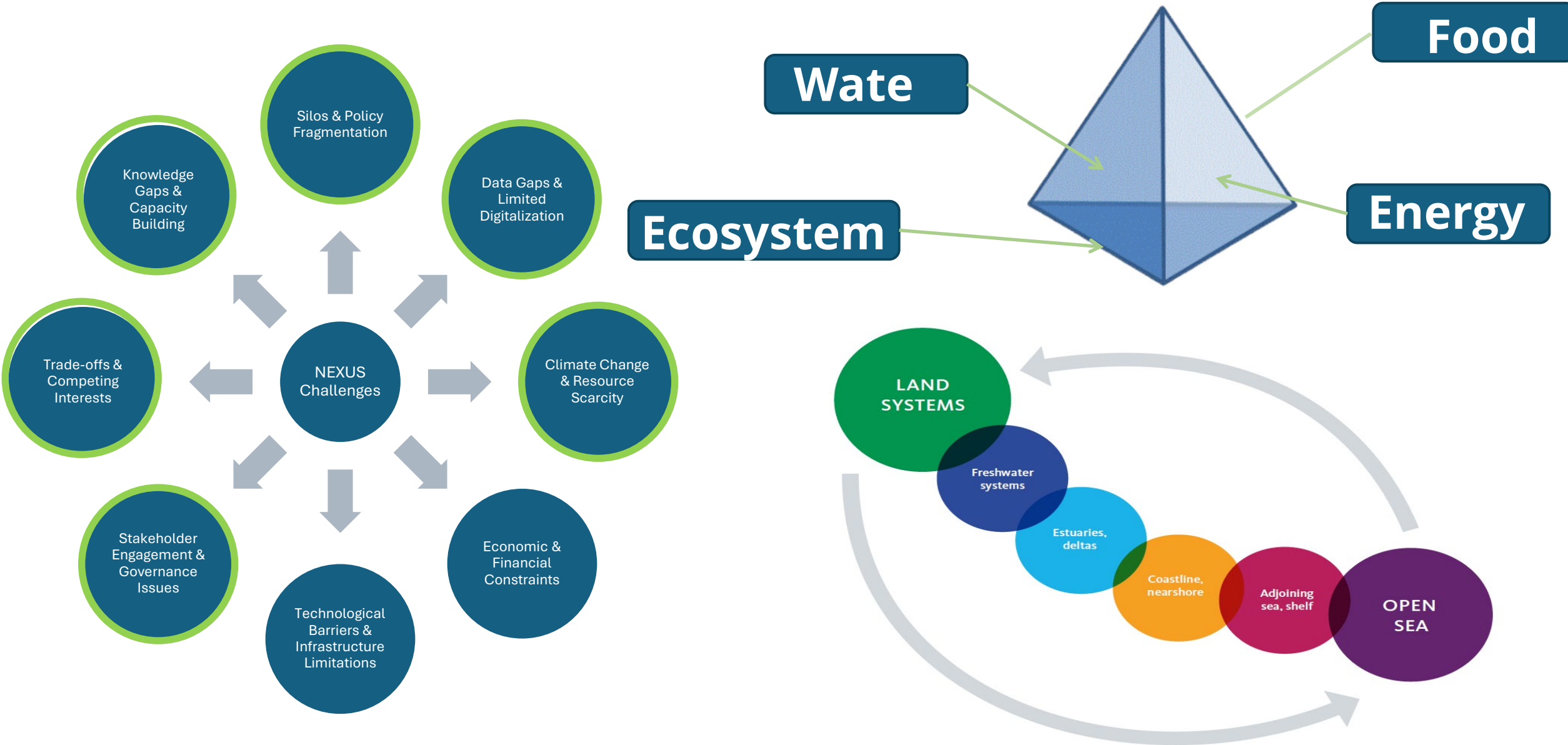


Digital Transformation for advancing Water-Energy-Food-Ecosystems Nexus in the Mediterranean Source to Sea continuum

Webinar on
AI-driven digitalization solutions for Water and WEF E Nexus in the Mediterranean
30 June 2025

Digital Transformation for WEF E Nexus in the Med S2S continuum



Digital Transformation for WEF E Nexus in the Med S2S continuum

Application Examples

Real-Time Monitoring	Data Integration	Prescriptive Management and Planning	Integrated Prescriptive Management and Planning
<ul style="list-style-type: none">• Smart meters• Virtual sensors (indirect measurements)• AI-powered Remote Sensing (land use, crop health, soil moisture, water availability & quality, evapotranspiration, air quality, biodiversity, erosion...)• ...	<ul style="list-style-type: none">• Data Spaces• Blockchain• IoT Platforms• Big & Small Platforms• Interoperability• ...	<ul style="list-style-type: none">• Smart Irrigation based on weather, crop demand, soil data.• Demand forecasting (water, energy...)• Optimization of water, energy and food infrastructures• Predicting crop growth, yields• ...	<ul style="list-style-type: none">• Water basin allocation considering agricultural, ecosystem, urban, and energy infrastructure demands.• What-if scenario analysis for climate change impacts on WEF E nexus• What if scenario analysis for policy impacts on WEF E Nexus• ...

Digital Transformation for WEF E Nexus in the Med S2S continuum

- **Digital transformation** is not just a technological upgrade. It is a strategic imperative for creating more sustainable, resilient, and interconnected responses to sectorial challenges in a holistic Water-Energy-Food-Ecosystems (WEFE) Nexus approach.
- **Digitalization in a WEF E Nexus in a Source to Sea (S2S) approach** can contribute to integrated and data-driven management for informed decision-making, optimising resource allocation, increasing efficiency in operations, promoting innovation, thus enhancing climate resilience.
- This refers to the **strategic adoption and integration of conventional and innovative digital policies and technologies** across the interconnected systems of water management, energy production and consumption, food supply chains and environmental capital, in the spatial components of the Source-to-Sea continuum.
- **It involves leveraging**, among others, advanced digital tools, data analytics, innovative technologies and related governance and managerial approaches to optimise the efficiency, sustainability, and resilience of integrated WEF E systems.

Digital Transformation for WEF E Nexus in the Med S2S continuum

- **UfM will be holding a Ministerial Meeting on Water** with focus on WEF E Nexus; Financing & Investment; Digitalisation.
- A **draft WEF E Nexus Strategy in the Med S2S continuum** is considered for high-level approval within UfM (March 2026) and the Barcelona Convention (December 2025). An **Action Framework** is expected to follow.
- The **PRIMA ACQUAOUNT** and **TALANOA-WATER** and the **H2020 TRANSCEND** projects are at the forefront of digitalization research and innovation for **Water** and its interlinkages with other sectors, including in a **WEF E Nexus approach**, creating impact on several demo sites across the Med via the development of actionable data, models and technologies, and their adoption through policy co-creation and co-implementation of novel digitalization tools.



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الاتحاد من أجل المتوسط



Regional Consultation on Digital Transformation for WEFE Nexus in the Med S2S continuum

AIM: to **promote digital transformation** for advancing Water-Energy-Food-Ecosystems (WEFE) Nexus in the Mediterranean within the spatial components of its Source-to-Sea (S2S) continuum, particularly under evolving climate change impacts.

OBJECTIVES:

- identify strengths, weaknesses, opportunities, and threats (**SWOT**) and present a related Analysis;
- highlight related **advancements made**, sharing **experiences** and **best practices**;
- **craft Recommendations** for promoting digital transformation contributing to the draft ‘**Strategy on WEFE Nexus in the Med S2S continuum**’ and its future **Action Framework** and provide technical input to key regional political fora like the **UfM Ministerial on Water, CoP of the Barcelona Convention**, etc.
- help the **PRIMA ACQUAOUNT, TALANOA-WATER and H2020 TRANSCEND** and **other** projects to adapt their research agenda towards transformational, actionable science that builds resilience to water scarcity and other natural resources management challenges under climate change impacts..

Regional Consultation on Digital Transformation for WEF Nexus in the Med S2S continuum

In the form of a Living Lab

- **Side Event on Transformative Water Resources Management (5 Feb 2024, Tunis), at the 5th Mediterranean Water Forum (5-7 Feb 2024):** Elaboration on smart and resilient solutions for climate challenge across the Mediterranean. Recommendation to elaborate further on digitalization of the WEF Nexus, and initial conception.

- **Launching/1st Regional Consultation Workshop (4-5 June 2024, Lisbon):** Kick started the process, articulated the basis for the SWOT Analysis and populated that with technical contents. A technical panel of regional institutions & organisations as well as a policy panel by country representatives shared policy advancements and gaps. Held back-to-back with the **UfM 14th Regional Platform Water** (5-6 June 2024, Lisbon).

- **2nd Consultation Workshop (6-7 February 2025, Malta and online):** Advanced contents of the SWOT Analysis, adding lines for consideration. A technical panel of regional institutions & organisations shared field experiences. A policy panel by country representatives shared policy advancements and gaps and contributed on shaping initial Policy Recommendations. Held back-to-back with the **UfM Drafting Group Meeting for the UfM Ministerial Conference** (6-7 February 2025).



Regional Consultation on Digital Transformation for WEFE Nexus in the Med S2S continuum

In the form of a Living Lab

NEXT STEPS:

- Webinar with emphasis on digital solutions and AI, **30 June 2025, online**, in synergy with UfM's on-going technical assignment on Water Digitalisation.
- Updates at the UfM 15th Regional Platform on Water, **29-30 September 2025, Ankara**
- 3rd Regional Consultation Workshop - TBC: **mid October 2025, Cairo, at the Cairo Water Week**, back-to-back with the EU/UfM 6th Annual Conference on Water Finance and Investment @ Cairo Water Week.
- Webinar to present and consult on key outputs of the regional consultation, **2nd week of January 2026**, in synergy with UfM
- 4th Regional Consultation Workshop – TBC: in conjunction with the UfM Ministerial Meeting on Water, **March 2026, Rome**

Parallel **on-line regional consultation** through a dedicated **module within PRIMA WEFE4MED Nexus Community of Practice**, integrating the WEFE Nexus process with the UfM Digital Transformation of the Water Sector Process



<https://wefe4med.eu/>



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Enriching the SWOT Analysis for WEFE Nexus Digital Transformation

HELPFUL TO ACHIEVING OBJECTIVES	HARMFUL TO ACHIEVING OBJECTIVES
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none">-What is unique?-What do we do well?-What are the assets?	<ul style="list-style-type: none">-Where we fall short in envisioning and planning?-Where we fall short in doing?-What enabling assets are we lacking (e.g. institutions, tools, knowledge, capacity, funds)?
OPPORTUNITIES	THREATS
<ul style="list-style-type: none">-What emerging trends can we take advantage of?-Which tangible prospects can lead us to achieving more?-What synergies we should tap on?	<ul style="list-style-type: none">-What cannot fundamentally work in medium/long term, no matter our efforts?-What can stop us from advancing?-What can lead us to failure?

Enriching the SWOT Analysis for WEFE Nexus Digital Transformation

HELPFUL TO ACHIEVING OBJECTIVES	HARMFUL TO ACHIEVING OBJECTIVES
<i>If relevant, link contributions with EXAMPLES/KEY REFERENCES (mainstreamed, projects, initiatives, etc)</i>	
STRENGTHS	WEAKNESSES
Governance	Governance
Science & Research	Science & Research
Technology & Infrastructure	Technology & Infrastructure
Financing	Financing
Partnerships	Partnerships
OPPORTUNITIES	THREATS
Governance	Governance
Science & Research	Science & Research
Technology & Infrastructure	Technology & Infrastructure
Financing	Financing
Partnerships	Partnerships

Enriching the SWOT Analysis for WEFE Nexus Digital Transformation

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
Governance <ul style="list-style-type: none"> - Regulation overall on digitalisation is advancing in most Med countries 	Governance <ul style="list-style-type: none"> - Existing regulatory frameworks do not adequately support the adoption and integration of Nexus digital solutions 	Governance <ul style="list-style-type: none"> - National coordination mechanisms for WEFE Nexus are formed in some Med countries 	Governance <ul style="list-style-type: none"> - Data privacy and security raise high concerns - Nexus digitalisation is a complex subject for policy makers
Science & Research <ul style="list-style-type: none"> - Overall digitalisation is part of university curricula - Science institutes prioritise research on overall digital solutions 	Science & Research <ul style="list-style-type: none"> - Nexus overall and, moreover, Nexus digitalisation are not yet integrated in university curricula 	Science & Research <ul style="list-style-type: none"> - Nexus and digitalisation are new and dynamic concepts and their combination even more 	Science & Research <ul style="list-style-type: none"> - The Nexus digitalisation contents are too complex and expensive for mainstreamed research
Technology & Infrastructure <ul style="list-style-type: none"> - Digital solutions on irrigation are applied through demos proofing benefits (PRIMA examples) - SMEs, including start-ups, make steps towards market creation 	Technology & Infrastructure <ul style="list-style-type: none"> - Examples of applied Nexus digitalisation technical solutions remain limited - Needed interoperability of technical solutions remains limited - Technical readiness on Nexus digitalisation is low given the absence of related skills 	Technology & Infrastructure <ul style="list-style-type: none"> - Nexus digitalisation applications, though still limited, are able to demonstrate multiple benefits 	Technology & Infrastructure <ul style="list-style-type: none"> - Not all countries nor stakeholders have equal access to such technologies - Technology transfer mechanisms for Nexus digitalisation are almost absent given multiple impediments
Financing <ul style="list-style-type: none"> - Credit lines overall on digitalisation are utilised by private sector 	Financing <ul style="list-style-type: none"> - Funding mechanisms for SMEs are complex 	Financing <ul style="list-style-type: none"> - Major donors, and particularly the EU, has prioritised digitalisation as well as Nexus in its long-term investments 	Financing <ul style="list-style-type: none"> - Investments needed for mainstreaming Nexus digitalisation are huge - Investment risks for businesses are high
Partnerships <ul style="list-style-type: none"> - Synergies between science institutes and private sector overall on digitalisation are advancing 	Partnerships <ul style="list-style-type: none"> - Public-private partnerships on Nexus digitalisation are in juvenile stage 	Partnerships <ul style="list-style-type: none"> - New types of partnerships are encouraged and supported by several donors 	Partnerships <ul style="list-style-type: none"> - Understanding of the benefits' potential by Nexus digitalisation is limited among the stakeholders

Open questions identified (at the 1st Workshop, Lisbon, June 2024)

- Ethical questions/property rights of intelligence/public goods/who owns the technologies?
- Information overload: Can we cope? Will it drive institutional reform?
- Removing technological lock-ins will drive removing institutional lock-ins? Will it drive policy reform?
- Is there willingness to use results (by policy makers and users)? Will it drive the changes in the model of water use?
- What is the road map? Small & scale up or be ambitious?
- Digitalization for policy change implementation or vice versa? The same solutions for all contexts? Will it really scale up? How to evaluate the success of digitalization of WEFE approach?
- How we tackle 'unintended' effects of WEFE digitalization e.g. driving more water use?

Enriching the SWOT Analysis for WEFE Nexus Digital Transformation

HELPFUL TO ACHIEVING OBJECTIVES		HARMFUL TO ACHIEVING OBJECTIVES	
<i>If relevant, link contributions with EXAMPLES/KEY REFERENCES (mainstreamed, projects, initiatives, etc)</i>			
➡	STRENGTHS	WEAKNESSES	
	Governance (including Partnerships)	Governance (including Partnerships)	
	Science & Research	Science & Research	
	Technology & Infrastructure	Technology & Infrastructure	
	Financing	Financing	
➡	Biodiversity	Biodiversity	
➡	OPPORTUNITIES	THREATS	
	Governance (including Partnerships)	Governance (including Partnerships)	
	Science & Research	Science & Research	
	Technology & Infrastructure	Technology & Infrastructure	
	Financing	Financing	
➡	Biodiveristy	Biodiversity	

Enriching the SWOT Analysis in four specific themes

- Sectoral **governance** and lack of adequate policy tools and **financing** mechanisms for integrated approaches among WEFE sectors and the spatial areas along the S2S continuum where the activities are implemented, constitute an unsuitable enabling environment. **What governance and financing shifts we need to assist digitalization advancing?**
- **Digital technologies with transformational potential** already exist and will further evolve. We need R&D to further develop them and a market-oriented approach to deploy them. **How will we make digital technology more available and have it adopted?**
- WEFE Nexus digital transformation provides opportunities for better **ecosystems assessment** and management, including through Nature-based Solutions. **How will we advance use of digital tools for nature protection and how to integrate them with Nexus objectives?**

Governance

STRENGTHS

- + Making **informed and integrated decisions**/solutions, not based on opinion, but on data
- + **Participatory governance**, decreasing the distance between citizen and policy makers
- + Early warning systems
- + Improvement of citizen engagement
- + Interest of the private sectors for smart agriculture and data collection/digital transformation
- + **Evidence-based decision making**

OPPORTUNITIES

- + **Transparency** on the decision making process
- + There are growing initiatives on WEF Nexus, eg interministerial Nexus committee.



WEAKNESSES

- Human capital is not ready to deal with intersectoral governance, **fragmentation of competences**
- Communities may be left out
- Susceptible to **cybersecurity risks**
- **Unequal access** to digital systems/tools
- Complexity and gap on the science-policy knowledge exchange
- Resistance to change, existing regulatory frameworks do not adequately support the adoption of nexus digital solutions
- Data monitoring requires follow-up and resources. Projects are often abandoned.

THREATS

- Misconception of digitalization -> digital platform without people engagement
- **Complexity** of the nexus system
- **Lack of collaboration** between ministries
- There are cases where regional political issues may completely override scientific decision making.
- **Resistance to the transparency and democratisation of digital data**
- **Data privacy and property**

Financing

STRENGTHS

- + New investment
- + **Job creation & development**
- + Major donors, such the EU, has prioritized digitalization as well as nexus in its long-term investments
- + **New type of partnerships** are encouraged and supported by donors

WEAKNESSES

- **High investments costs** of the digitalization
- Possible **loss of usual jobs**, false belief about the opportunity of leave behind the field work
- **Economic inequalities**;
- Funding mechanism for SME are complex

OPPORTUNITIES

- + Bringing research efforts (eg Copernicus/ Horizon) to the market after the end of the project.
- + Downscaling to farm level - **room for private initiatives**
- + Reducing the cost of the use of resources
- + **Public-private schemes**
- + Possible contributions from outsourcing

THREATS

- **Ethical and social risks**
- **Vulnerability** to technical failures
- **Job displacements**
- **Monopolization**



Technical tools

STRENGTHS

- + Support to decision making, they offer huge and widely used database for **enhancing modelling capabilities** to improve decision-making and governance.
- + Many tools already existing and they can **spread the knowledge** and improving the models toward a digital twin.
- + Real time monitoring and assessment/evaluation of resource
- + **Reducing risks, Increased efficiency,**
- + Optimisation of models,
- + Enhances visibility of information, emergency responses

OPPORTUNITIES

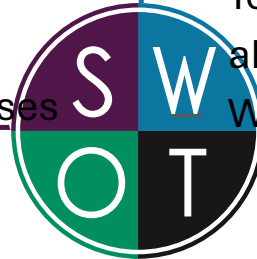
- + Remote sensing and in general distance acquisition is **very important for marginal areas** where there is a high lack of data
- + Digital twins, higher efficiency and **improved capacity of understand reality**
- + Improve efficiency and upstream climate services

WEAKNESSES

- Need for regional network, **not isolated efforts**
- Currently, there is limited access to spatial data, and in some case high uncertainty
- **Overflow of information**
- **Scalability is a big challenge.** eg many PRIMA projects dealing with digitalization but they face difficulties in upscaling.
- **Interoperability** of technical solutions remains limited
- Technical readiness on nexus digitalization is low given the absence of related skills
- We still need data and measurements from the field/ground

THREATS

- Risk of forgetting the need of field and practical data
- Fast change is risking **leaving people behind**
- increase of costs and tariffs
- **A lot of data are in the hands of very few people**
- **Possible increasing of digital divide** – unbalanced access to technology
- Risk of rushing, before thinking what data is needed and how it will be used
- **Risk of “maladaptation”**



Ecosystems and biodiversity

WEAKNESSES

STRENGTHS

- + Can help monitoring, planning and valuing ecosystem benefits.
- + **Restoration of ecosystems** is essential for water cycle and carbon storage (wetlands, forests)
- + **Green infrastructure and Nature base solutions** are giving practical improvement to the other sectors
- + **Strong synergies** with all the sectors and with the digitalization tools

- Not clear for all the benefits of ecosystem services to the other sector of the WEFEE -> **need for monetization of ES**
- Need to include the landscape level

OPPORTUNITIES

- + **Coupling innovative practices with traditional ones** (e.g. water harvesting)
- + Bring the private sector through technological innovations
- + Big data and predictive analysis. IoT, smart sensors - useful for integrating ecosystems into WEFEE Nexus
- + Can help view productive units like farms not in a narrow way, but as a functioning multidimensional Nexus system.

THREATS

- If the services to the other sectors are not clearly evaluated and monetarized, **possible conflicts with other sectors**, in particular agriculture



Some overall messages

- Digital transformation is **not about technologies alone**. Without governance and engagement, this won't deliver properly
- Particularly for Water, digitalization transforms the sector **from reactive to proactive**
- Digital technologies for WEF Nexus are already in place and they can help the decision making «**at the right place in the right time**». They can also **reduce the distance** between citizens and policy makers.

But...

- There is an issue in terms of **scalability of the initiatives**: initiatives are often fragmented and lack long term sustainability and mainstreaming
- There are grounds for a **stronger regional collaboration**, at all levels, and Med initiatives,

But...

- there is still a **digital divide** and a **lack in digital literacy**

Some to dos

- For digitalisation, also, we shall **move from Nexus thinking >> Nexus doing**
- Investments are needed in **digital infrastructure** to render data available and accessible, to improve **fair data sharing** -> is a regional Mediterranean platform with open data, structured on rules and protocols, feasible?
- Investments are also needed to **develop digital skills**, not only in education but also for the technicians and field workers
- **Public-private partnership should be strengthened also** engaging research institutions -> attract investments from companies for digital development
- **Deconstruct the apparent conflicts** between nature restoration and ecosystem conservation and agricultural production - > monetarization is key

Join the Regional Dialogue on Digital Transformation for WEFE Nexus in the Med S2S continuum



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