The NWSAS nexus assessment and this workshop

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UNECE

Atelier National Tunisie
Évaluation Nexus Eau – Alimentation - Energie - Ecosystèmes dans le SASS
Hammamet, 3 – 4 Avril 2019

OUTLINE

The Nexus Project under the Water Convention

… but what is the Nexus?

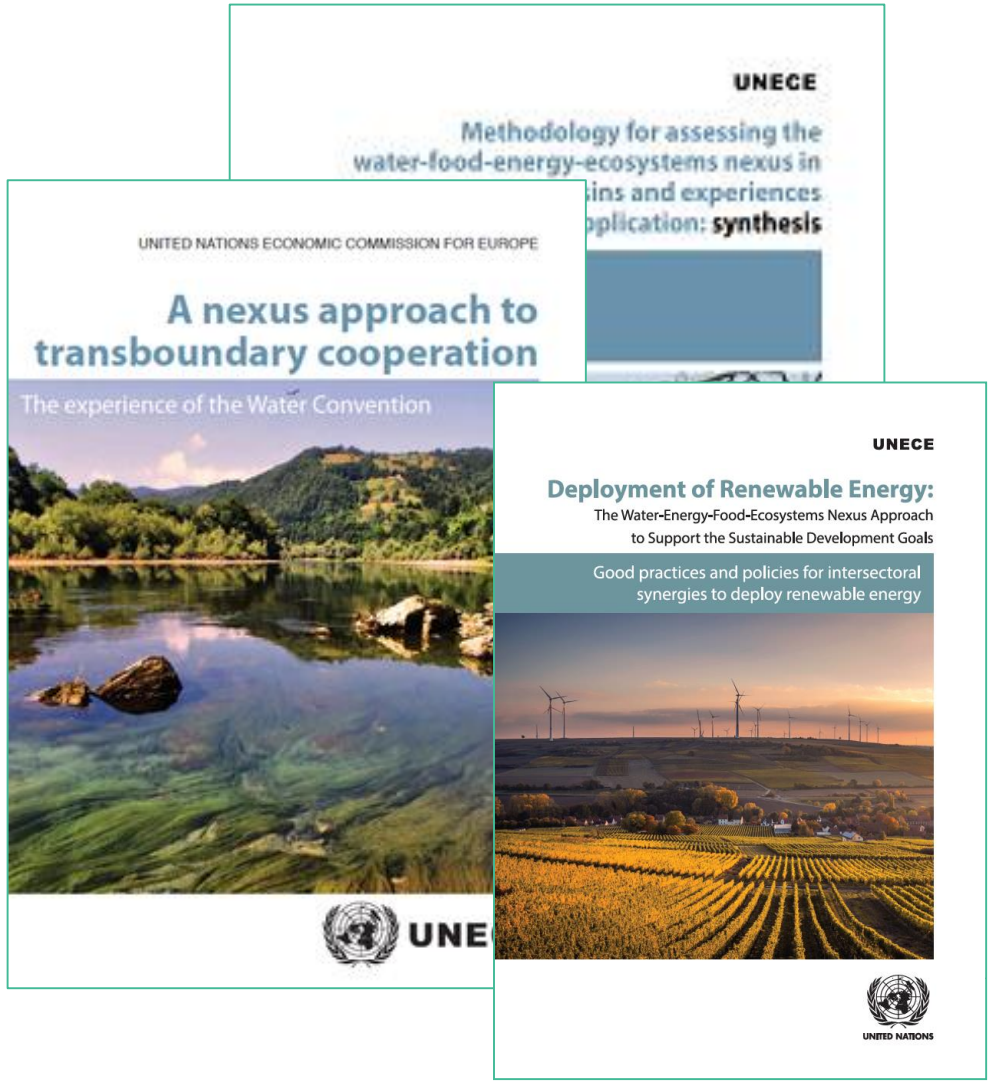
Nexus Solutions and their implementation

The NWSAS Nexus Assessment

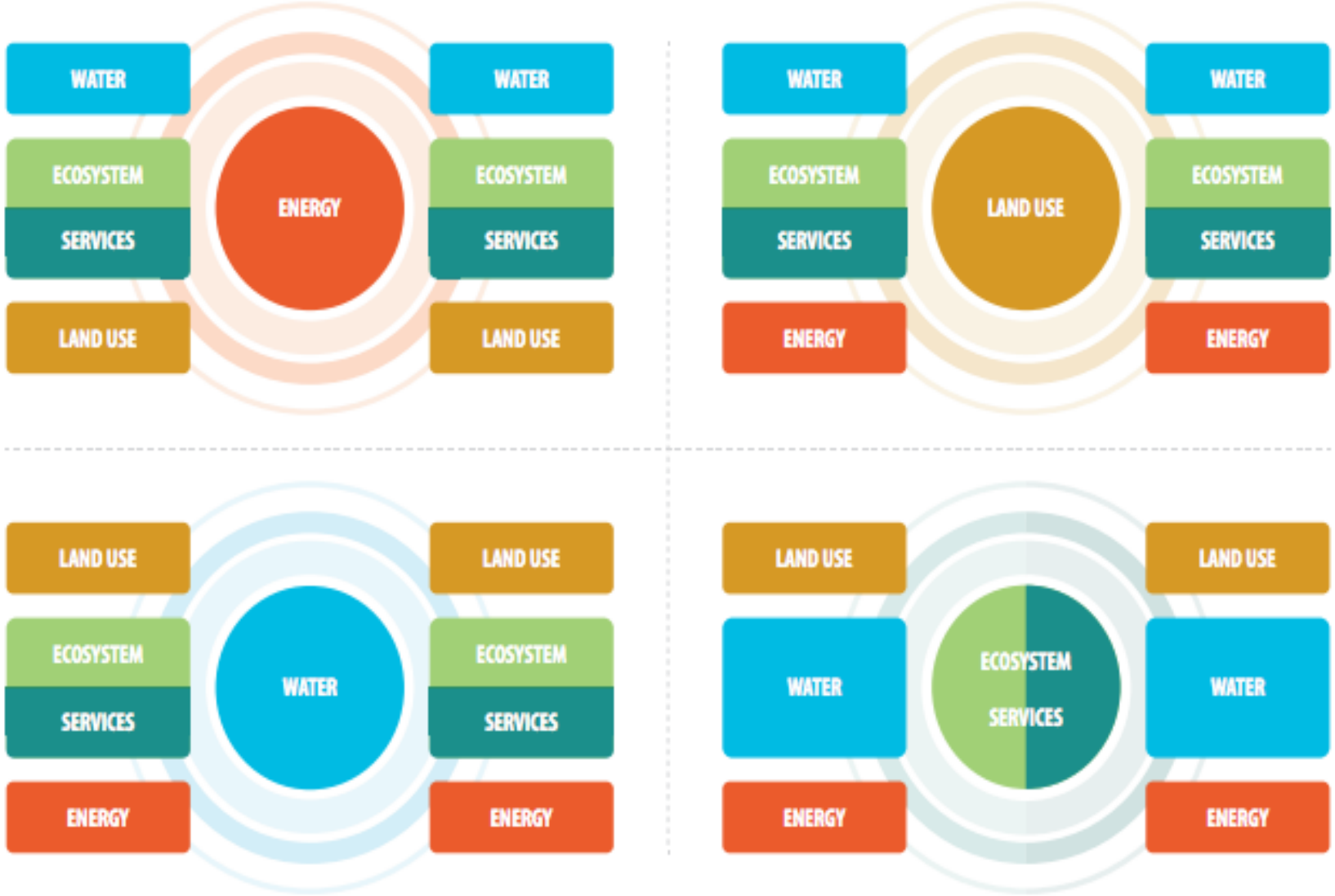
Plan for the workshop

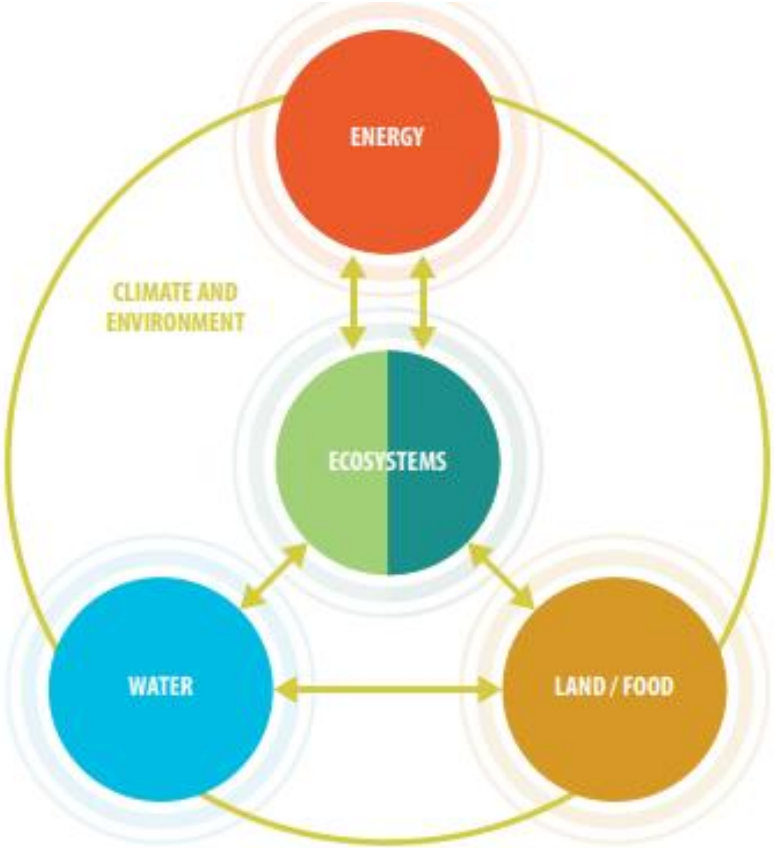
NEXUS PROJECT UNDER THE WATER CONVENTION

- 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)

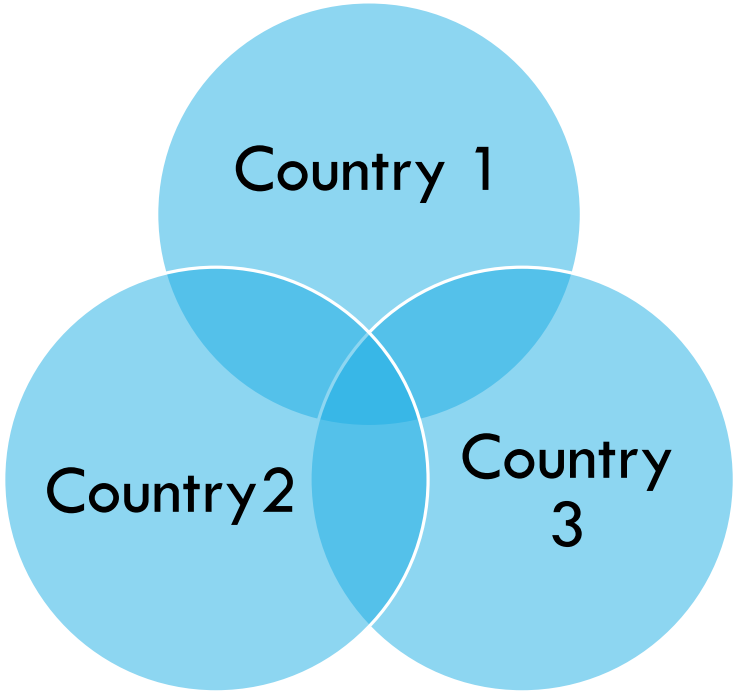


NEXUS DIALOGUE = A MATTER OF PERSPECTIVE





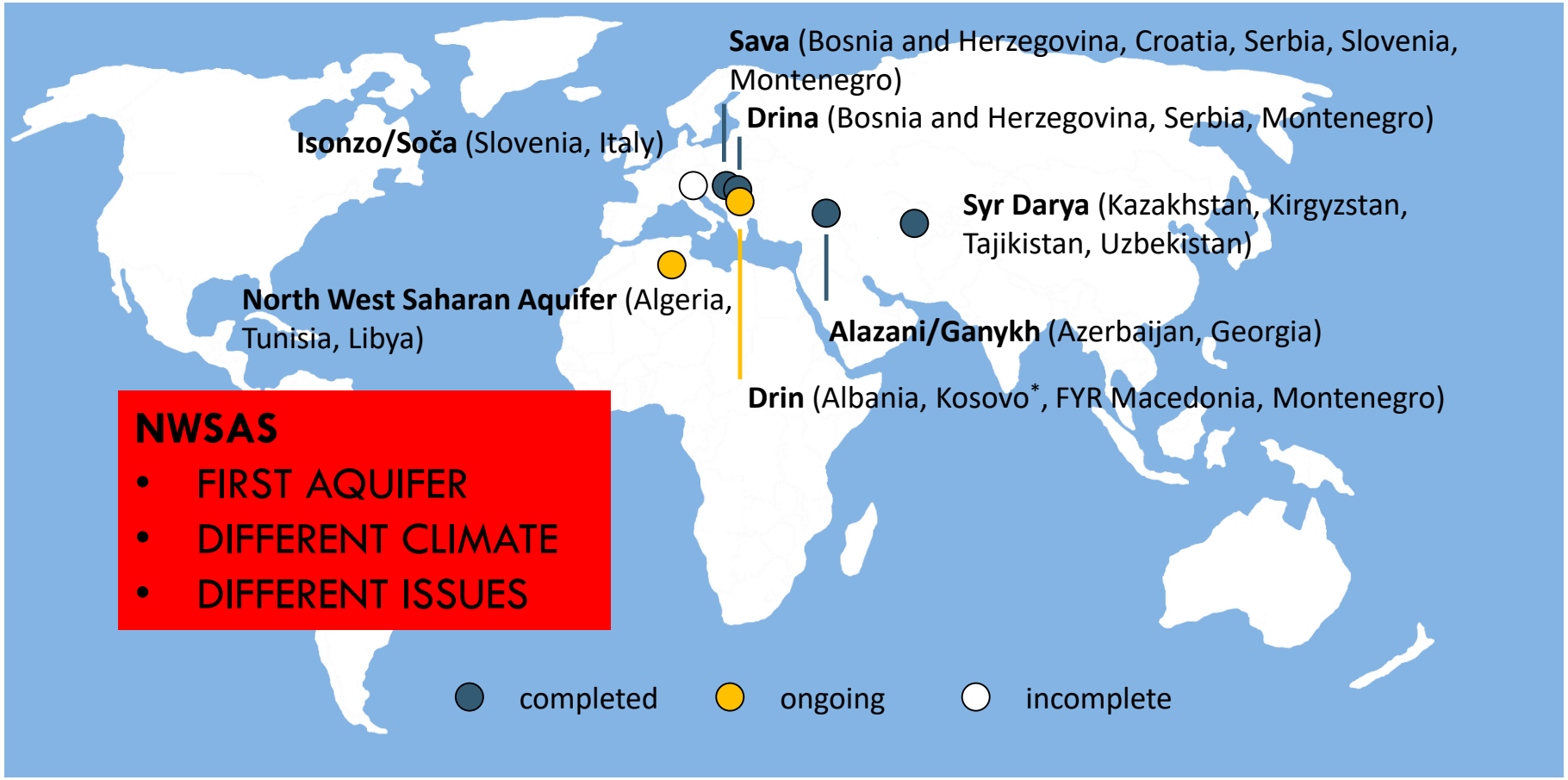
…IN TRANSBOUNDARY BASINS



nexus dialogue
inter-sectoral,
cross-country

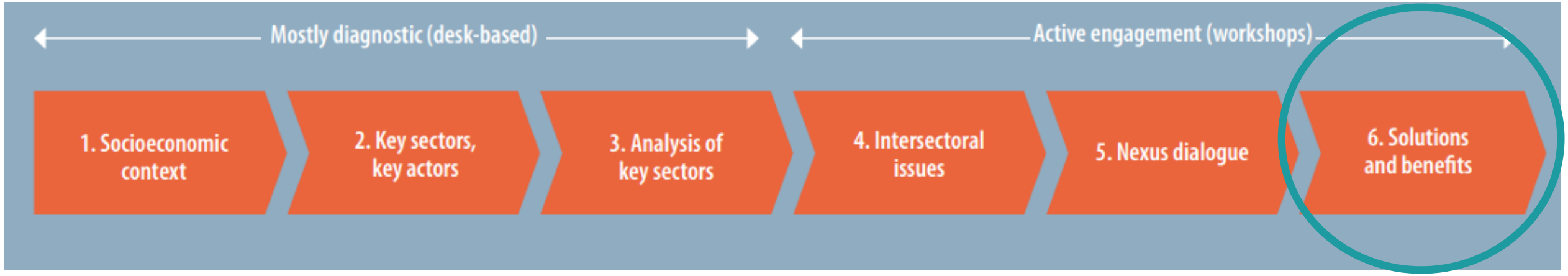
on water-food-energy-ecosystems:
resources, uses,
security, and governance

WHERE HAVE WE WORKED ON NEXUS SO FAR?



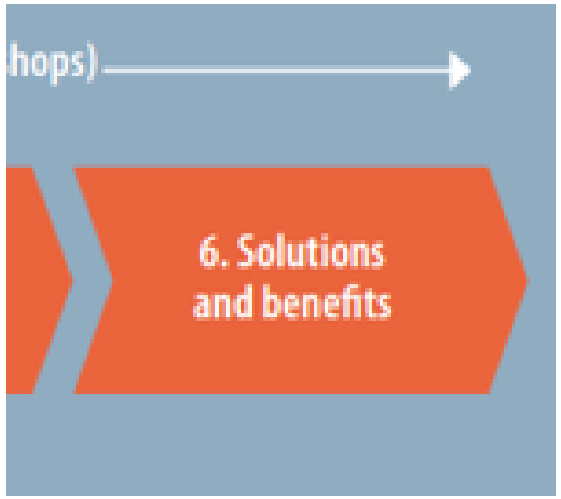
* United Nations administered territory under the UN Security Council Resolution 1244 (1999)

METHODOLOGY 6 STEPS



for the NWSAS, we are at the last step

THE NWSAS NEXUS ASSESSMENT: WHERE ARE WE?



- Track 1: Integrated Water-Food-Energy model of the NWSAS (preliminary results ok)
- Track 2: Governance analysis (stakeholder mapping done, institutional study done)

- (Developing the NWSAS Nexus Assessment Report with multi-sectoral team of experts)

- Multi-sectoral dialogue on solutions & benefits of cooperation

NEXUS SOLUTIONS: five I's…

TYPE OF NEXUS SOLUTION	EXAMPLES
Institutions Spanning from institutional reforms to improved institutional cooperation and governance culture.	• Clarify roles and responsibilities of organizations. • Set up or improve existing mechanisms for coordinating across sectors at the national and/or the transboundary level. • Ensure coherence between sectoral strategies.
Information Improving collection, accessibility and communication of data, information and knowledge related to basin resources and their dynamics.	• Improve monitoring of resource availability, quality, uses etc., as well as forecasting and prediction. • Identify policy implementation barriers. • Introduce and improve standards (e.g. for efficiency) and develop and apply integrated planning principles and guidelines. • Share data across borders and with different users.
Instruments Defining and implementing various instruments to address trade-offs and promote synergies in the management of natural resources and environmental protection.	• Policy instruments, targets and plans for key sectors • Economic instruments to provide incentives for rational and sustainable resource use, including tariffs by consumption and fees • Legal instruments such as agreements and protocols
Infrastructure (and investments) Planning (i.e. designing, siting, financing) and modernizing or modifying existing infrastructure.	• Direct investments towards multi-purpose and environmentally sound infrastructure projects (both "grey" and "green"). • Improve resource efficiency in transmission and conveyance networks on the user side as well, taking into account indirect and cross-sectoral impacts. • Account for different needs (including environmental needs) in optimizing the use of existing structures.
International coordination and cooperation The most cross-cutting category: solutions of this type are aimed at broadening the scope of transboundary cooperation and identifying common priorities.	• Improve basin-wide monitoring, data verification and exchange, as well as knowledge-sharing. • Define areas of common interest for regional development and potential complementarities of resources and between policy goals. • Facilitate trade to improve water, energy or food security; optimize the use of resources and infrastructure at the regional level. • Develop common rules and joint guidelines for key sectors.

PRACTICALLY: IMPLEMENTATION OF SOLUTIONS

Through **existing platforms** and cross-sectoral **policy frameworks**

- transboundary: ISRBC (Sava and Drina); NWSAS Consultation Mechanism
- cross-sectoral: sustainable development, NDCs, adaptation plans, environmental regulation
- revision/expansion of organizational mandates

Applying/developing **policy instruments** such as Strategic Impact Assessment (policy) and Environmental Impact Assessment (projects), **economic instruments** (e.g. subsidies)

Embracing "**nexus thinking" in** cooperation and **policy** development (new platforms, instruments, etc?) as well as in sustainable/synergetic **project** development and green **financing**

NWSAS: PARTICIPATORY PROCESS

- Nexus issues
- Nexus solutions
- Conclusions and recommendations

DIALOGUE AT FIRST REGIONAL WORKSHOP: INTERSECTORAL ISSUES

Energy

How does the Energy sector affect the Water sector?

Access to energy increases water extraction and transfers:
- The availability of the modern drilling technologies and increasing water demand caused significantly increase in the number of wells in the NWSAS.
- The number of wells jumped from few wells in the 1960s to about 18000 wells in 2012.

Water for Solar power plants:
- A CSP plant requires water as the working fluid (for the steam cycle), as well as for cooling if a cooling tower is used.
- Water consumption can range from 98-295 m³/MWh for a dry type of cooling, to 2,975-3,785 m³/MWh for the tower type.
- 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.

Water

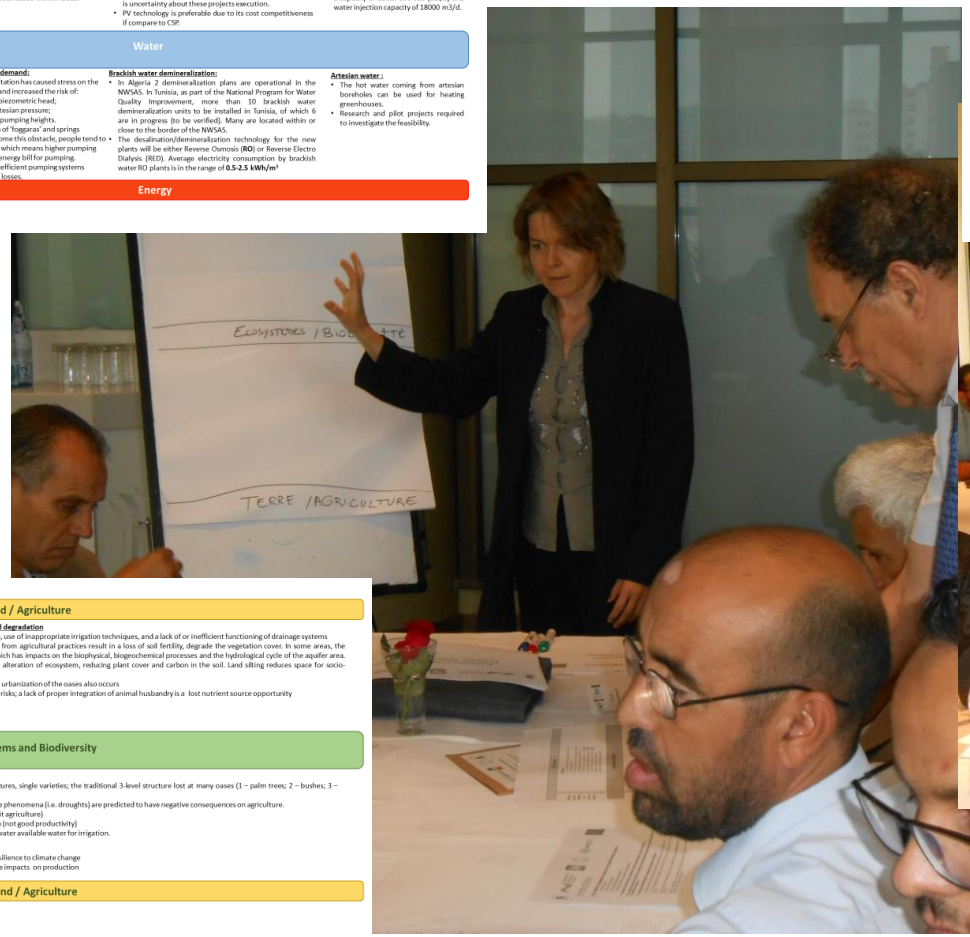
What impacts has the Water sector on the Energy sector?

Increased pumping demand:
- This heavy exploitation has caused stress on the water resources and increased the risk of:
  - Reduced piezometric head;
  - Loss of artesian pressure;
  - Excessive pumping heights.
  - Depletion of "foggaras" and springs
- 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.

Brackish water demineralization:
- 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

How does the Land/ Agriculture affect the Water sector?

Degradation of water resources due to heavy exploitation:
- The groundwater recharge is estimated to be 1.4 billion m³/year, however the use of the NWSAS increased significantly from 1 billion m³/year in 1980 to reach about 2.7 - 2.8 billion m³/year in 2012.
- 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.

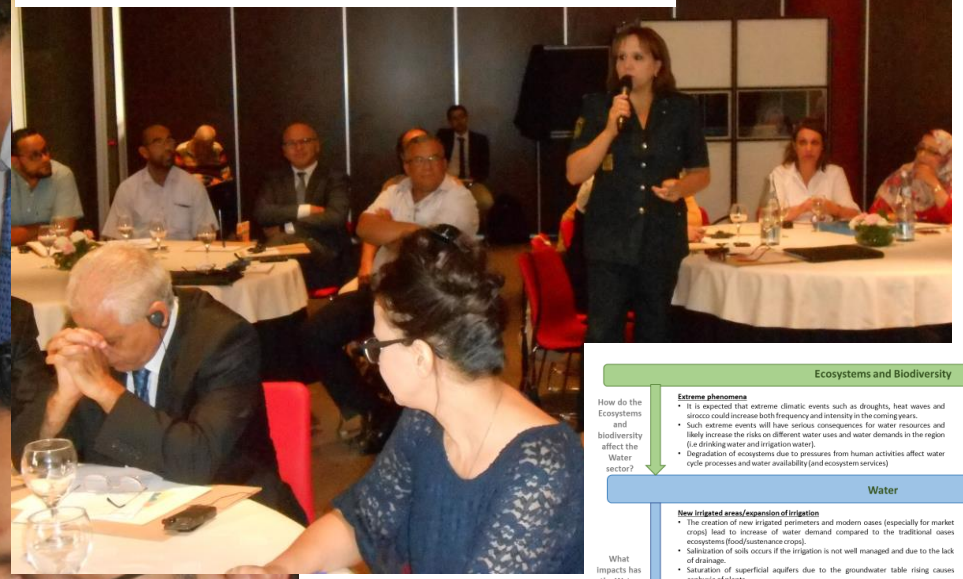
Water

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

Land / Agriculture



Land / Agriculture

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

Ecosystems and Biodiversity

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

A series of intersectoral issues in the NWSAS

Interlinkages discussed:

- trade-offs
- impacts

	Water	Energy	Land/Agriculture	Ecosystem services
Water		*Energy (ENE) to Water (WAT) 1 * ENE to WAT 2 Etc.	* Land/Agriculture (AGR) to WAT 1 * AGR to WAT 2 Etc.	*Ecosystem (ECO) to WAT 1 Etc.
Energy	*WAT to ENE 1 * WAT to ENE 2 Etc.		* AGR to ENE 1 Etc.	*ECO to ENE 1 Etc.
Land/Agriculture	*WAT to AGR 1 * WAT to AGR 2 .	*ENE to AGR 1 * ENE to AGR 2		*ECO to AGR 1 * ECO to AGR 2
Ecosystem services	*WAT to ECO 1 * WAT to ECO 2	* ENE to ECO 1 Etc.	* AGR to ECO 1 * AGR to ECO 2 Etc.	

MOVING FROM ISSUES TO SOLUTIONS: WHAT HAS BEEN DONE

1. We have taken all issues identified in the 1st Transboundary workshop
2. We have identified sectoral objectives and we have detailed many solutions that combine in *multi-sectoral packages*
3. The are grouped around three main objectives:
    - Slowing down depletion of the groundwater resource and rationalizing **water** use
    - Modernizing and increasing the value and viability of **agriculture**
    - Sustainable **energy** for water management and economic development
4. We have prioritized 30 solutions to be presented and discussed here.

THIS IS WHAT YOU SEE IN THE (DRAFT) INFORMATION NOTE

MOVING FROM ISSUES TO SOLUTIONS: WHAT WE NEED TO DO

1. <u>We want ONE feasible Package of Solutions, with 15 solutions max</u>
2. We need you to discuss our proposed list and prioritiye solutions that:

- bring high positive impact in the NWSAS
- are synergetic or at least coherent across sectors
- are feasible in the NWSAS *and* in your country (who, what, how?)

THIS IS WHAT YOU WILL DISCUSS IN GROUPS

THE WORKING GROUP DISCUSSION

PART 1 Prioritization of nexus solutions (today)

4 groups by category (Economic & Policy Instruments, Institutions & International Cooperation, Information, Infrastructure & innovation)

each group selects 5 priority solutions max

PART 2 Implementation of nexus solutions (tomorrow)

4 groups by sector (Water, Energy, Agriculture, Environment)

each group details the implementation of its priority solutions (who and how)

Result: ONE feasible Package of nexus Solutions for Tunisia/NWSAS

Thank you!

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Land / Agriculture

LESSONS LEARNED FROM THE PROJECT

Challenging to engage relevant sectors and key actors (strong interests, lack of awareness/communication)

Process design and communication throughout the process is crucial

Appropriate institutional frameworks are key not only for carrying out the assessment but also for fostering follow-up actions

Many obstacles to **implement solutions,** first of all **availability of resources**

Need for **fit-for-purpose analytical nexus tools** and better availability of **data**

Potential of the nexus perspective to **add value to other processes** e.g. GEF projects merits further attention

	ALAZANI/GANYKH (2013–2015)	SAVA (2014–2015)	SYR DARYA (2014–2016)	ISONZO/SOČA (2015)	DRINA (2016–2017)	NORTH-WEST SAHARA AQUIFER SYSTEM (2017–2019)	DRIN (2018-2019)
Basin size	11,700 km²	97,700 km²	410,000 km²	3,400 km²	20,320 km²	1,000,000 km²	20,311 km2
River length	391 km	945 km	3,019 km	140 km	346 km	---	335 km
Countries sharing	Azerbaijan, Georgia	Bosnia and Herzegovina, Croatia, Montenegro, Serbia, Slovenia, (Albania)	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan	Italy, Slovenia	Bosnia and Herzegovina, Montenegro, Serbia, (Albania)	Algeria, Libya, Tunisia,	Albania, Montenegro, Kosovo*, North Macedonia
Climate	Warm, temperate	Warm, temperate	Arid/semi-arid	Mediterranean-influenced, partly humid	Warm, temperate	Arid/hyper-arid	Warm, temperate
Main nexus storylines	• Lack of access to affordable energy aggravates deforestation, which increases the exposure to flash floods, erosion and landslides. • A poor state and inadequate maintenance of irrigation systems aggravates the impact of flash floods on the loss of fertile soil and damage to settlements.	• Energy production in the countries depends on water availability in the Sava River Basin. • Targets for renewables and climate mitigation push countries to develop more hydropower. • There are environmental concerns about dam construction in environmentally sensitive areas.	• Energy and food insecurity are drivers for conflicting seasonal water uses and make countries prioritize self-sufficiency over cooperation. • This aggravates the current situation of suboptimal use of resources.	• Diverse ecosystem services need protection. • Hydropeaking affects biodiversity and water availability for irrigation. Irrigation is reduced with water-efficient technology. • Groundwater abstraction for irrigation needs energy and may cause seawater intrusion.	• Water-flow regulation for power generation is suboptimal and has impacts on flood and drought risks. • Application of environmental flows is challenging. • Rural development is hampered by low agricultural productivity and a lack of infrastructure. • Water quality is declining because pressures go unchecked (solid waste, wastewater).	• Heavy and unsustainable use of the aquifer. • Heavy use of irrigation with high losses. • Water and soil salinization from irrigation and inadequate management of drainage. • Water management (pumping from higher depth, treatment etc.) requires sustainable energy solutions.	• Water-flow regulation for hydropower is suboptimal and has impact on floods and drought risks • Heavy biomass use drives forest degradation and loss of forest ecosystems • Developments of agriculture and trade need to be understood in relation to resource use

MODELING THE NWSAS

INFORMING POLICY:

- *water savings from improving irrigation efficiency,*
- *estimating the energy economic benefit (energy) of groundwater savings,*
- *comparing different energy supply options, now and in the future*
- *..? (depending on future developments of the model)*