A holistic (nexus) approach to respond to resource management challenges in the NWSAS

Lucia de Strasser and Djamel Latrech

UNECE and OSS

Atelier Regional
Évaluation Nexus Eau – Alimentation - Energie - Ecosystèmes dans le SASS
Hammamet, 18 – 19 June 2019

OUTLINE OF PRESENTATION

1. Recap on the participatory process
2. Increasing groundwater use in the NWSAS
3. Multiple challenges in different sectors: drivers and impacts
4. A «nexus approach» to tackle the problem (effectively and efficiently)
5. Plan for the workshop

A PARTICIPATORY PROCESS

- Nexus issues
- Nexus solutions
- Conclusions and recommendations

INTERSTECTORAL CHALLENGES (DRIVERS AND IMPACTS)?
-- FIRST WORKSHOP, ALGIERS 2017 --

Energy

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- The number of wells jumped from few wells in the 1960s to about 18000 wells in 2012.

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- Several projects are planned in the region. However there is uncertainty about these projects execution.
- PV technology is preferable due to its cost competitiveness if compare to CSP.

Water for Enhanced Oil Recovery (EOR) systems :
- Water is injected into the oil fields to increase pressure and increase oil recovery from existing reservoir.
- Many fields in the region uses this technology; i.e Haoud Berkoui which has a capacity of about 190 000 (bbl/d) and water injection capacity of 18000 m3/d.

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  - Reduced piezometric head;
  - Loss of artesian pressure;
  - Excessive pumping heights.
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- In order to overcome this obstacle, people tend to dig deeper wells, which means higher pumping head and higher energy bill for pumping.
- Also the use of inefficient pumping systems increased energy losses.

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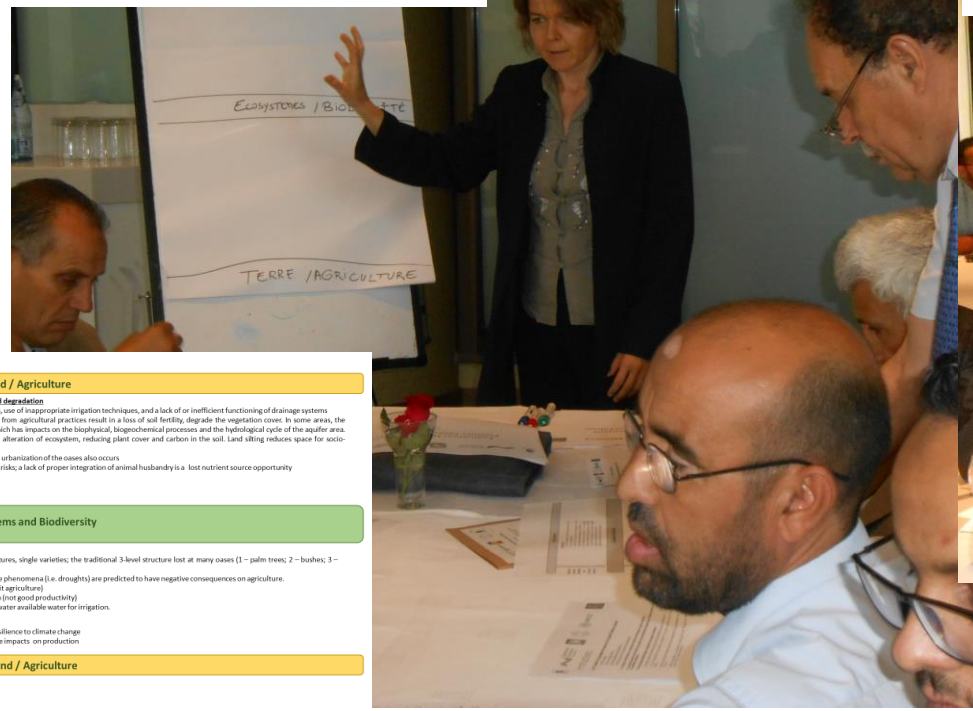
- In Algeria 2 demineralization plans are operational in the NWSAS. In Tunisia, as part of the National Program for Water Quality Improvement, more than 10 brackish water demineralization units to be installed in Tunisia, of which 6 are in progress (to be verified). Many are located within or close to the border of the NWSAS.
- The desalination/demineralization technology for the new plants will be either Reverse Osmosis (**RO**) or Reverse Electro Dialysis (RED). Average electricity consumption by brackish water RO plants is in the range of **0.5-2.5 kWh/m³**

Artesian water :
- The hot water coming from artesian boreholes can be used for heating greenhouses.
- Research and pilot projects required to investigate the feasibility.

Energy



Land / Agriculture

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- The water use distribution is as follows: Algeria with 2 Billion , Tunisia : 0.3 billion in Tunisia, and Libya 0.5 billion m³/year. The respective distribution of surface area: Algeria - 700 000 Km², Tunisia - 80 000 km², Libya 220 000 km².
- This heavy abstraction, mainly for agricultural activities, has caused stress on the water resources and increased the risk of drying up of outlets and depletion of natural springs as a results of lowering water tables.

High water waste due to inefficient irrigation systems:
- Irrigation of agricultural land in the NWSAS is a main source of wasting water due to in efficient irrigation systems.
- According to OSS (2012): the total irrigated area in the NWSAS aquifer is about 270,000 ha (202,000 ha in Algerian part- 30,000 ha in the Libyan part and 38,000 ha in the Tunisian part). Expected to grow to 40,000 ha by 2020.
- The average efficiency of irrigation system in the region is 42.4% and can go up to 60% at best in some parts of the region.
- In terms of volume, the estimated losses reach about 2500 m³/ha.

Water

What impacts has the Water sector on the Land/ Agriculture ?

Soil salinization due to low water quality and inappropriate irrigation techniques :
- The salinization of irrigation water is increasing in the region deteriorating land quality.
- The estimate of soil resources loss reached the level of 4,300 ha per year over an area of 170,000 ha in Algeria, and 300 ha per year over an area of 40,000 ha in Tunisia.
- The population in the NWSAS region is highly dependent on agriculture, the increase in water salinity and soil degradation causes decline in agriculture yield and farmers revenues.
- Inefficient / Lack of drainage networks causes soils salinization and lands degradation.

Low water quality impacts agriculture production:
- Decrease of the yields due to the water quality
- Water with high degree of mineralization not well adapted some cultivation. Abandonment of certain crops

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How does the Land Use affect the Ecosystem Services?

Agricultural and land use practices aggravate land degradation
- Among the reasons: Lack of protection of oases, use of inappropriate irrigation techniques, and a lack of or inefficient functioning of drainage systems
- The changes in land use and negative impacts from agricultural practices result in a loss of soil fertility, degrade the vegetation cover. In some areas, the degradation can aggravate to desertification which has impacts on the biophysical, biogeochemical processes and the hydrological cycle of the aquifer area. Which area accordingly causing loss in habitat, alteration of ecosystem, reducing plant cover and carbon in the soil. Land silting reduces space for socio-economic activities
- Fragmentation of land and the oases as well as urbanization of the oases also occurs
- Inappropriate use of fertilizers causes pollution risks; a lack of proper integration of animal husbandry is a lost nutrient source opportunity

Ecosystems and Biodiversity

What impacts have the Ecosystems and biodiversity on the Land Use?

Negative impacts
- Reduced diversification in cultivation: monocultures, single varieties; the traditional 3-level structure lost at many oases (1 – palm trees; 2 – bushes; 3 – ground level)
- Vulnerability to climate change . Extreme climate phenomena (i.e. droughts) are predicted to have negative consequences on agriculture.
- Protection of biodiversity outside oases may limit agriculture)
- Ill-adapted species get introduced for cultivation (not good productivity)
- Degradation of natural spring reduces the freshwater available water for irrigation.

Positive effects
- Healthy ecosystems and biodiversity improve resilience to climate change
- Co-existence of several plant species has positive impacts on production

Land / Agriculture

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How do the Ecosystems and biodiversity affect the Water sector?

Extreme phenomena
- It is expected that extreme climatic events such as droughts, heat waves and sirocco could increase both frequency and intensity in the coming years.
- Such extreme events will have serious consequences for water resources and likely increase the risks on different water uses and water demands in the region (i.e drinking water and irrigation water).
- Degradation of ecosystems due to pressures from human activities affect water cycle processes and water availability (and ecosystem services)

Degradation of vegetation cover and loss of soil quality and fertility
- Leads to degradation of the physical and chemical properties, and to reduced infiltration of rainwater and recharge aquifers, reservoirs and wetlands

Water

What impacts has the Water sector on the Ecosystems and biodiversity

New irrigated areas/expansion of irrigation
- The creation of new irrigated perimeters and modern oases (especially for market crops) lead to increase of water demand compared to the traditional oases ecosystems (food/sustenance crops).
- Salinization of soils occurs if the irrigation is not well managed and due to the lack of drainage.
- Saturation of superficial aquifers due to the groundwater table rising causes asphyxia of plants

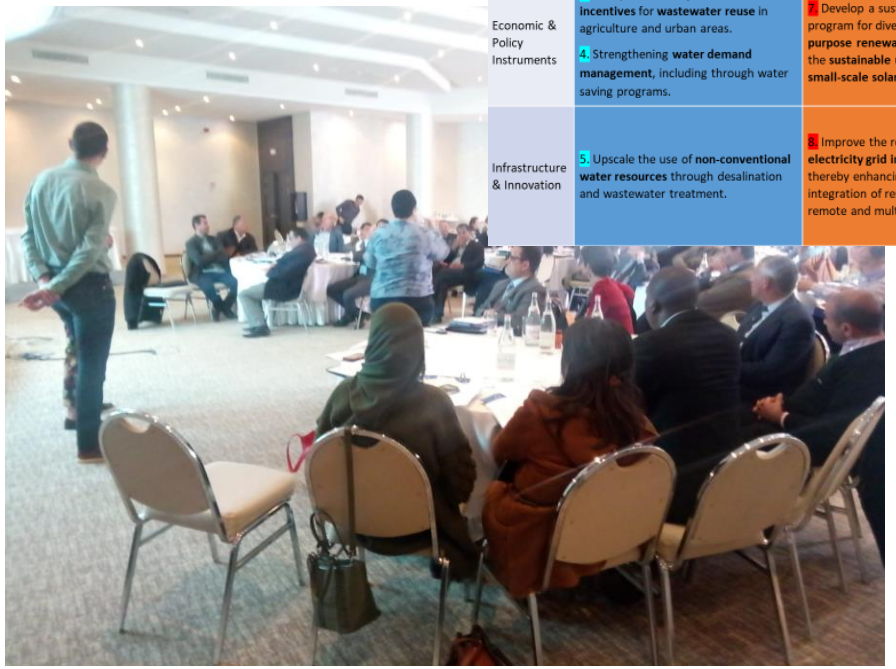
Degradation of the biodiversity due to aquifer overexploitation:
- The overexploitation led to the degradation of water resources in the aquifer which affected severely the ecosystem and biodiversity.
- The NWSAS aquifer domain includes 19 groundwater dependent ecosystems (of which 11 are in Tunisia) and 7 RAMSAR accredited wetlands. These ecosystems include Sebkhas, national parks, wadies, springs etc.
- Modification of biodiversity: appearance of new species adapted to the conditions and disappearance of those not favoured by the current conditions
- Impacts on ecotourism from degradation of ecosystems

Impacts due to changes in water quality:
- Intrusion of seawater (in Djerfara) or saline water from chotts to the aquifers (chott Djerid)
- Pollution of drainage waters, by the use of fertilizers and pesticides may affect the fauna and flora
- Non-treated petroleum waste by companies active in the zone of hydrocarbon exploitation probably causes contamination of aquifers (In-Aména, Hassi Messaoud)
- Polluted water may provoke health impacts such as allergies and asthma

Ecosystems and Biodiversity

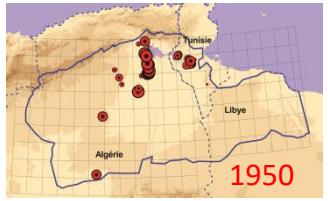
NEXUS SOLUTIONS FOR THE COUNTRIES -- NATIONAL CONSULTATIONS, TUNIS 2019

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



CHALLENGES

- **CROISSANCE DE LA DEMANDE :** Populations: 5 millions (2012) à 8 millions (2030) - Superficies irriguées:300.000 ha (2012) à 500.000 ha (2030)
- **CHANGEMENT CLIMATIQUE :** Pluies 20% (1970 – 2000)- température 1°C à 2°C (2050) – ETP 350mm (2050) actuellement (2000 mm)
- **ABSENCE DE CONSERVATION :** Pertes dans les réseaux – Faible efficience de l'irrigation
- **FACTEURS SOCIO-ECONOMIQUES :** Limite de l'offre conventionnelle de l'eau (de + en + coûteuse) – subventions excessives – faible valorisation de l'eau
- **TRANSFERTS HORS BASSIN (demande dans les zones périphériques):**



400 points

9000 points d'eau

P + T + ETP

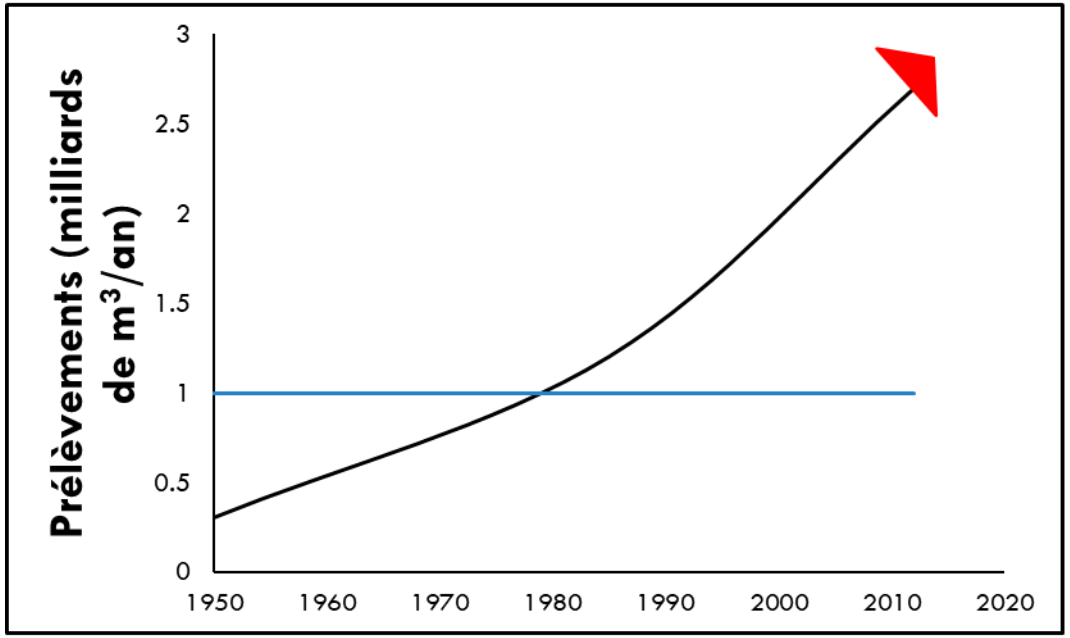
De + en + de prélèvements

Une diminution des ressources en eau et en sols (salinisation)

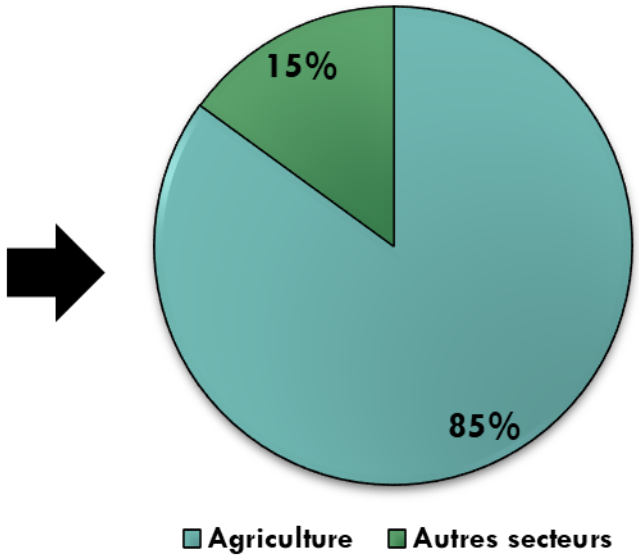
Besoin de plus d'énergie /Conflit d'usage

PRESSURE: INCREASED GROUNDWATER DEMAND

Accroissement des prélèvements d'eau souterraine



Activités dépendantes des ressources en eau souterraines

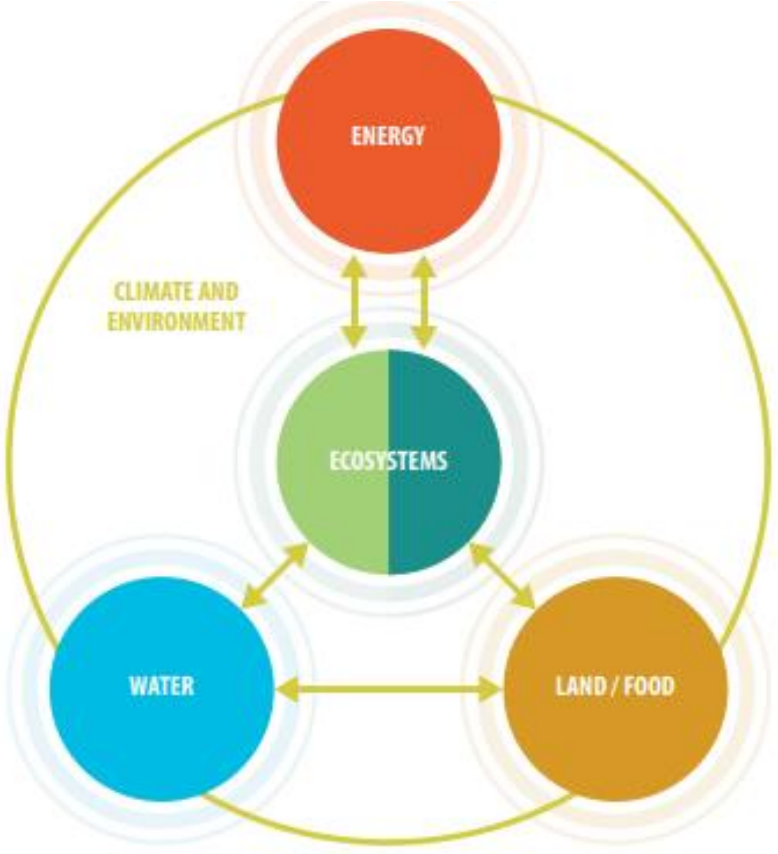


Défis liés à la vulnérabilité et la non durabilité de l'agriculture

Défis liés à la dégradation de l'eau et à la rareté accrue

Défis liés à l'utilisation de l'énergie en agriculture

A NEXUS APPROACH TO TACKLE GROUNDWATER RELATED CHALLENGES IN THE NWSAS



Challenges are interlinked -> this *requires* coordinated action (across sectors and countries)

Intersectoral synergies can maximize impact of policy, action, and investments -> this *motivates* nexus dialogue

The "Nexus Approach" - three guiding principles (Hoff, 2011):

- investing to sustain ecosystem services
- creating more with less
- accelerating access, integrating the poorest

Approach increasingly adopted by international organizations, refined by analysts/modellers, tested in policy making

Experience in the MENA region: the "*WEF security nexus*" focus on efficiency of resources and strategic planning

PLAN FOR THE WORKSHOP

Session 2 – Quantitative analysis of nexus challenges in the NWSAS

Session 3 - The «package of nexus solutions» for the NWSAS. Solutions and actions to be taken in the different sectors (water, energy, agriculture, environment)

Session 4 – Strategic implemention of solutions

- Group work on **synergies** across sectors and countries

Session 5 - Regional governance in the NWSAS

- Group work on **benefits** of transboundary cooperation

Session 6-7 - Follow up activities to the NWSAS nexus project

- Panel on existing initiatives and financing opportunities
- Group work on **investments** in nexus solutions

Session 8 - A shared vision for the NWSAS

Thank you!

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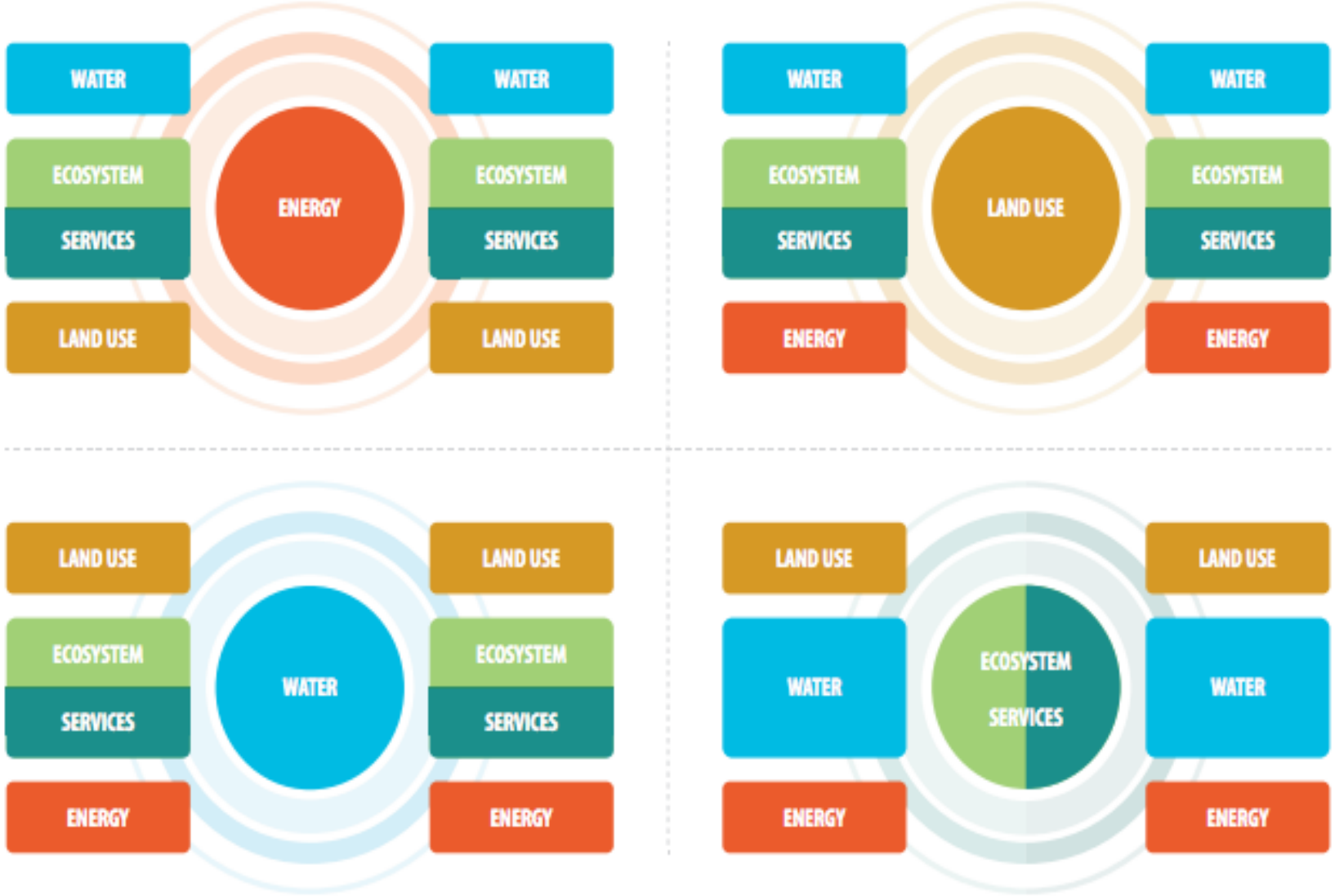
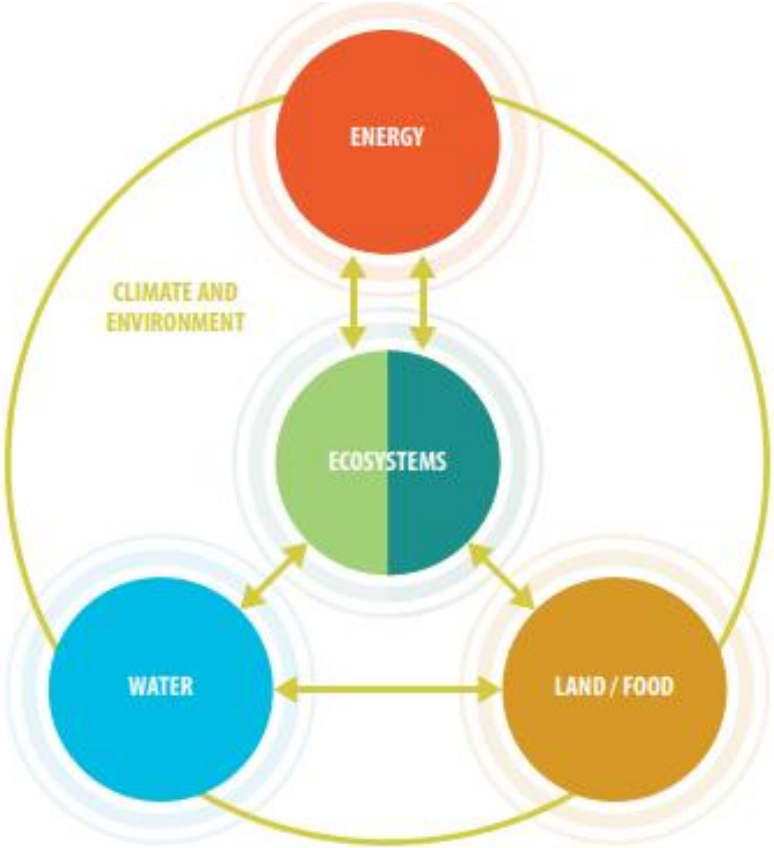
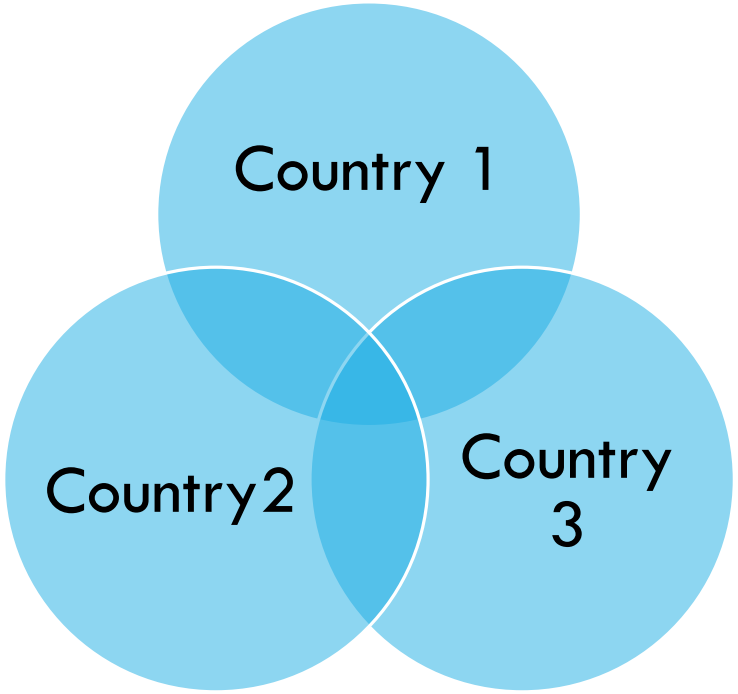
NEXUS DIALOGUE = A MATTER OF PERSPECTIVE





…IN TRANSBOUNDARY BASINS

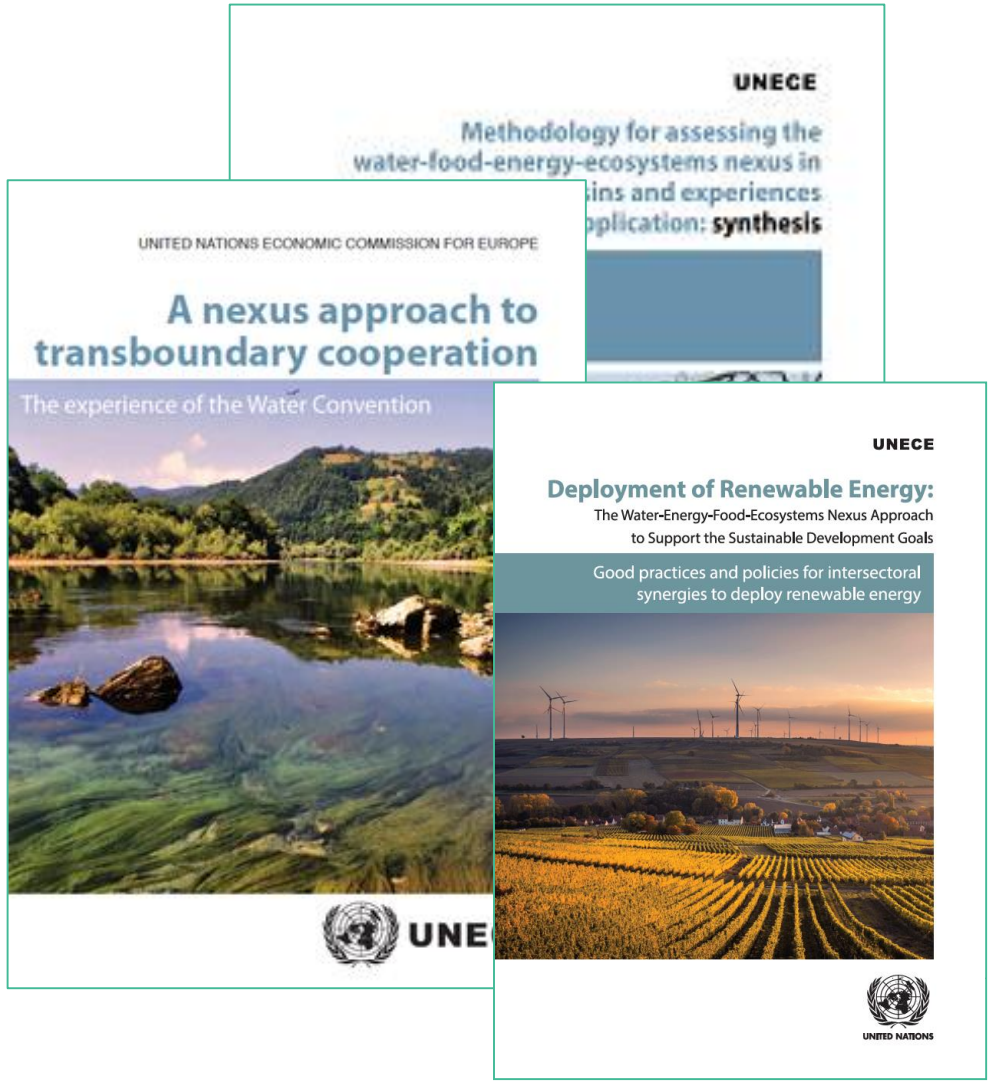


nexus dialogue
inter-sectoral,
cross-country

on water-food-energy-ecosystems:
resources, uses,
security, and governance

NEXUS PROJECT UNDER THE WATER CONVENTION

- 6 **Basin assessments** (with Nexus Solutions)
- Strong **capacity building,** promoting practical addressing of the **transboundary nexus**
  - 5 meetings of the Water-Food-Energy-Ecosystems Nexus Task Force
- Policy brochure on **renewable energy and nexus**
- Synthesis: **consolidated methodology** & **summary** published (2018)



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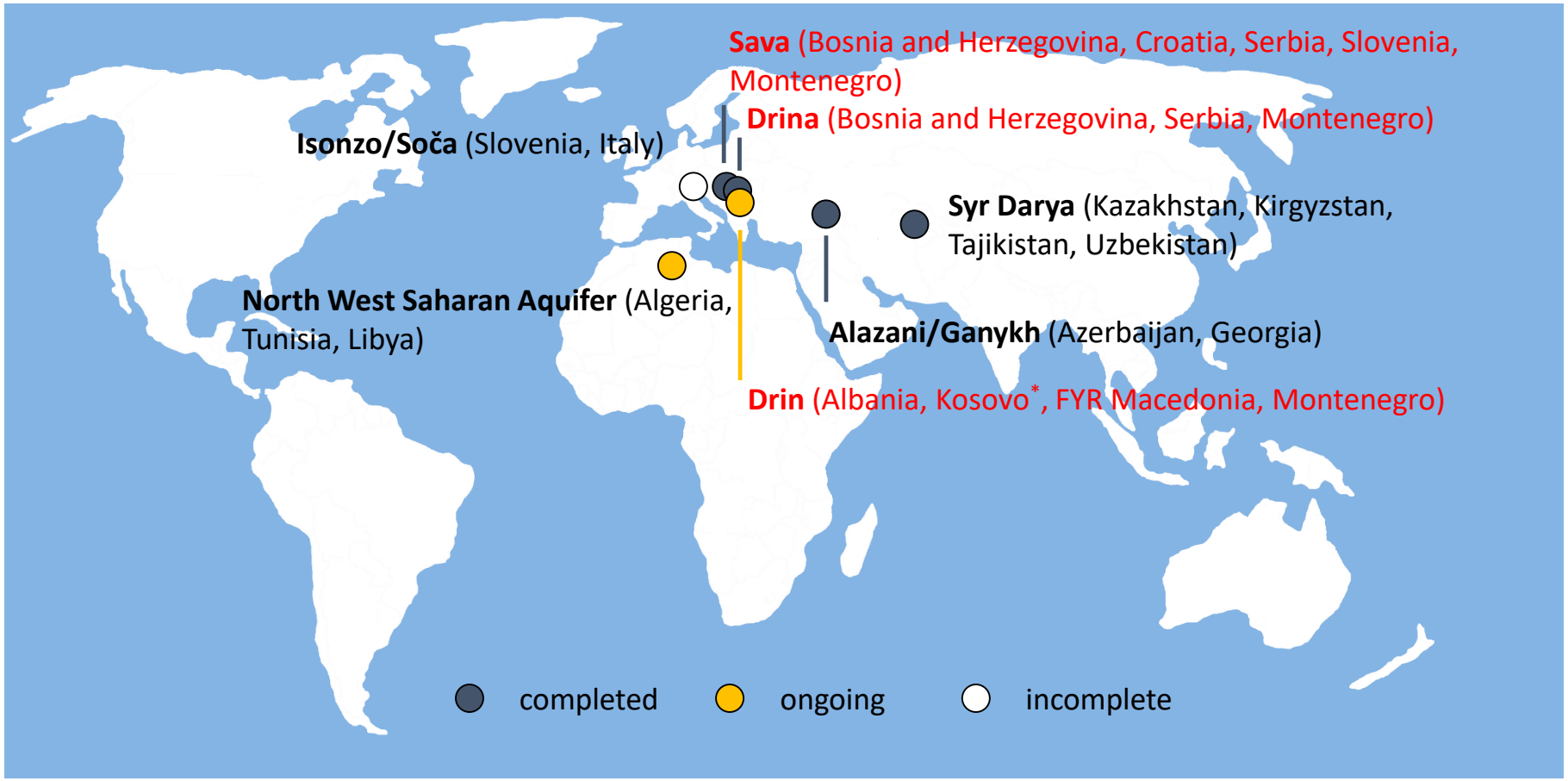

* United Nations administered territory under the UN Security Council Resolution 1244 (1999)