



06 September 2023

Time: **09:00 - 10:30 CEST / 10:00 - 11:30 Jordan time**

# The Water Energy Food Ecosystems Nexus in the Middle East



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**Swiss Agency for Development  
and Cooperation SDC**

RésEAU  
BGE EAO

# Facilitation



## **Delphine Magara**

Junior Water Advisor, RésEAU Backstopper, Skat Consulting Ltd., St.Gallen.

# Programme

1

## **Introduction - Why the WEF Nexus Matters @ the Global & Regional Level**

**Dr. Daniel Maselli**, Focal Point of RésEAU, SDC Bern.

**Mufleh Alalaween**, Regional Core Team Leader of Sub-RésEAU MENA, and Regional Advisor on Water Cooperation - SDC Amman.

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2

## **Opportunities and Challenges of Applying the WEF Nexus in the Middle East - A Blue Peace Perspective**

**Dr. Tuğba Evrim Maden**, Policy Development Coordinator at SUEN Turkish Water Institute, former Head of Blue Peace Middle East Coordination Office, Istanbul. *(recorded presentation)*

**Dr. Hakam Al Alami**, Member of Managing Committee for the Blue Peace in the Middle East Initiative, Amman.

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3

## **Reconciling Resource Use in Transboundary Basins - UNECE's WEF Nexus approach**

**Lucia de Strasser**, Environmental Affairs Officer, United Nations Economic Commission (UNECE), Geneva.

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## **Q&A and Interactive Discussion**

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5

## **Conclusion and Outlook**

**Mufleh Alalaween**, Regional Core Team Leader of Sub-RésEAU MENA, and Regional Advisor on Water Cooperation - SDC Amman.

## INTRODUCTION

# Why the WEFE Nexus Matters @ the Global & Regional Level



## Dr. Daniel Maselli

Focal Point RésEAU


Senior Policy Advisor on Water, SDC Berne/Switzerland

## Mr. Mufleh Alalaween

Regional Core Team Leader Sub-RésEAU MENA

Regional Advisor on Water Cooperation, SDC Amman/Jordan

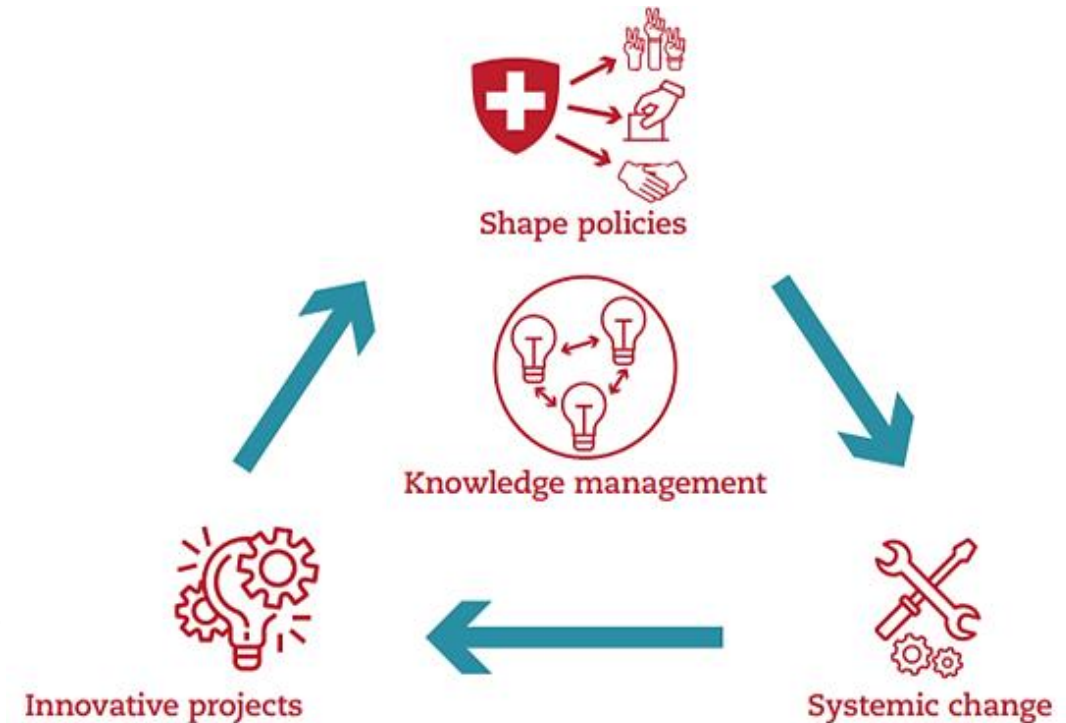
SDC Network RésEAU  
RÉSÉAU

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Swiss Agency for Development  
and Cooperation SDC

# RésEAU - SDC's Thematic Network on Water

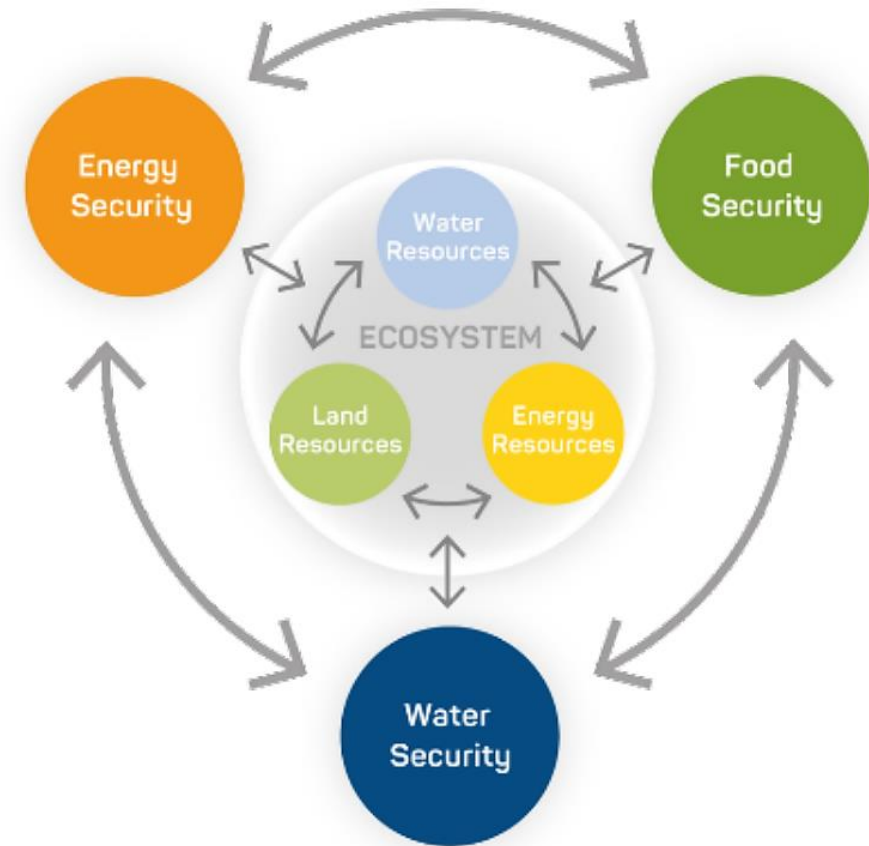
- about **600 members**
- **4 regional sub-networks:**
  - Eastern Europe - Central Asia (EECA)
  - Middle East - North Africa (MENA)
  - Latin America - Carribean (LAC)
  - anglo- and francophone Africa (AFR)
- **Cluster Green:** close collaboration with the thematic networks CC, DRR&E and FS with a main focus on implementing the nexus approach
- **Trend Observatory on Water** (mandate with adelphi: <https://hazu.swiss/deza/trend-observatory-on-water>)



*Operational principles of SDC's thematic sections; role of thematic networks*

# RésEAU - Importance of the WEFE Nexus @ SDC

- **'Nexus'**: latin word describing the act of tying something together or something that binds
- first introduced in 1980s in the Food-Energy (FE) nexus program of the UN University
- expanded during lead-up to the Bonn Conference 2011 to Water-Energy-Food (-security / WEF) nexus
- further expanded to the WEFE (Water-Energy-Food-Ecosystem) nexus during the last decade



# RésEAU - How to Participate in the RésEAU:

- **Register** as a member: <https://dgroups.org/sdc/reseau>
- **Receive news:** thematic RésEAU Briefs, RésEAU Updates, Dgroup messages
- **Share** your news, announce your events, inform on your projects
- **Participate** in specific RésEAU and Sub-RésEAU online and face-to-face activities such as webinars, e-workshops and e-discussions and exchange with other network members
- Next highlight: **37th AGUASAN Workshop** in Switzerland on digitalization in the water sector to be held 9-13 October 2023
- for more information check: <https://www.shareweb.ch/site/Water/about-the-reseau/your-input>





# Sub-ResEAU Middle East - North Africa MENA

- Launched in June 2022
- **5 priority areas** identified during **learning journey with AGUASAN Workshop 2022:**
  - Wastewater treatment and reuse
  - Water-Energy-Food-Ecosystems (WEFE) nexus
  - Groundwater resources management
  - Impact of multi-dimensional water scarcity on food security
  - Smart WASH approach for refugee camps and host communities
- **Follow-up** with current focus on two topics:
  - decentralized waste-water treatment systems
  - promoting the understanding and application of the WEFE nexus



# Blue Peace Middle East (BPME)

- Launched by Switzerland and other partners in 2011 as **hydro-diplomatic initiative to improve transboundary water management**
- New thematic area:
  - **WEFE as new the thematic area** of the new phase of the BPME, i.e. BPME 2.0
- Focus on two pillars:
  - **Policy:** hydro-diplomacy based on a newly established regional mechanism. Coordinated by INWRDAM
  - **Capacity development:** research, training and education on water diplomacy by the Water Diplomacy Center established in Jordan as regional hub.



# Opportunities and Challenges of Applying the WEF Nexus in the Middle East



**Dr. Tuğba Evrim Maden** (*recorded presentation*)

Policy Development Coordinator at SUEN Turkish Water Institute, former Head of Blue Peace Middle East Coordination Office, Istanbul.

# Opportunities and Challenges of Applying the WEFE Nexus in the Middle East - A Blue Peace Perspective

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**Dr. Hakam Al Alami**

Member of Managing Committee for the Blue Peace in the Middle East Initiative, Amman.

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Swiss Agency for Development  
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**Blue Peace**  
MIDDLE EAST





# BPME WEF E Nexus Programme

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graph TD; A[BPME WEF E Nexus Programme] --> B[Change the narrative around water and switch thinking around water cooperation]; A --> C[Develop solution-oriented WEF E dialogue among Middle East Countries]; A --> D[Prepare a new generation to become champions and advocates of the WEF E Nexus approach]; A --> E[Contribute to increased water, energy, food security in a resilient ecosystem in the Middle East];
```

Change the narrative around water and switch thinking around water cooperation

Develop solution-oriented WEF E dialogue among Middle East Countries

Prepare a new generation to become champions and advocates of the WEF E Nexus approach

Contribute to increased water, energy, food security in a resilient ecosystem in the Middle East

# WEFE Working Group

Change the narrative around water and switch thinking around water cooperation

- Collaborative evolution of a common understanding of WEFE
- Development of a new narrative of WEFE as a tool for cooperation

# WEFE Baseline-study

Water Diplomacy Center and INWRDAM are jointly conducting a WEFE baseline study

- Assess the knowledge on the ground for appropriate action
- Understanding the existing WEFE interconnections in the region
- Revealing opportunities and gaps in the interconnections of sectors
- Identify regional WEFE opportunities
- WDC and INWDDAM are jointly establishing a WEFE regional hub and a pilot study.



# Thank you for your attention



Dr Hakam Al Alami  
WEFE WG Leader Blue Peace ME

# Reconciling Resource Use in Transboundary Basins - UNECE's WEFE Nexus Approach

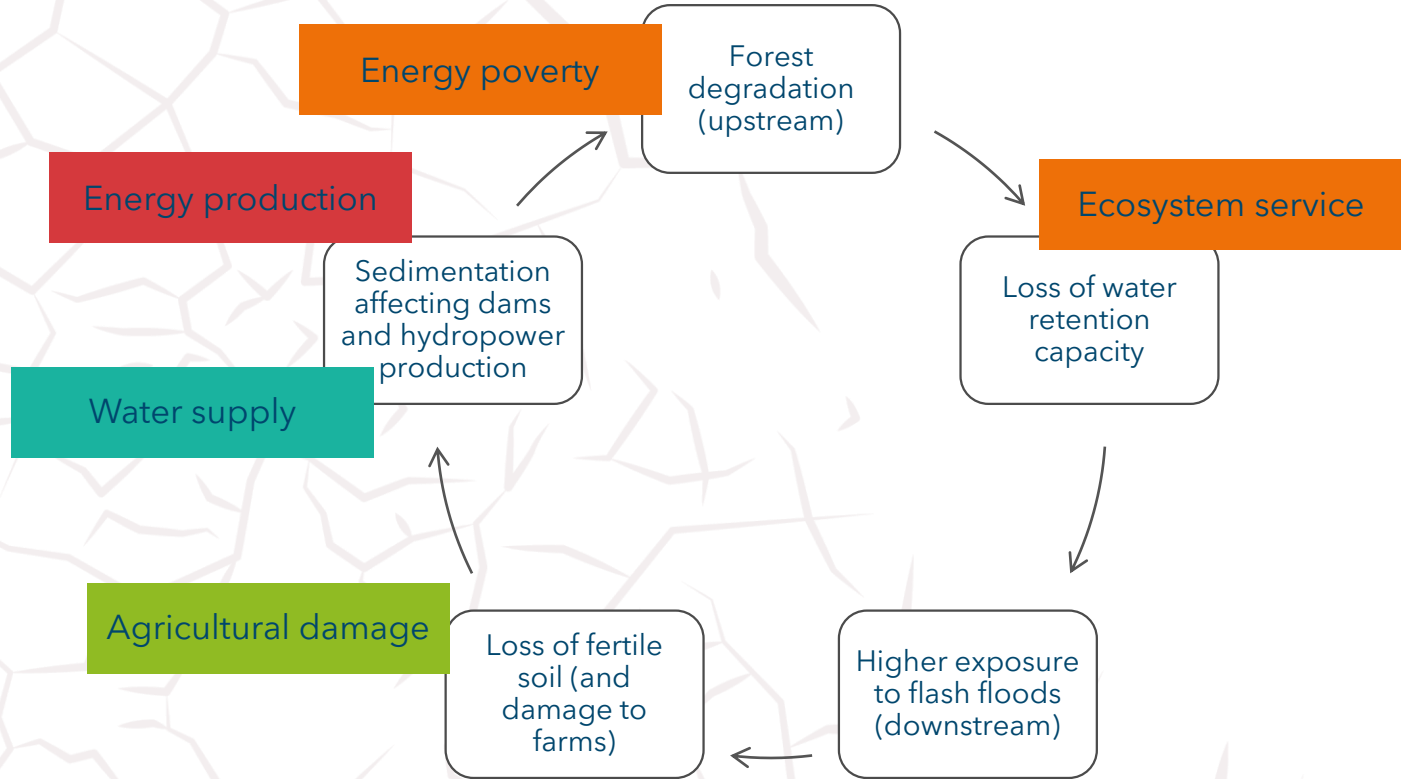
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**Lucia de Strasser**

Environmental Affairs Officer, Water Convention Secretariat, United Nations Economic Commission (UNECE), Geneva.



# Sectors, Borders... and Watersheds



## Benefits (not yet quantified)

- reduced erosion, to hydrological regime, to ecosystems
- reduced impacts from flash floods

- An Example: Alazani/Ganykh River Basin (Georgia and Azerbaijan) - UNECE nexus assessment 2013
- Suggested policy actions:
  - Facilitate access to modern energy sources and energy trade
  - Control illegal wood harvesting
- **Policy action:** 50 000 new consumers in 178 villages across 8 municipalities of Kakheti (Georgia) have been connected to the gas network (UNECE, 2021)

# The Water Convention



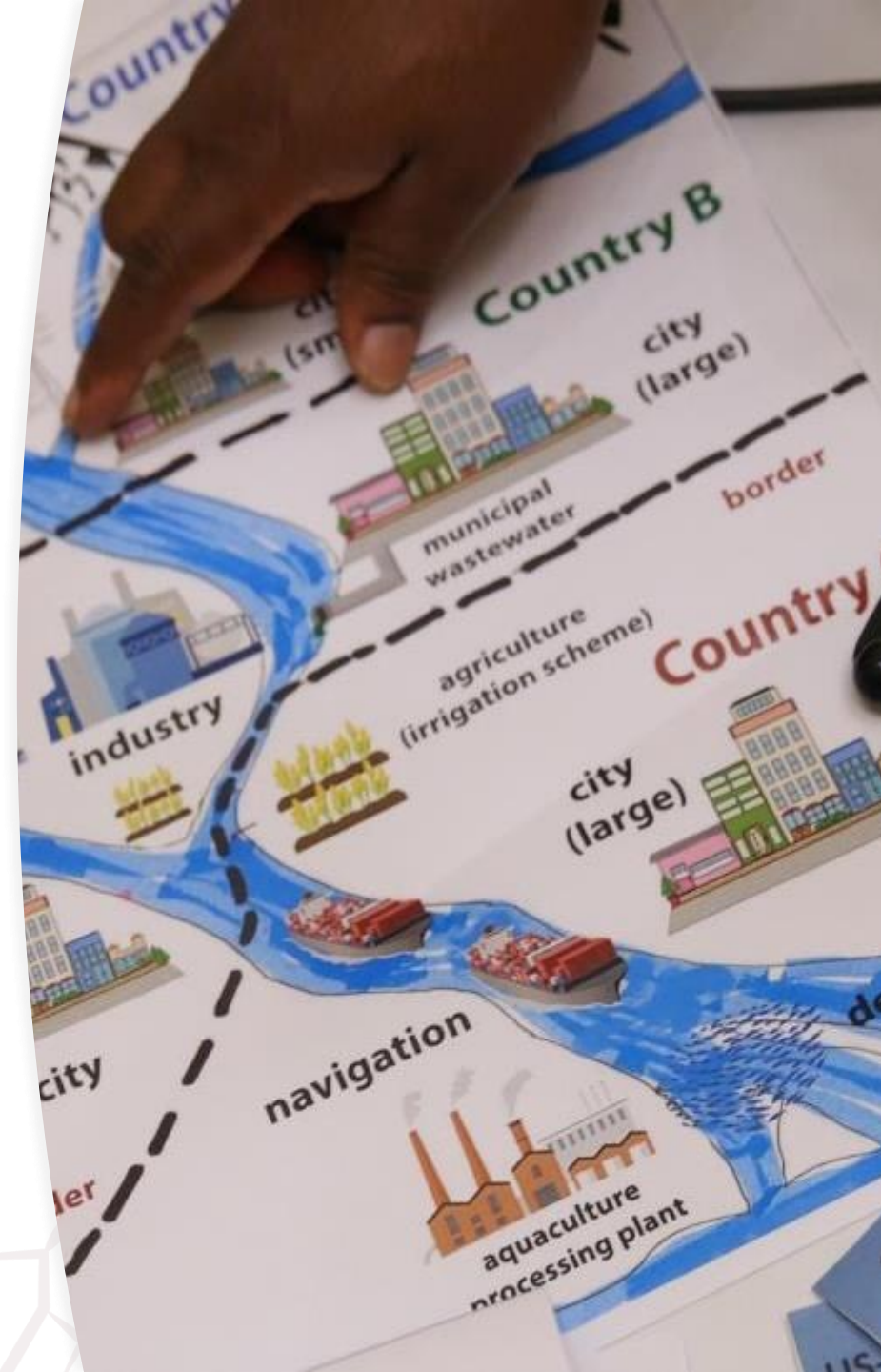
A **legal and institutional framework** for transboundary water cooperation contributing to sustainable development, international peace and security.



A unique **platform** to discuss progress of **transboundary water cooperation** worldwide under the umbrella of the United Nations



Opened to all interested countries, with more than **130 countries exchanging experiences and knowledge** to prompt progress in cooperation



## OVERALL OBJECTIVE

Transboundary waters worldwide are managed in cooperation between riparian countries in accordance with the Water Convention, promoting sustainable development, peace and security

### OUTCOME 1

Countries understand the Convention, accede to it, develop agreements and establish joint bodies



#### Awareness & accession

##### Programme Area 1

Increasing awareness of and accession to the Convention and application of its principles drawing on the benefits of cooperation

### OUTCOME 2

Transboundary water resources in transboundary basins are monitored and assessed, and information is shared among riparian countries



#### Monitoring & assessment

##### Programme Area 2

Supporting monitoring, assessment and information sharing in transboundary basins

### OUTCOME 4

Transboundary water cooperation is sustainably financed



#### Financing Programme Area 5

Facilitating financing of transboundary water cooperation

### OUTCOME 5

Transboundary water cooperation is monitored and partners are mobilized to support it



#### Reporting Programme Area 6

Reporting on Sustainable Development Goal indicator 6.5.2 and under the Convention

### OUTCOME 3

Integrated water resources management is implemented at all levels in a changing climate



#### Integrated & intersectoral approach

##### Programme Area 3

Promoting an integrated and intersectoral approach to water management at all levels



#### Climate change adaptation

##### Programme Area 4

Adapting to climate change in transboundary basins



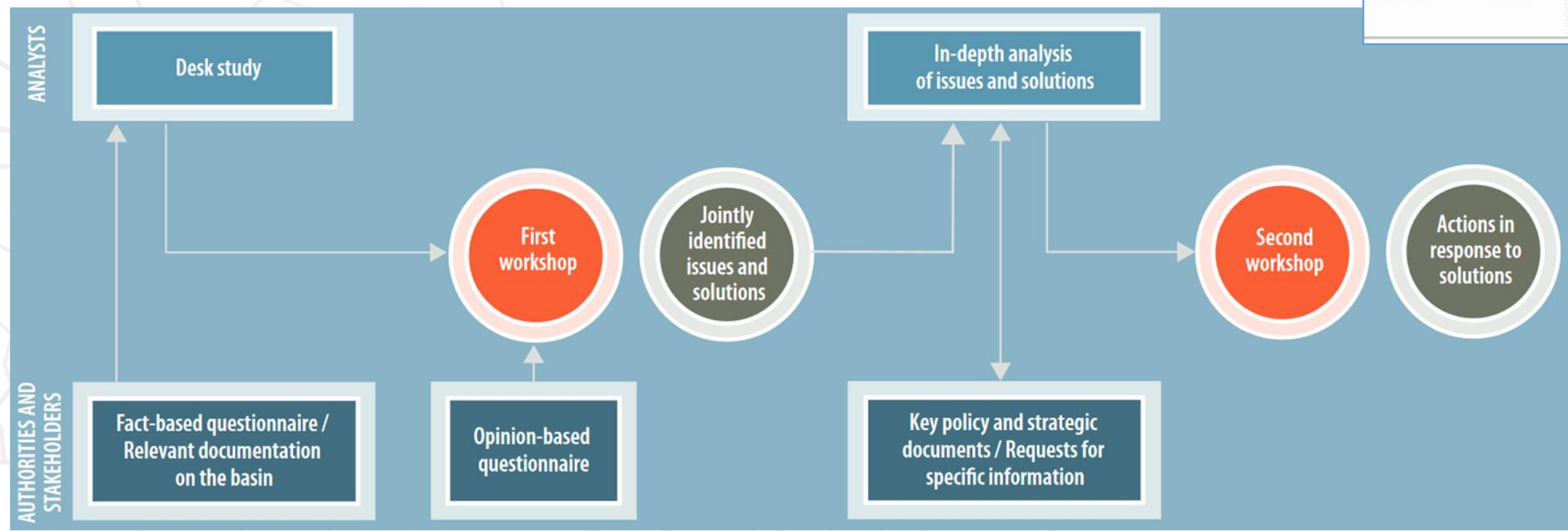
#### Partnership & knowledge

##### Programme Area 7

Partnerships, communication and knowledge management



# Nexus Assessment: a participatory process



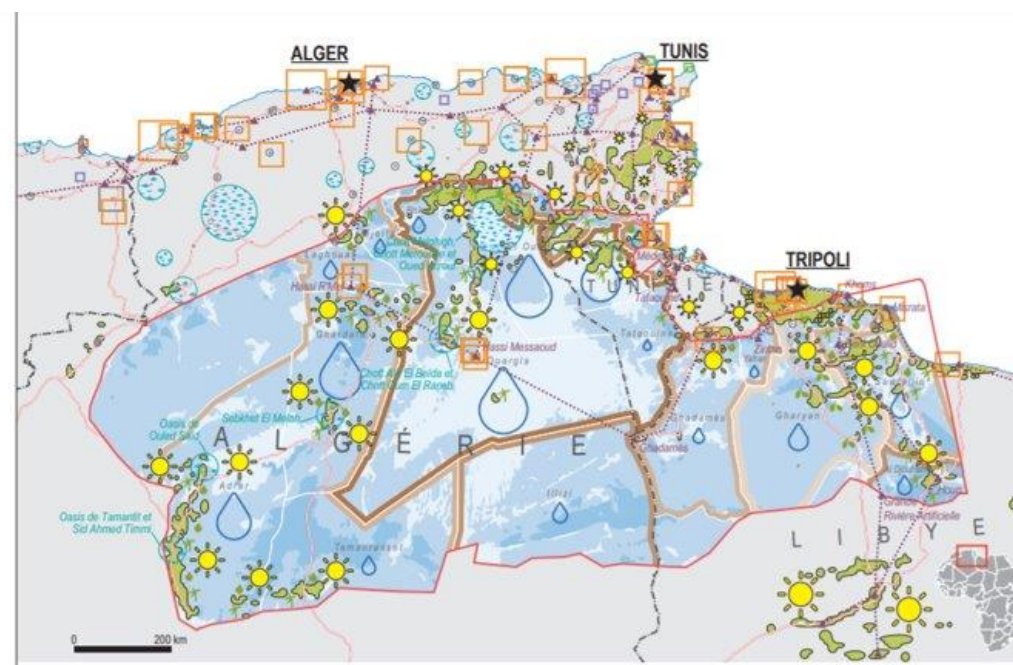
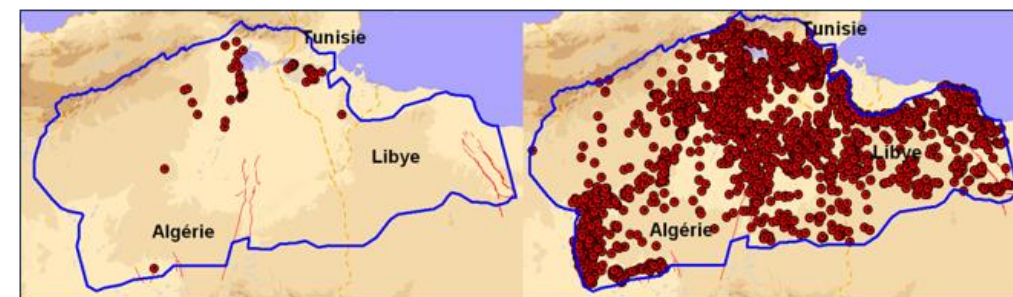
# Nexus Assessments under the Convention



\* United Nations administered territory under the UN Security Council Resolution 1244 (1999)

# The North-Western Sahara Aquifer System

- Shared by Algeria, Libya and Tunisia (1,000,000 km<sup>2</sup>)
- Main challenges: increased demand for water and withdrawals (i.e. energy for pumping), climate change, insufficient infrastructure (irrigation), low value of water
- Integrated modelling (water-energy-agriculture)
- Cross-sectoral dialogue: joint prioritization of problems, development of solutions and synergistic action (a "set of solutions" between sectors)



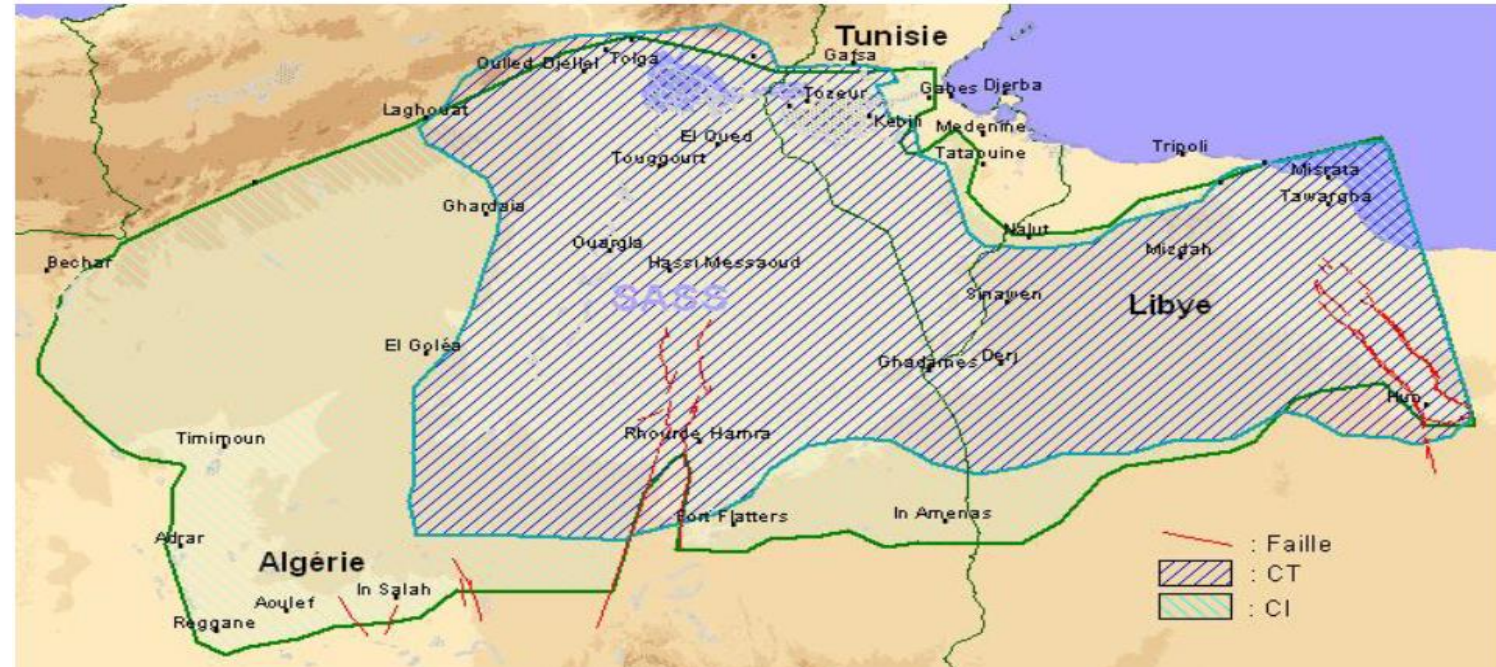
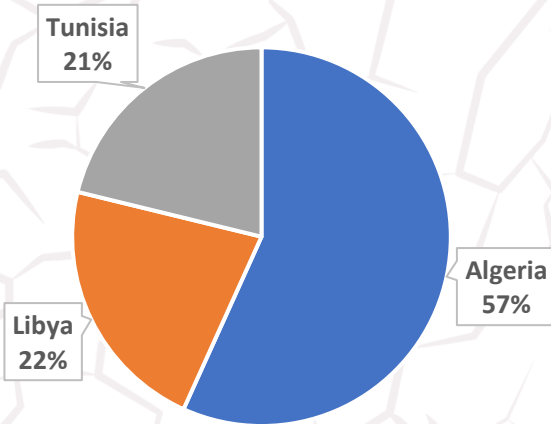


# NWSAS: Background

The NWSAS consists of:

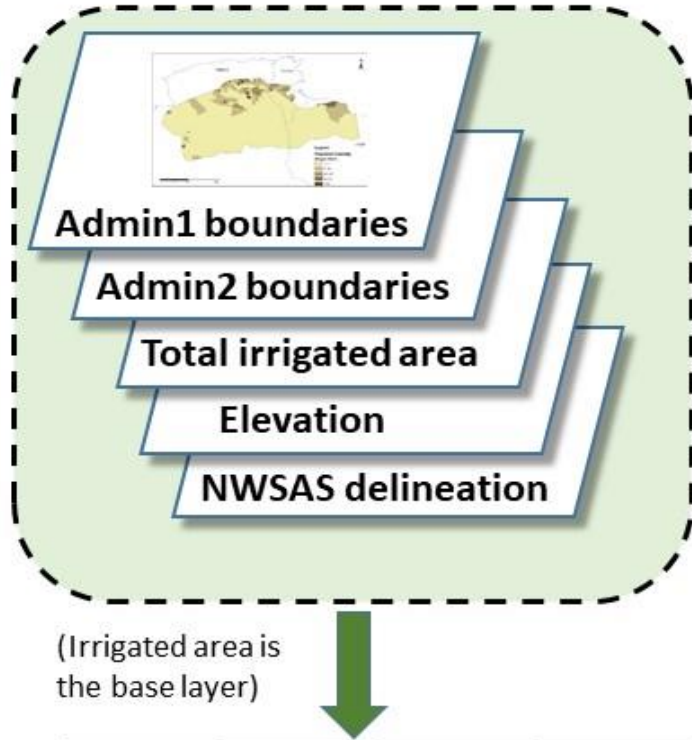
- 1) The Continental Intercalary (CI):**  
a surface area of 1000,000 km<sup>2</sup>  
depth 1500 - 2800 m
- 2) The Terminal Complex (TC):**  
area of 600,000 km<sup>2</sup>  
depth of 100 - 600 m

Population in the NWSAS (2014)

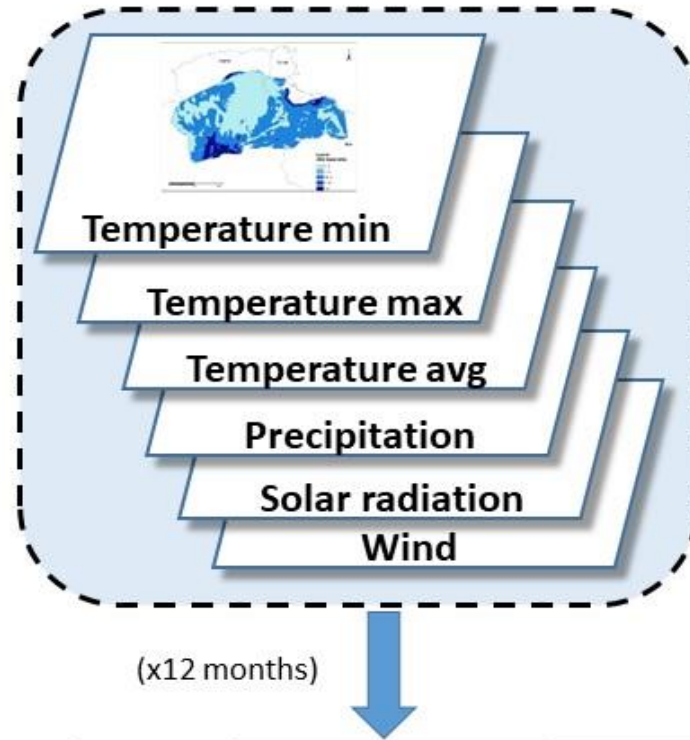


	Algeria	Tunisia	Libya
Country area (km <sup>2</sup> )	2,381,741	163,610	1,759,540
Country area in the basin (km <sup>2</sup> )	700,000	80,000	250,000
Share of national territory in the NWSAS (%)	29	49	14
Share of NWSAS (%)	68	8	24

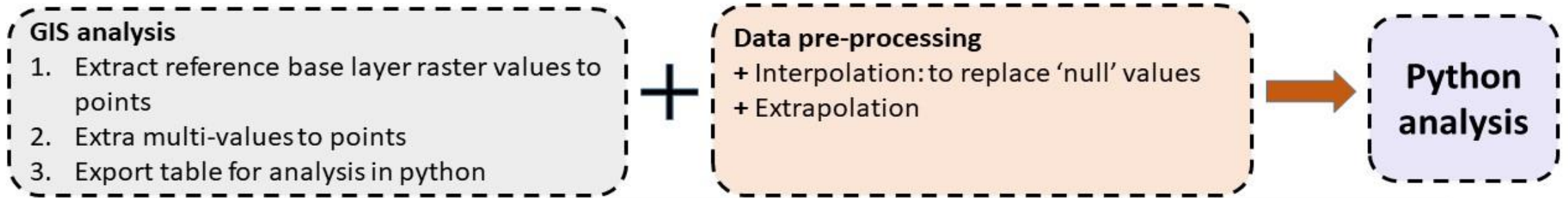
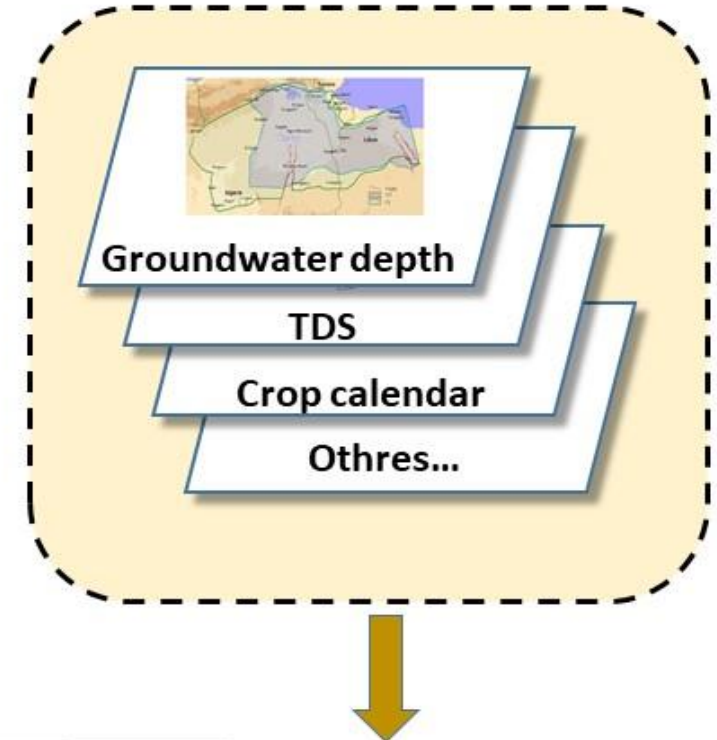
### 1. Irrigated area: (2017, 1x1km)



### 2. Metrological data (1970-2017, 1x1km)



### 3. Water table, quality and more



**Approach:** To develop an open source GIS-based model that informs integrated planning in the NWSAS.

# KEY QUESTIONS FOR THE MODELLING ANALYSIS

Agricultural activity

- What is the total irrigated area in the region?

Water demand

- What is the total water demand for irrigation?
- What is the impact of improving irrigation systems?

Electricity demand

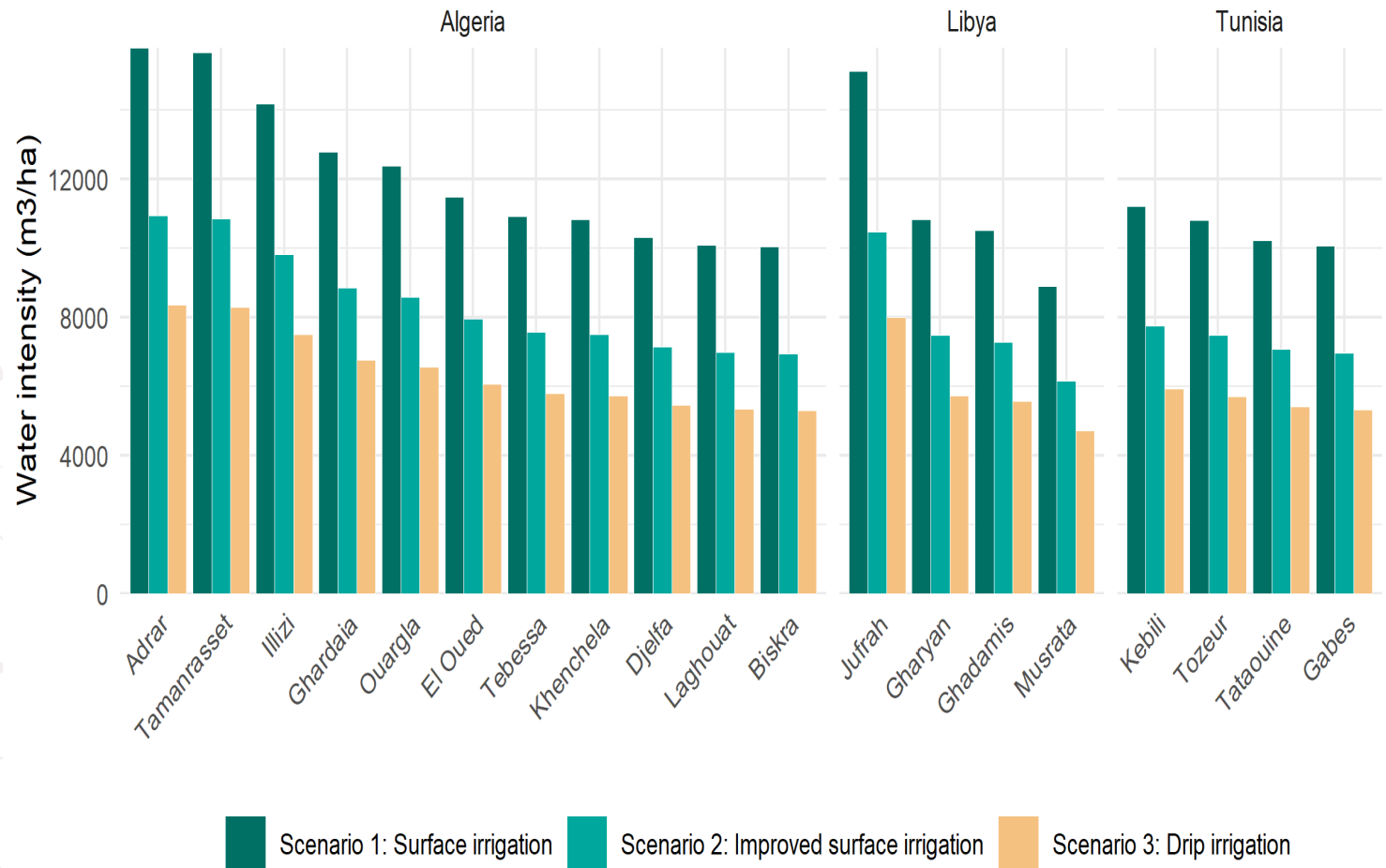
- How much energy required for pumping?
- If desalination would be needed, how much energy would be required?

Electricity Supply

- What is the least cost electricity supply option?
- What makes PV more competitive in the region?

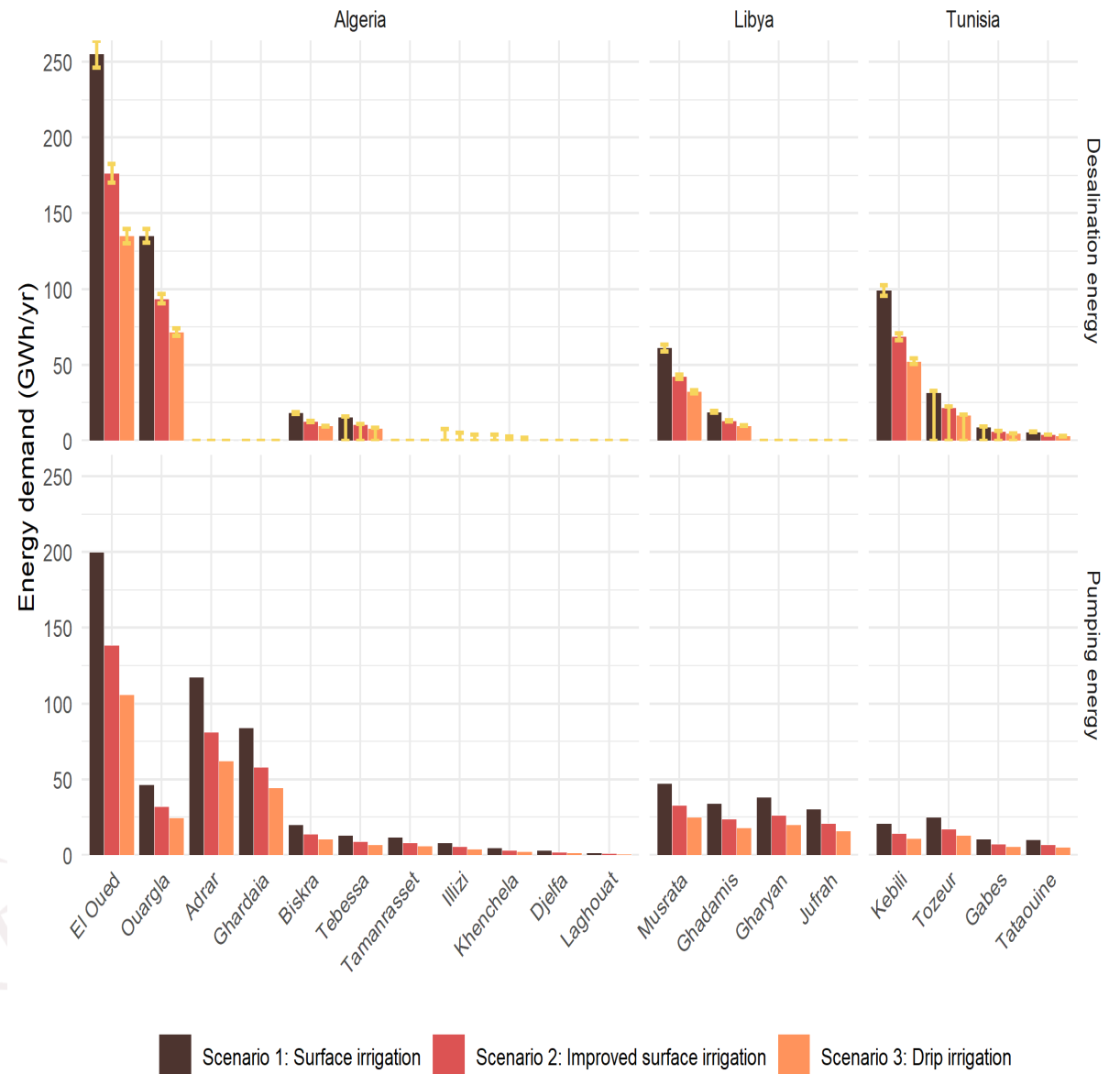
# Selected results - Irrigation water demand

- Investment in improving irrigation efficiency can lead to 47% saving in water demand.
- In terms of volume can save on average 5500 m<sup>3</sup>/ha.
- **NOTE!!!:** Water efficiency does not equal water conservation!!



# Selected results: Energy demand

- The energy demand for pumping groundwater is about 730 GWh annually. (Algeria accounts for 70%).
- The Total Dissolved Solid (TDS) levels were studied (2000, 2500 and 3000).
- Tolerating higher TDS level (from 2000 to 3000) reduces energy demand for desalination from ca. 685 GWh/yr, to ca. 574 GWh/yr (**16% Savings**).

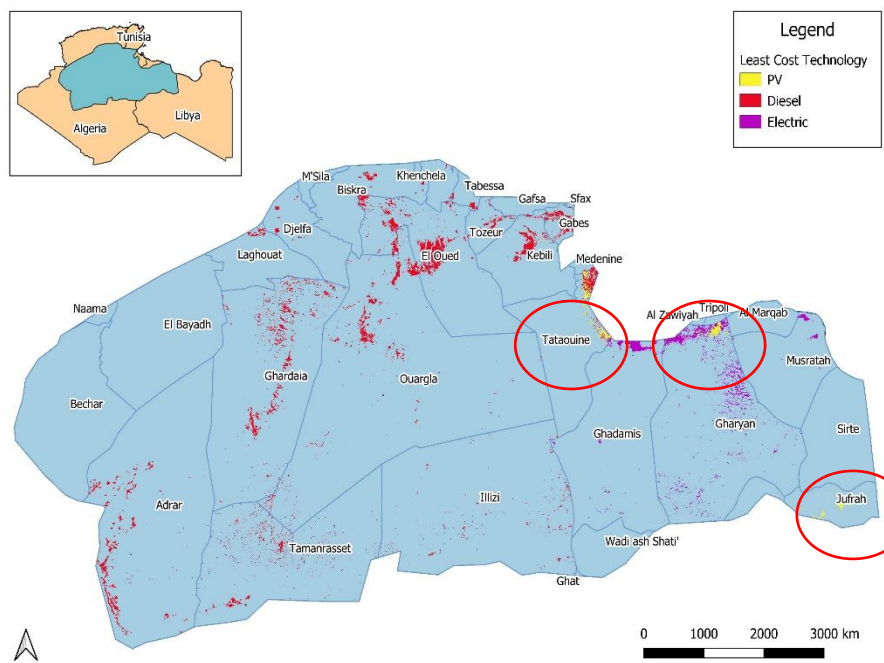
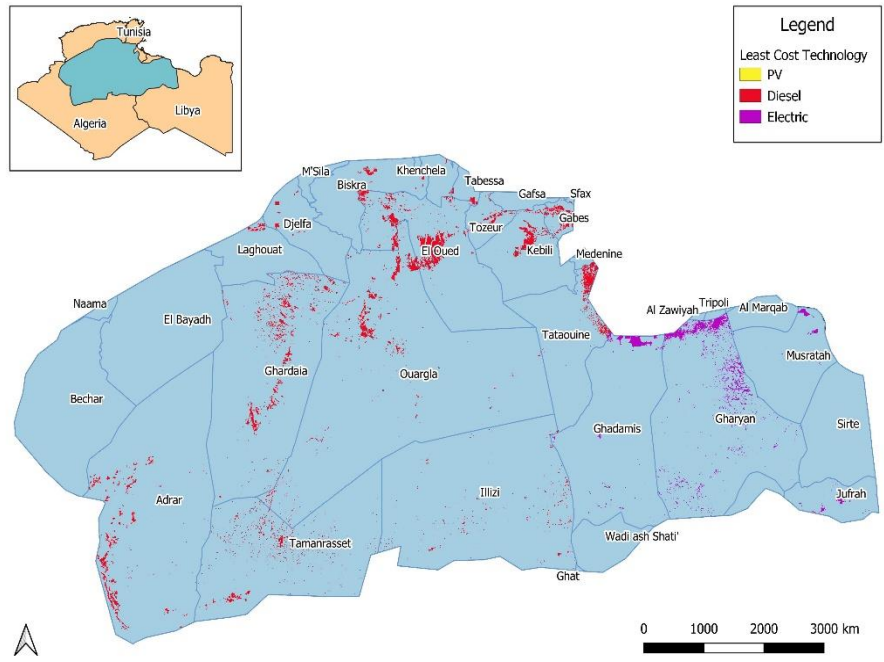


Technologies	Parameter	Units	Sensitivity Levels			Source
			1	2	3	
<b>Diesel Gen sets</b>	Capital Cost (CAPEX)	USD/KW	938	938	938	(WB, 2016b) and (WB, 2016a)
	O & M	USD/KWh	0,1	0,1	0,1	
	Life Time	Years	10	10	10	
	Fuel Cost (Algeria)	USD/Litre	0,17	0,21	0,26	
	Fuel Cost (Tunisia)	USD/Litre	0,62	0,78	0,93	
<b>Electric Pump</b>	Capital Cost (CAPEX)	USD/KW	845	845	845	(WB, 2016b) and (WB, 2017)
	O & M	USD/KWh	0,1	0,1	0,1	
	Life Time	Years	10	10	10	
	Fuel Cost (Libya)	USD/Litre	0,168	0,21	0,252	
<b>Wind</b>	Capital Cost (CAPEX)	USD/KW	1300	1105	910	(IRENA, 2012a)
	O & M	USD/KWh	0,02	0,02	0,02	
	Life Time	Years	20	20	20	
<b>PV</b>	Capital Cost (CAPEX)	USD/KW	1140	970	680	(Gager and Lahham, 2019) and (IRENA, 2012b)
	O & M	USD/KWh	0,01	0,01	0,01	
	Life Time	Years	15	15	15	

**CAPEX level 1  
(current)  
Fuel level 1  
(current)**

**15% decrease**

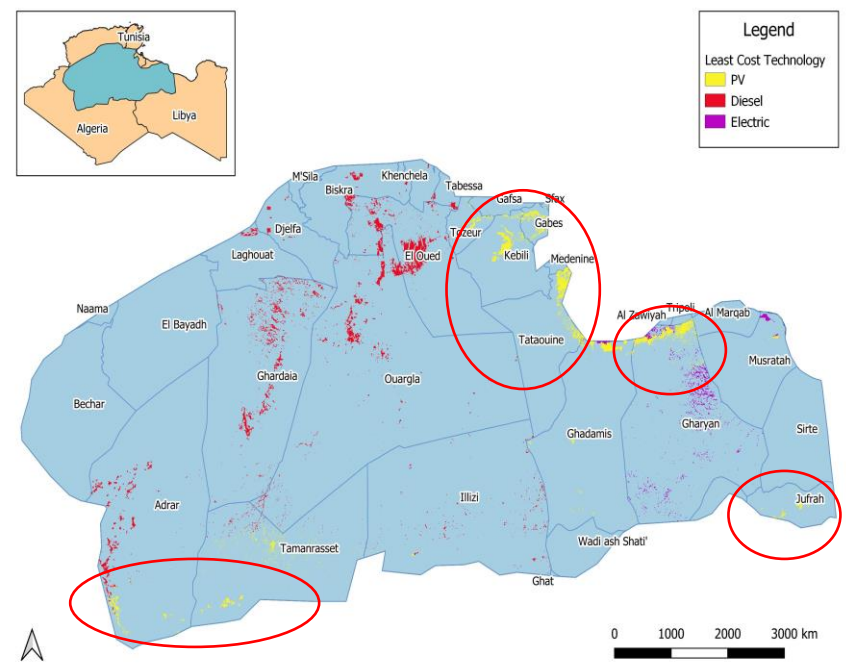
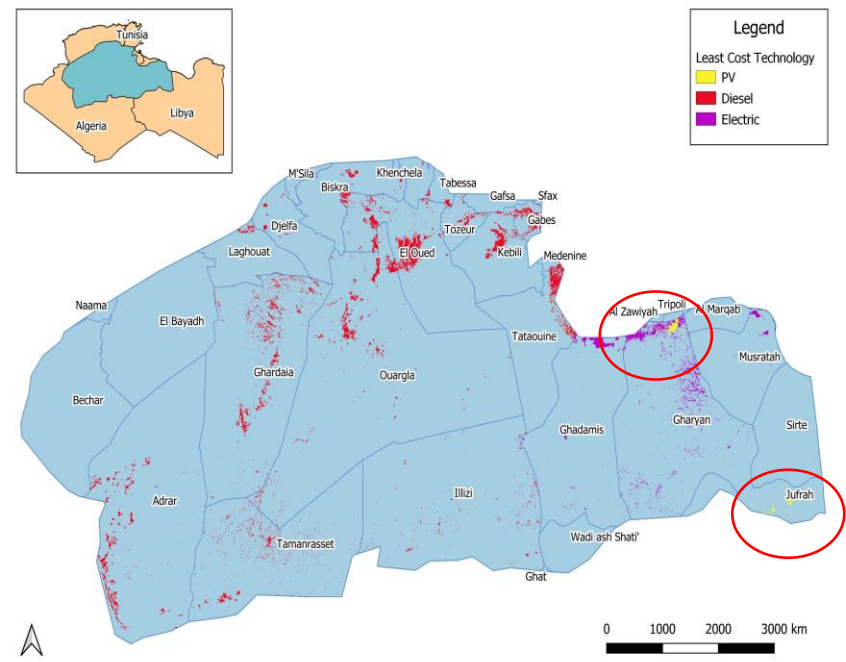
**CAPEX level 2  
(-15%)  
Fuel level 1  
(current)**



**CAPEX level 1  
(current)  
Fuel level 3  
(+50%)**

**50% increase**

**CAPEX level 2  
(-15%)  
Fuel level 3  
(+50%)**



	Water	Energy	Agriculture	Environment
Governance & international cooperation	<p>1. Enhance <b>local water management</b> including by: revitalising <b>participatory</b> models in oasis and enhancing the enforcement of <b>existing laws</b> on water.</p> <p>2. Reinforce <b>transboundary cooperation</b> for sustainable groundwater resource management.</p>	<p>6. Enhance mechanisms for the <b>coordination of energy development with other sectoral plans</b>, to anticipate tradeoffs and build on intersectoral synergies.</p>	<p>9. <b>Set up agricultural policies</b> oriented toward <b>reasonable, sustainable and productive agriculture</b>.</p> <p>10. <b>Valorize local products</b> and strengthen programs for a more <b>balanced diet</b> while involving <b>young people and women</b> in economic and social development of the oases.</p>	<p>13. Increase <b>awareness of the trade-offs and synergies</b> between different sectors in public institutions.</p>
Economic & Policy Instruments	<p>3. Set up dedicated <b>policies and related incentives</b> for <b>wastewater reuse</b> in agriculture and urban areas.</p> <p>4. Strengthening <b>water demand management</b>, including through water saving programs.</p>	<p>7. Develop a sustainable program for diversified, <b>multi-purpose renewable energy</b> and the <b>sustainable upscale of small-scale solar irrigation</b>.</p>	<p>11. Promote the <b>circular economy</b> including <b>agroecological practices</b>, by means of ad-hoc <b>economic measures and social instrument</b>.</p>	<p>14. Upgrade <b>inter-sectoral cooperation</b> based on a detailed <b>water balance of the aquifer</b> that includes sectoral demands as well as environmental needs.</p>
<p><b>Synergy</b> e.g.</p>	<p>5. Upscale the use of <b>non-conventional water resources</b> through desalination and wastewater treatment.</p>	<p>8. Improve the reliability of the <b>electricity grid in the rural area</b>, thereby enhancing the integration of renewables for remote and multiple uses.</p>	<p>12. Enhance <b>innovative practices and techniques for sustainable soil and crop management</b> and invest in their upscaling and dissemination.</p>	<p>15. Systematize <b>environmental and social impact assessment</b> for all new <b>infrastructure</b> (large and small scale).</p>
Infrastructure & Innovation				



# Example solution 5 (NWSAS): Actions for upscaling non-conventional water resources

Action	Sector
5_1: Develop an intervention strategy with clear objectives and financing sources for the recovery of brackish water and wastewater.	WATER FOOD
5_2: Facilitate public and private investment and partnerships for desalination and wastewater treatment schemes.	WATER ENVIRONMENT
5_3: Promote the use of solar energy in projects for seawater desalination and / or demineralization of brackish water.	WATER ENERGY
5_4: Develop and upscale solar treatment and demineralization units adapted to oasis conditions.	WATER ENERGY
5_5: Develop a resource diagnosis (volume, quality, geographical distribution of treated wastewater available. as well as an inventory of the different uses of treated wastewater and brackish water demineralized (by farmers, tourists, schools, communities, etc.)	WATER
5_6: Carry out an inventory of crop species that can be irrigated by the treated wastewater without health impact, aligning with national regulations and international standards for exportation.	WATER FOOD ENVIRONMENT
5_7: Promote drainage water reuse in irrigation (in combination with sustainable soil management and safe disposal of pollutants).	WATER FOOD

# Example solution 7 (NWSAS): Actions for sustainable deployment of renewable energy in the basin

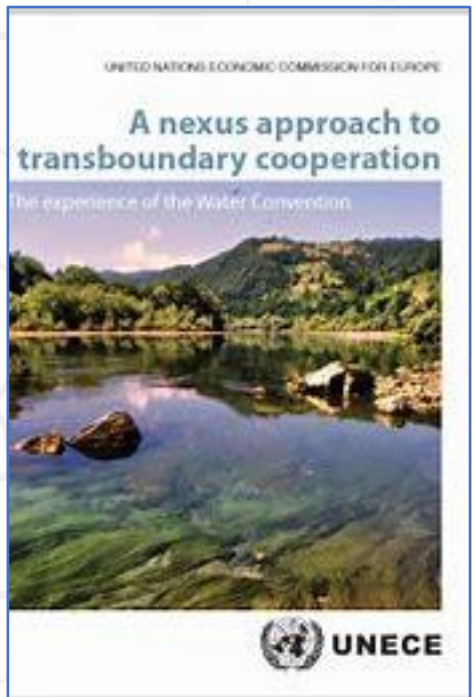
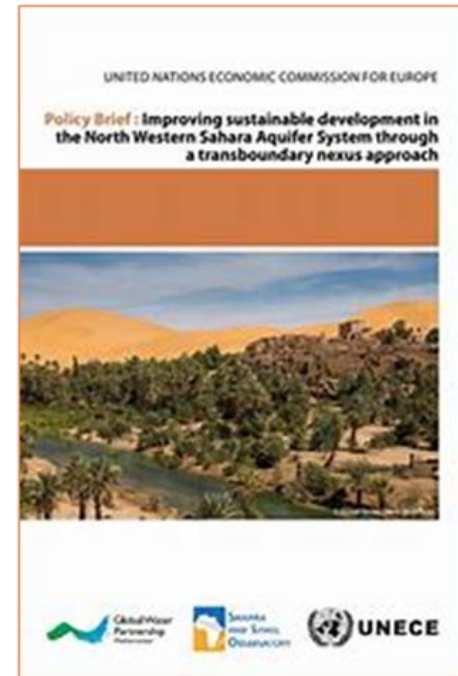
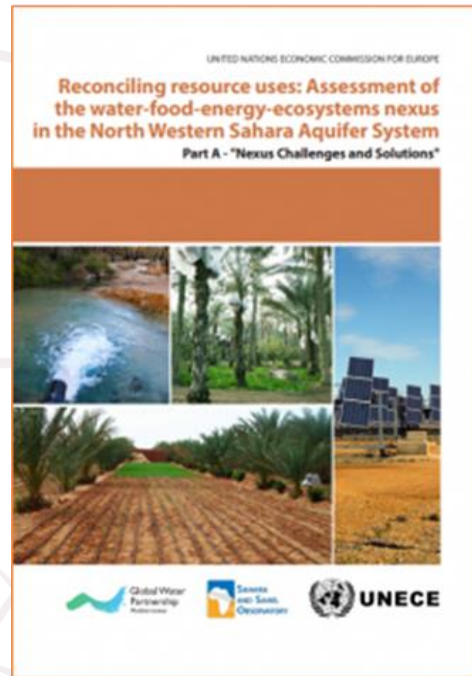
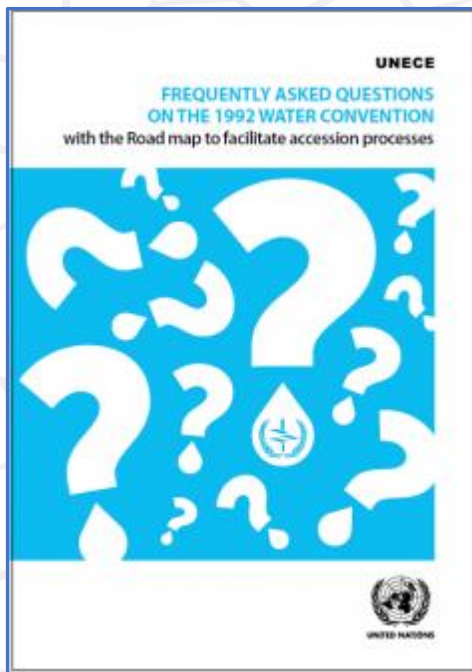
Action	Sector
7_1: Develop a scheme to make solar irrigation affordable, reduce the use of fossil fuel-based irrigation, and integrate solar energy into regional and local rural development plans.	ENERGY FOOD
7_2: Ensure that Action 7_1 is accompanied by effective technical measures (i.e. monitoring meters) as well as legal and economical tools (e.g. fiscal incentives, regulatory measures) that limit the exploitation of groundwater resources.	ENERGY WATER FOOD ENVIRONMENT
7_3: Develop solar energy solutions that aggregate various energy demands and distribute the cost of solar energy across different users and/or activities (e.g. irrigation and water desalination, potable water conveyance, lighting and heating)	ENERGY WATER FOOD
7_4: Support the development and diversification of renewable energy sources by making use of all available resources including geothermal energy, biomass, and waste.	ENERGY WATER FOOD
7_5: Gradually restructuring fossil subsidies to accompany and facilitate renewable energy deployment (by motivating a shift from diesel pumps).	ENERGY
7_6: Facilitate transboundary information and experience sharing on renewable energy development, to accelerate sustainable development in the basin.	ENERGY
7_7: Enhance capacity within administrations and trust between administrations and farmers, and raise awareness on renewable energy, energy efficiency and rational use of water resources.	ENERGY WATER FOOD

# Experience shared from MENA region

- “Solutions and investments in the WFEE nexus” ([UNECE, 2021](#)):
- Multi-benefit nexus investment:
- Jordan’s As-Samra Waste Water Treatment Plant (WWTP) – an example of PPP
- Regional opportunities identified:
- Synergic transboundary solutions for the water-energy nexus (Jordan, Israel, Palestine)
- A “package” of nexus solutions in the North-Western Sahara Aquifer System (Algeria, Libya, Tunisia) – ref to NWSAS Nexus Assessment Publication, [UNECE 2020](#))
- 7th meeting of WFEE Nexus Task Force under the Convention (Geneva, Dec 2022):
- [Jordan’s presentation](#): highlights from country level nexus assessment and opportunities for nexus solutions through: regional cooperation, bilateral agreements, and infrastructure (desal and grids).

# Concluding remarks

- Transboundary cooperation is the top enabling factor for the implementation of nexus solutions in shared basins (UNECE, 2021).
- « Nexus » approach *can be* key to:
  - Expanding IWRM « deeper » into national sectoral strategies
  - Sustainable renewable energy planning
  - Climate change adaptation and mitigation
  - Unlocking financing sources and multi-benefit projects
- Nexus solutions are not necessarily called “nexus” but it’s important to build a common language for sharing experience
- To implement and upscale nexus solutions and investments in transboundary basins: basin-level action plans, coordinated strategies and investment plans (also regional, facilitated by regional orgs or IFIs) can be important vehicles



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**A GIS-Based Approach to Inform Agriculture-Water-Energy Nexus Planning in the North Western Sahara Aquifer System (NWSAS)**

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<sup>3</sup> The United Nations Economic Commission for Europe (UNECE), Bureau S411, Palais des Nations, 1211 Geneva 10, Switzerland  
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**Thank you!**

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➤ <https://unece.org/environment-policy/water>

➤ [Water-food-energy-ecosystem nexus | UNECE](#)

# **Q&A and Interactive Discussion**



# Conclusion and Outlook



## Mufleh Alalaween

Regional Core Team Leader of the Sub-RésEAU MENA, and Regional Advisor on Water Cooperation – SDC Amman.

# THANK YOU!



## For more information contact:

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