abdul Khaleq	Director, Finance & Int'l Cooperation	Ministry of Water a	and Irrigation
3-Djibouti	Mr. Ismail Elmi Habane	Technical Advisor to the Minister in charge of Marine Resources	Ministry of Agricult Fisheries	ture, Water, Livestock,
4-Qatar	Mr. Saad Abdullah El Hatmi		Ministry of Environ	ıment
5-Libya	Mr. Mahdi ElMejrebi	Director General	Public Water Autho	ority
6-Oman	Mr. Ali Ben Mohsen Ben Jawad Lwatia	Hydrological	Ministry of Regiona Water Resources	al Municipalities and
7-Palestine	Ms. Salam Abouhantash	Head, Water Harvesting Section	Palestinian Water A	Authority
8-Mauritania	Mr. Mohamed Abdellahi Ould Taleb	Technical Advisor responsible for Hydrology	Ministry of Hydrolo	ogy and Sanitation
9-Morocco	Mr. Hasan Bargheit	Head of Surface Water Establishment,	Ministry of Energy,	, Minerals, Water and
	!	Water Research & Planning Directorate	Environment	Attending
10-Saudi Arabia	Mr. Yaser Bin Mashfar El Asmari	Hydrologist	Ministry of Water	meetings: Egypt
11-Sudan	Mr. Ammar Abdelrahman	Water Resources Engineer	Ministry of Water	Lebanon
	Ms. Widad Saadalla	Executive Secretary		Tunisia
12-Yemen	Mr. Abdulkhaleq Alwan	IWRM Principal Advisor, Water Planning & Policies, Director NWRA-SB	Ministry of Water a	and Environment

Impact Assessments

Agriculture

- FAO, ACSAD, GIZ/ACCWaM
- Forests
- In-land Fisheries
- Selected Crops
 - Irrigated
 - Rainfed
 - Mixed
- Selected Hot Spots







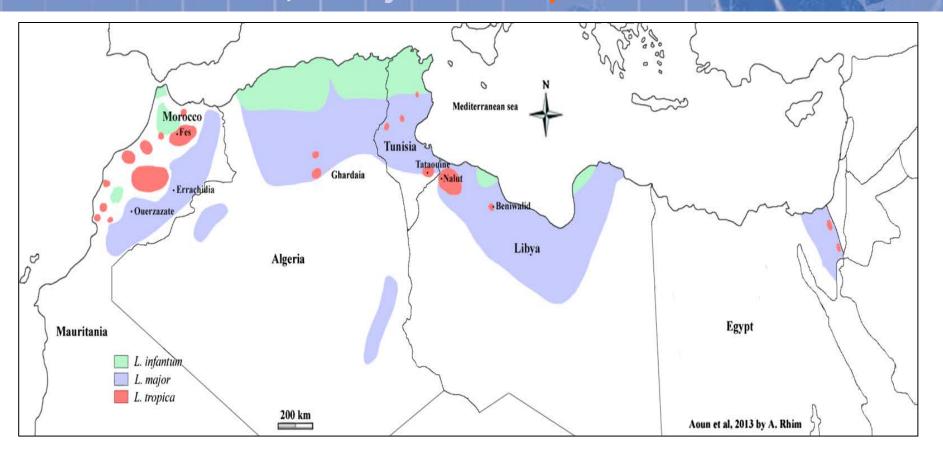
Health

- UNU/INWEH under Sida Project in consultation with WHO on Neglected Tropical Diseases (NTCs) looking at:
- Disease Vectors
- Rodent-Borne Infectious Diseases
- North Africa





Geographical distribution of cutaneous leishmaniasis cases due to *L. infantum, L. major & L. tropica* in North



Source: Aoun and Bouratbine, 2014, as cited by UNU-INWEH in "Climate change impacts on health in the Arab region: A case study on neglected tropical disease" RICCAR, UNU-INWEH draft report 7 Dec 2015

L.major causes zoonotic cutaneous leishmaniasis and is the dominant form in North Africa, causing 90% of cases.

L. tropica largely occurs in Morocco, while only sporadic cases of L.infantum are reported.

Applying WADI in RICCAR: Leishmaniasis: Fall **Exposure** A: RCP 4.5 Exposure B: RCP 8.5 No exposure No exposure **Historical** (1986-2005)Exposure Exposure No exposure **Mid-century** No exposure (2046-2065)Exposure Exposure **End century** No exposure No exposure (2081-2100)

Column A: Fall (October) ZCL exposure 1) Historical ii) RCP 4.5 2046-2065 iii) RCP 4.5 2081-2100; Column B: Fall (October) ZCL exposure 1) Historical ii) RCP 8.5 2046-2065 iii) RCP 8.5 2081-2100

iii

iii

UNU-INWEH "Climate change impacts on health in the Arab region: A case study on neglected tropical disease" RICCAR, draft report 7 Dec 2015

Applying WADI in RICCAR: Leishmaniasis: Summer Exposure C: RCP 4.5 Exposure D: RCP 8.5 No exposure No exposure Historical (1986-2005)Exposure Exposure Mid-century No exposure No exposure (2046-2065)Exposure Exposure **End century** No exposure No exposure

Column C: Summer (June) ZCL exposure 1)Historical ii)RCP 4.5 2046-2065 iii)RCP 4.5 2081-2100 Column D: Summer (June) ZCL exposure 1)Historical ii)RCP 8.5 2046-2065 iii)RCP 8.5 2081-2100

(2081-2100)

Too Hot for Transmission

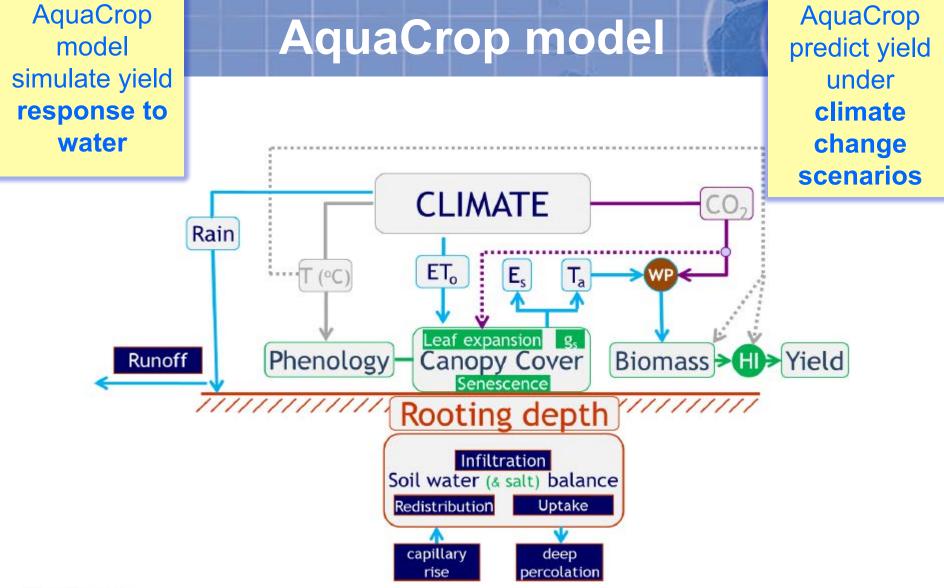
UNU-INWEH "Climate change impacts on health in the Arab region: A case study on neglected tropical disease" RICCAR, draft report 7 Dec 2015

Agriculture Case Studies by ACSAD-FAO-GIZ/ACCWaM

Three case studies to assess impact of climate change on crop yield (due to T, P, CO₂ in atmosphere, etc.)

- Egypt: North Delta
 *Irrigated agriculture
 zone
- 2. Jordan: KarakGovernorate*Rainfed agriculture
- 3. Lebanon: Orontes watershed*Mixed agriculture

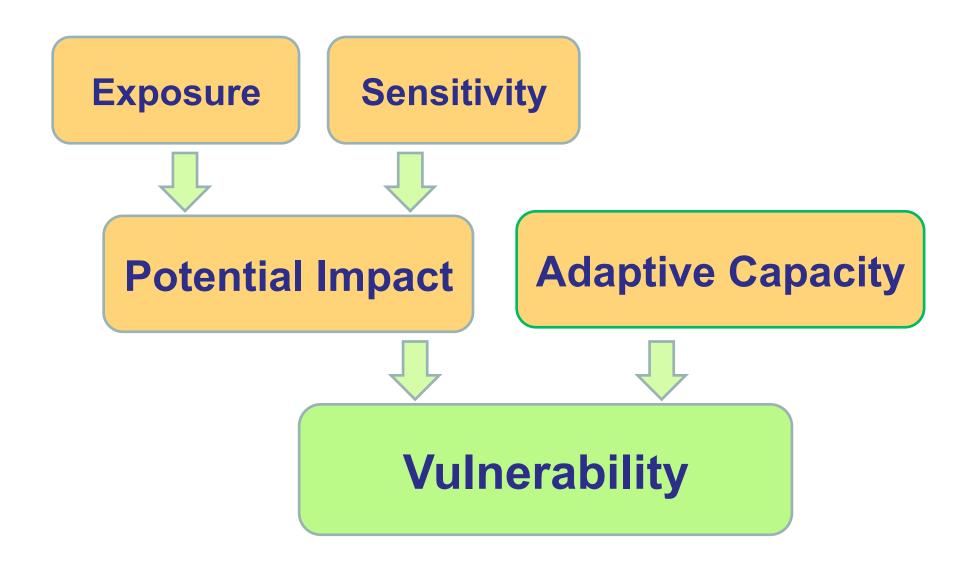




Developed by FAO

Dirk RAES, Pasquale STEDUTO, Theodore C. HSIAO, and Elias FERERES

Vulnerability Assessment Framework

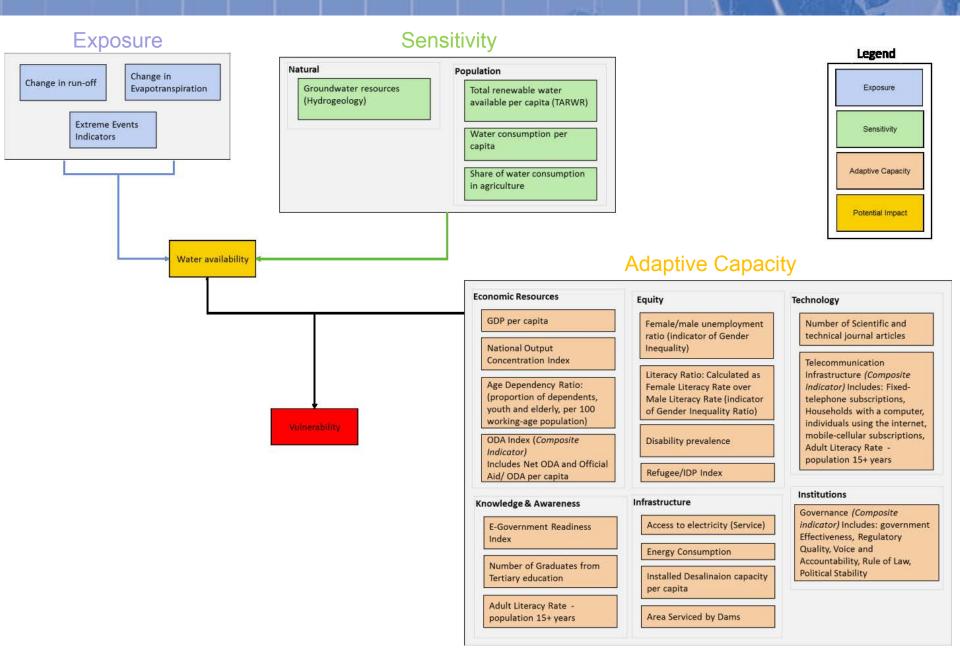


RICCAR VA Sectors

Work supported by GIZ/ACCWaM Contribution to RICCAR, with ACSAD & ESCWA

	Impacts	Su	b-Vulnerabilit
Water	Change in water availability		V0
Biodiversity &	Change in area covered by forests		V1
Ecosystems	Change in area of wetlands		V2
Agriculture	Change of water available for crops		V3
	Change of rangeland for livestock		V4
Infrastructure & Human Settlements	Damage from inland flooding		V5
	(Damage from coastal flooding)		(V6)
	Change of water available for drinking		V7
People	Change in health due to heat stress		V8
	Change of employment rate in the agricultural sector		V9
			on: VA Training Manual

Impact Chain for Water Availability



VA Aggregation, Normalization & Weighting Scheme detailed in Manual









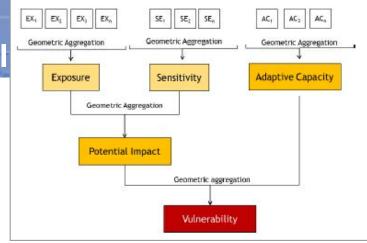


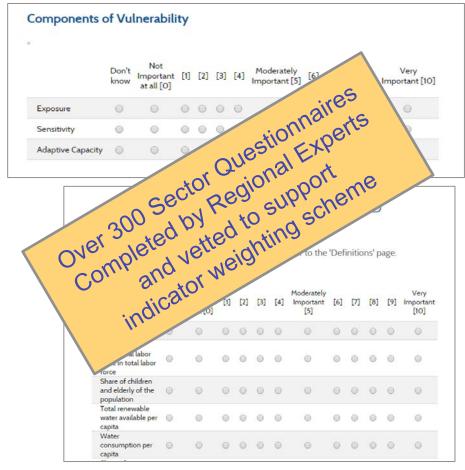


Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR)

Adaptation to Climate Change in the Water Sector in the MENA Region (ACCWaM)

Training Manual on the Integrated Vulnerability Assessment Methodology





Vulnerability Assessment Outputs

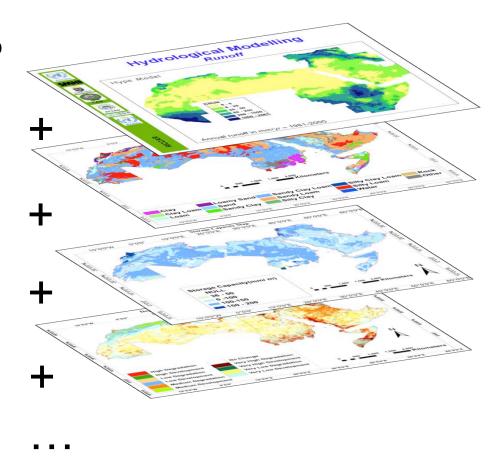
Preparation of a Vulnerability Index:

Per Sector

- Contains all indicators identified to assess a given sectors
- Attribution of weights for each indicator dependent on impact chains and expert judgment
- As sector level, aggregated by component: Exposure, Sensitivity, Adaptive Capacity

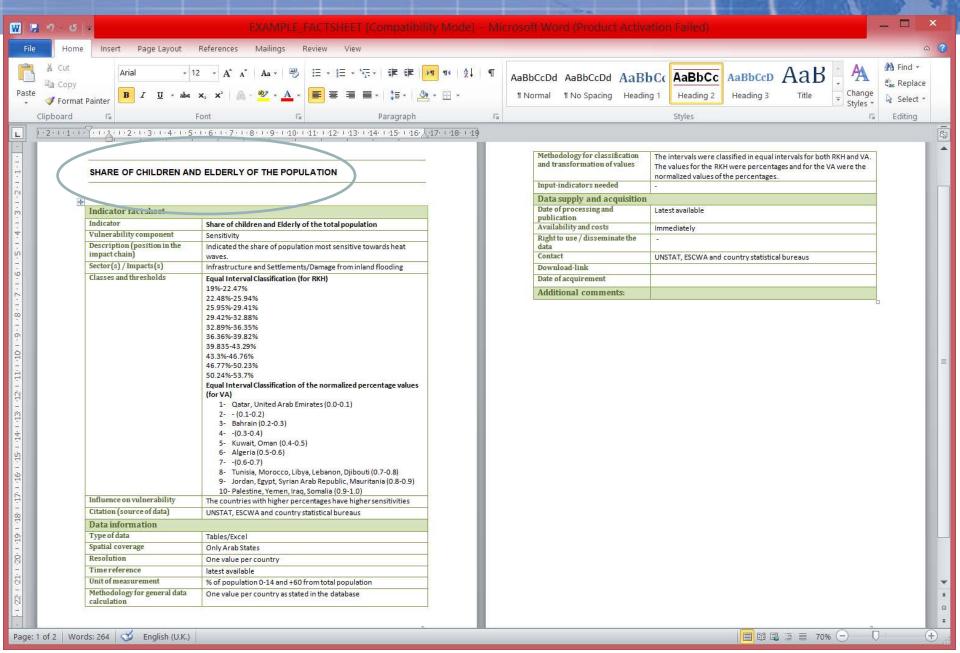
Overall Vulnerability

- Aggregates vulnerability of each sector to generate an Overall VA
- Supports identification of VA Hotspots



Slide graphics: adelphi Source of maps: ACSAD, SMHI

VA Indicator Fact Sheets



Regional Knowledge Hub

Governance

- ACSAD-ESCWA Coordinating Secretariat (Doha, 2014)
- FAO identified to provide IT Platform via FENIX
- RKH Consultative Meeting: ESCWA, ACSAD, FAO, GIZ (Beirut, 19-20 April 2015); Contracting planned in 2016

Regional Knowledge Hub on Water & Climate

- Reports
- Studies
- Briefs
- Training Materials

- EGM
- Workshop
- Working Group
- **Documents**

Data Portal for Arab Domain Outputs

RCM Maps RHM Maps & Data

Sub-Domains Extreme Events

Indices

VA Maps Hotspots & Data

Additional Technical & Training Materials to be provided from ACCWaM & UNDA Climate Change Adaptation using IWRM Tools Capacity Building Project, which draw on RICCAR Outputs

RICCAR Regional Knowledge Hub



Arab Ministerial Water Council (AMWC)



Regional Knowledge Hub

RKH Advisors (GIZ)

ACSAD-ESCWA
Coordinating Secretariat

Mandated May 2014

Regional Knowledge Hub Network

Sub-Regional Nodes

Thematic Nodes

Water & Climate Node

Arab Climate Outlook Forum under development

Purpose

- Regular seasonal forecast products for the Arab region.
- Regional assessments of climate extremes based on national inputs.
- Climate/climate change monitoring and assessment
- Regional assessment of climate change scenarios and their implications.
- Improved and accurate climate data and enhanced monitoring capacity.
- Provision of regional climate information to help responding to user needs (hydrology, agriculture, health, etc.).
- Regular capacity development efforts and promotion of common approaches for climate services by Arab countries
- Better user awareness and sustainable platform for user interface.

Governance

- Approved by Arab Permanent Committee for Meteorology (KSA, March 2015)
- ToR for ArabCOF and hosting supported by LAS and ESCWA with WMO
- Will be considered within new Capacity Building Action Plan to be prepared per resolution of 1st Arab Ministerial Met Council Session (UAE, May 2016)



Capacity Building	, & Inst	titutional	Strengthe	ning	The state of the s
Workshops			Expert Grou	up Mee	tings
Projection/ Prediction and Extreme Events Indices	Arab Met Offices	March 2012 Casablanca	EGM 1: Launching	Water, Environ	2009 Beirut
Applications & Analysis of Regional Climate Models	Water Ministries	July 2012 Beirut	EGM 2: Arab Domain	Water Environ	2010 Beirut
National Workshops for Disastor	Intor	Sontombor	E014.0	VA / (0044

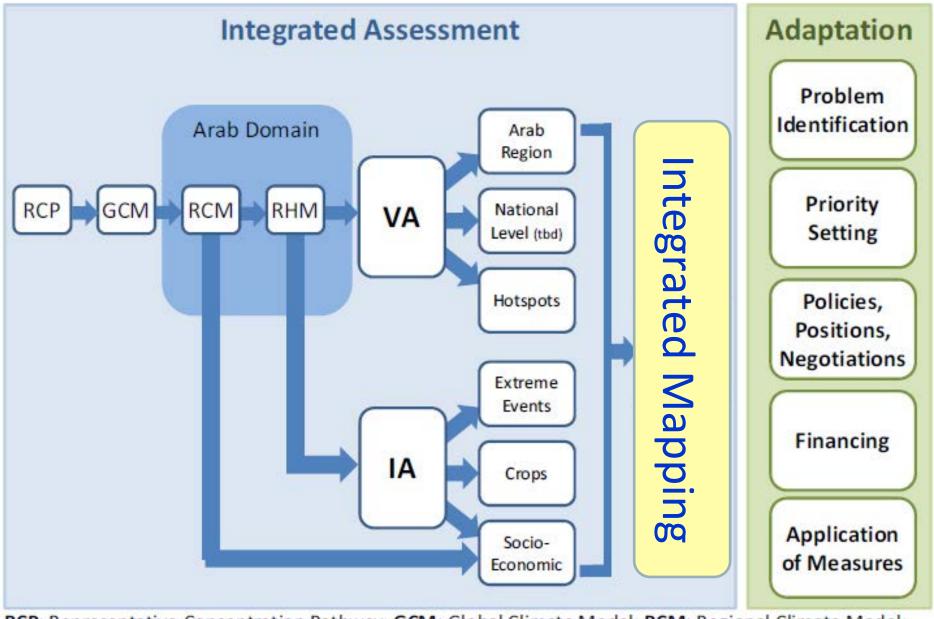
Extreme Events Indices	Offices	March 2012 Casablanca	EGM 1: Launching	Water, Environ
Applications & Analysis of Regional Climate Models	Water	July 2012	EGM 2:	Water
	Ministries	Beirut	Arab Domain	Environ
National Workshops for Disaster Losses Inventories (Tunisia,	Inter-	September	EGM 3:	Water
	ministerial	2012-April 2014	RCMs	Environ

Applications & Analysis of	Water	July 2012	EGM 2:	Water	2010
Regional Climate Models	Ministries	Beirut	Arab Domain	Environ	Beirut
National Workshops for Disaster Losses Inventories (Tunisia, Morocco, Yemen, Jordan, Palestine)	Inter-	September	EGM 3:	Water	2011
	ministerial	2012-April 2014	RCMs	Environ	Beirut
Climate Data Rescue Sub-regional Workshop (Palestine, Jordan, KSA, Yemen)	Met Services	June 2013 Amman	EGM 4: Climate Ensemble & Working Groups	Water Ministries Environ Agencies	2012 Beirut
Linking Regional Climate Models	Arab Water	June 2013	EGM 5:	Water	2013

Inter- ministerial	September 2012-April 2014	EGM 3: RCMs	Water Environ	2011 Beirut
Met Services	June 2013 Amman	EGM 4: Climate Ensemble & Working Groups	Water Ministries Environ Agencies	2012 Beirut
Arab Water Ministries`	June 2013 Beirut	EGM 5: Preliminary RCM	Water Ministries	2013 Amman
Research Centers	May 2014 Beirut	Findings for Arab Domain & VA Methodology		
Met Services	Oct 2014, Amman	egm 6: Review of RCM & RHM Findings & VA	Water, Ag & Envion Ministries	2014 Cairo
	Met Services Arab Water Ministries` Research Centers	Met June 2013 Services June 2013 Arab Water Ministries` Beirut Research Centers May 2014 Met Oct 2014,	ministerial Met Services Amman Amman Met Services June 2013 Amman Arab Water Ministries May 2014 Centers Met Services M	ministerial 2012-April 2014 Met Services June 2013 Amman Arab Water Ministries Arab Water Ministries Arab Water Ministries Beirut Findings for Arab Domain & VA Methodology Met Services Amman Met Services Oct 2014, Amman Met Services Amman Met Services Research Centers Preliminary RCM Findings for Arab Domain & VA Methodology Met Services Research Centers Preliminary RCM Findings for Arab Domain & VA Methodology Met Services RCM 6: Review of RCM & RHM Ministries Environ Water Ministries Water Ministries Water Ministries Water Ministries Findings for Arab Domain & VA Methodology Met Services RCM 8: Review of RCM & RHM

Morocco, Yemen, Jordan, Palestine)	Tim notorial	2012 / 10111 2011	INCIVIS	LIMIOII	Beirut
Climate Data Rescue Sub-regional Workshop (Palestine, Jordan, KSA, Yemen)	Met Services	June 2013 Amman	EGM 4: Climate Ensemble & Working Groups	Water Ministries Environ Agencies	2012 Beirut
Linking Regional Climate Models to Hydrological Models	Arab Water Ministries`	June 2013 Beirut	EGM 5: Preliminary RCM	Water Ministries	2013 Amman
Technical Workshop on the Vulnerability Assessment Methodology Application	Research Centers	May 2014 Beirut	Findings for Arab Domain & VA Methodology		
Scoping Meeting for Establishing an Arab Climate Outlook Forum (ArabCOF)	Met Services	Oct 2014, Amman	EGM 6: Review of RCM & RHM Findings & VA	Water, Ag & Envion Ministries	2014 Cairo
Moving from Impact Assessment to Socio-Economic Vulnerability Assessment	Water & Agriculture Ministries	June 2015 Beirut	Sectors EGM Peer Reviews	Experts, Gov't	2016

Sub-regional Workshop (Palestine, Jordan, KSA, Yemen)	Services	Amman	Ensemble & Working Groups	Environ Agencies	20
Linking Regional Climate Models to Hydrological Models	Arab Water Ministries`	June 2013 Beirut	EGM 5: Preliminary RCM Findings for Arab Domain & VA Methodology	Water Ministries	2013 Amman
Technical Workshop on the Vulnerability Assessment Methodology Application	Research Centers	May 2014 Beirut			
Scoping Meeting for Establishing an Arab Climate Outlook Forum (ArabCOF)	Met Services	Oct 2014, Amman	EGM 6: Review of RCM & RHM Findings & VA	Water, Ag & Envion Ministries	2014 Cairo
Moving from Impact Assessment to Socio-Economic Vulnerability Assessment	Water & Agriculture Ministries	June 2015 Beirut	Sectors EGM Peer Reviews	Experts, Gov't	2016



RCP: Representative Concentration Pathway; GCM: Global Climate Model; RCM: Regional Climate Model;

RHM: Regional Hydrological Model; VA: Vulnerability Assessment; IA: Impact Assessment;

IM: Integrated Mapping

RICCAR supported & implemented through Regional Cooperative Arrangements & Mechanisms

UN-LAS Coordination Mechanism

UN-LAS
Sectoral Meeting
on Climate Change
2009

Arab Summit approved IWRM Project on Climate Change

LAS/ACSAD - 2009

UN Regional Coordination Mechanism (RCM)
Thematic Working Group on Climate Change
Chaired by UNEP/ROWA - 2010

RICCAR Formulation & Implementation with Partners

Annual EGMs

2009, 2010, 2011, 2012, 2013, 2014 **Technical Workshops**2011, 2012,
2013, 2014

Working Groups 2013, 2014

VA & RKH

RCM Ensemble Task Force & CORDEX 2011, 2012,

2013, 2014

VA Task Force Meetings (sensitivity, AC) 2014, 2015

Assessment informing Policy Action

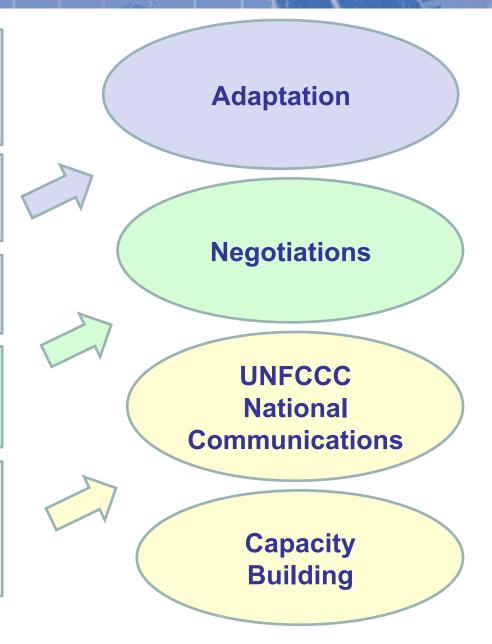
Arab Water Security Strategy for Sustainable Development (2010-2030)

Arab Climate Change Action Plan

Arab Disaster Risk Reduction Strategy & Action Plan

Arab Climate Change Working Group

Country-Level Requests (Outputs, Inputs, Training)



Arab Climate Change Assessment Report

- I. Introduction
- II. Data, Databases and Baseline Information
- III. Regional Climate
 Modelling Findings for
 Arab Region
- IV. Hydrological Findings for Major Shared Basins
 - A. Nile Basin
 - **B.** Tigris and Euphrates Rivers
 - C. Medjerda River Basin
 - D. Jordan River Basin
 - E. Senegal River Basin

V. Extreme Events Case Studies

- A. Wadi Diqah (Oman)
- B. Medjerda (Tunisia/Algeria)
- C. Nahr Al-Kabir (Lebanon/Syria)

VI.Impact Assessment Studies

- A. Agriculture (rainfed, irrigated, mixed)
- **B.** Human Health

VII.Vulnerability Assessment

- A. Water
- **B.** Agriculture
- C. Biodiversity & Ecosystems
- D. Infrastructure & Human Settlements
- E. People

VIII. Conclusion

Forthcoming at 10 year anniversary of Arab Climate Change Declaration (2007) We welcome collaboration to analyze and draw comparisons with Ensemble Findings

MENA CORDEX Working Group

Coordinator: The Cyprus Institute

- RCM Ensemble Meeting organized by SMHI (Brussels, 2013)
- First CORDEX MENA-CA Meeting (Nicosia, Nov 2014)
 - Hosted by The Cyprus Institute
 - Organized by CORDEX (WMO) with SMHI
 - Attended by some RICCAR partners (KAU, KAUST, ESCWA) & several modeling institutes, with inputs from ACSAD and Maroc Meteo
- Lingering challenge regarding application of CORDEX Archive Specifications for consolidating regional ensembles

Members:

- 1. The Cyprus Institute
- 2. SMHI
- 3. Arab Center for Studies of Arid Zones & Dry Lands (ACSAD), League of Arab States, Syria
- 4. Bogazici University, Turkey
- 5. CLM Community / Centro EuroMediterraneo sui Cambiamenti Climatici, Italy
- 6. Climate Service Center 2.0 (CSC2.0), Max Planck Institute for Meteorology, Germany
- 7. Cairo University Faculty of Engineering
- 8. Direction de la Météorologie Nationale, Maroc
- 9. Int'l Center for Biosaline Agriculture, UAE
- 10. Center of Excellence for Climate Change Research, King Abdulaziz University, Jeddah, Saudi Arabia
- 11. King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

RICCAR looks forward to the outcomes of this cooperative CORDEX effort for the generation of new RCM Ensembles for inform Policy-Making in region

Thank you!

RICCAR Implementing Partners

www.escwa.un.org/RICCAR











LAS





United Nations Educational, Scientific and Cultural Organization Cairo Office



Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH





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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

Collaborating Research Institutes

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