



Mediterranean Science, Policy, Research and Innovation Gateway

3rd EMEG Meeting – *Malta, 30 September – 2 October 2015*

Position paper

“A FRAME FOR A COMPREHENSIVE UNDERSTANDING OF WATER-ENERGY-FOOD NEXUS”

Recommendations by the Euro-Mediterranean Experts Group (EMEG)
(an outline of outcomes of 3rd EMEG meeting)

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Introduction

Global projections indicate that demand for freshwater, energy and food will increase significantly over the next decades under the pressure of population growth and mobility, economic development, international trade, urbanisation, diversifying diets, cultural and technological changes, and climate change (Hoff, 2011).

As demand grows, there is increasing competition for resources between water, energy, agriculture, fisheries, livestock, forestry, mining, transport and other sectors with unpredictable impacts for livelihoods and the environment (FAO, 2011).

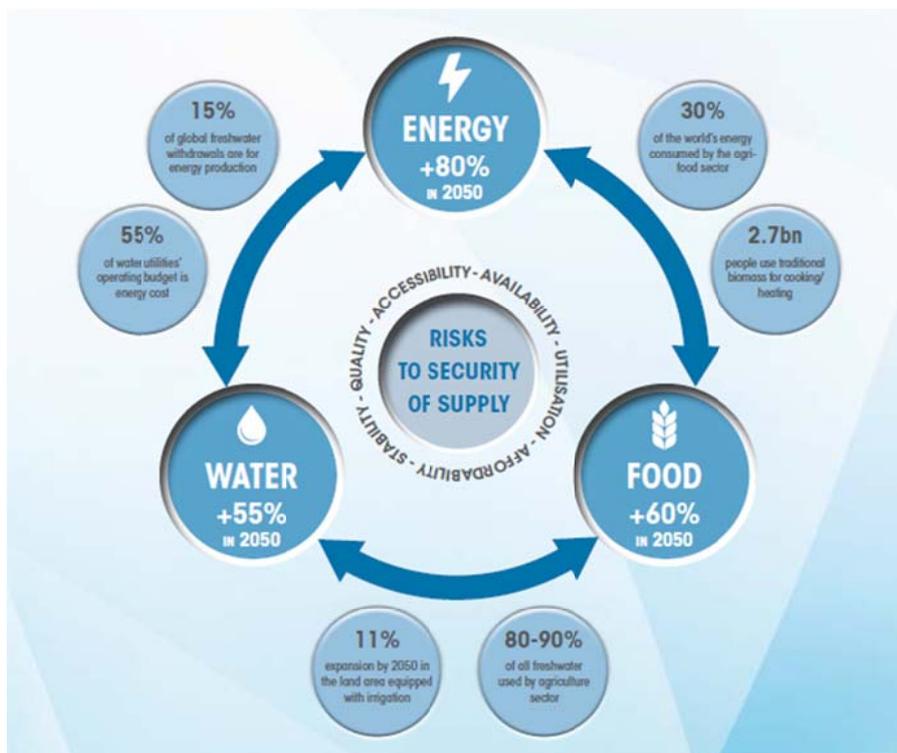


Figure 1 – Projections of demand on water-energy-food sectors in 2050 (source : IRENA, 2015)

The problem could be exacerbated by the climate change and its ecological consequences, and by fast changing socio-economic boundary conditions, including global redistributions of wealth and power, as well as changing flows of people, resources and knowledge (Schmidhuber and Tubiello, 2007; Hanjra and Qureshi, 2010).

In this context, the Water-Energy-Food Nexus has emerged as a useful concept to describe and address the complex and interrelated nature of our global resource systems, on which we depend to achieve different social, economic and environmental goals (FAOa,b, 2014).

A nexus approach can support a transition to sustainability, by reducing trade-offs and generating additional benefits that outweigh the transaction costs associated with stronger integration across sectors. Such gains should appeal to national interest and encourage governments, the private sector and civil society to engage.

This position paper, based on the work of the Euro-Mediterranean Experts Group (EMEG) established in the framework of MedSpring project, intends to describe the process that has led to the development of a logical frame to achieve a comprehensive understanding of the complex interactions and trade-offs among water, energy and food. Moreover, by submitting a set of recommendations – both technical and political - for the Euro-Mediterranean research agenda, this position paper also aims to support the EC in the identification of policy and research priorities when designing ad-hoc initiatives/calls addressing the *nexus*.

Background

MedSpring is aligned with the ideas, the debate and the call for action expressed in international fora such as the Davos Summit, the United Nations Conference on Sustainable Development (Rio+20) (UN, 2012) and the Bonn 2011 and 2014 Nexus conferences¹ (SEI, 2011).

In particular, MedSpring acknowledges that there is a need for coherence of cross-sector policy efforts and cross-border cooperation for jointly improved efficiency as a successful strategy to achieve environmental sustainability (GWSP, 2014), and that actions are required to achieve a responsible governance of natural resources, to extensively involve stakeholders to collaboratively work toward sustainable development and to expand financial, institutional, technical, and intellectual resources for nexus research.

Over the past two years MedSpring has engaged the scientific community as well as the civil society, with the purpose to investigate the relationship between research and innovation and the real needs of the civil society in the frame of the three societal challenges water-food-energy.

The EMEG meeting in Malta in September 2015 was the fourth stage of a path that started in Lisbon in 2013 and continued in Sousse in 2014 and Barcelona in January 2015. The events have engaged the experts in the discussion and investigation related to the identification of water, food and energy related research topics that would offer results, solutions and market opportunities contributing to sustainable development and create opportunities for new jobs in the region and then in the identification of ways and means to address (or re-address) policy and policy dialogue, taking into account the current scenarios in Research and Innovation cooperation. The 3rd EMEG meeting aimed to develop a Nexus approach as a new framing for the interdependence of water, energy and food (the societal challenges addressed by MedSpring project) and, through a better understanding of the synergies and trade-offs among them, identify the factors research should take into consideration to ensure that demand is met without compromising sustainability requirements.

Preliminary analysis outcomes

The meeting engaged in developing a comprehensive, multi-dimensions logical frame, based on a thorough understanding of the interconnectedness of water, energy and food leading to a better Nexus analysis and how it satisfies the sustainability imperatives. The output were a set of recommendations – both technical and political - for the Euro-Mediterranean research agenda.

In preparation to the meeting a preliminary analysis was carried out based on the outputs of the first (Lisbon, 2013²) and second (Sousse, 2014³) EMEG meetings, the Meeting of the Projects Coordinators Platform (Barcelona, 2015) and a topic-related literature review⁴. The experts agreed that research, research cooperation and the related policy dialogue in the three areas of interest - Water, Energy, Food - is affected by problems that can be grouped into 4 categories:

- NETWORKING & COMMUNICATION,
- MANAGEMENT AND INSTITUTIONAL RESPONSIBILITY,

¹ The Bonn 2011 Nexus Conference (held in November 2011), “The Water Energy and Food Security Nexus – Solutions for the Green Economy”, organized by the Federal Government of Germany, was a major milestone to place the nexus perspective on the international agenda.

² The extract of the 1st Position paper on “Research results valorization” could be founded here: <http://agora.medspring.eu/en/content/emeg-position-paper>; the entire document (in .pdf) is available here: <http://agora.medspring.eu/sites/default/files/uploads/emegpositionpaper.pdf>

³ The 2nd Position paper on “Policy dialogue” is available here: <http://www.medspring.eu/sites/default/files/MED-SPRING-EMEG-Position-Paper.pdf>

⁴ A critical overview of external links and documents related to Nexus is available here: <http://www.medspring.eu/emeg-nexus-repository>

- RESOURCES (FINANCIAL/HUMAN) & CAPACITY,
- RESPONSIVENESS TO USERS' NEEDS.

The subsequent problem analysis aimed at considering each domain specific problems under the perspective of a Nexus approach, trying to single out cross-domain problems. This operation led to the identification of what has been defined as **Main problems** requiring a sustainable set of objectives to solve them.

The same process has guided the identification of *sustainable Main objectives* that, following a *Nexus approach*, can tackle the “*main problems*”. The Main objectives identified were the basis on which to develop the EMEG discussion and work in Malta.

EMEG outcomes

This work lead to the identification of new Nexus objectives and possible actions to be implemented in the Euro-Mediterranean R&I policy dialogue and cooperation.

About 67 experts (EMEG experts, EU officers, Clusters’ representatives, young researchers), participating to the event, were subdivided in three following groups:

- WG1. WATER vs. FOOD & ENERGY
- WG2. ENERGY vs. FOOD & WATER
- WG3. FOOD vs. WATER & ENERGY

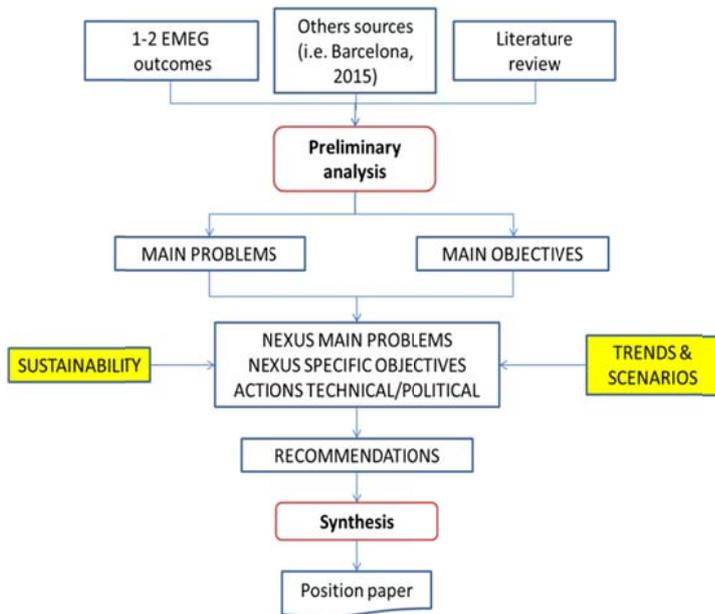


Figure 2 – Main sources, works performed and outcomes leading to the Position Paper

Moving from **Nexus Main Problems** (challenges related to W-E-F inter-linkages in the EU-Mediterranean area), experts were asked to identify **Nexus Specific Objectives** related to:

- Governance
- Social and cultural
- Technical/ Practical / Capacity
- Economy

This last exercise was aimed at collecting suggestions for possible **Actions** able to support the Nexus intervention logic.

These actions are considered as possible solutions that can address both the technical and institutional level (depending on the type of objectives). Innovation and market opportunities were highlighted for each Action, when possible.

Following the EMEG meeting, a further elaboration of the outcomes was made. The log-frames developed into each working group were “clustered” and summarized into a synoptic table, as reported below (Table 1)

Table 1 – The Log-frame (Nexus Main Problems-Specific Objectives-Suggested Actions) summarizing the Work Groups outcomes

	Nexus Main Problems	Nexus Specific Objectives	Actions (both technical and policy related)
Governance	Lack of strategies and poor policies harmonization for WEF that enable a proper implementation of the nexus approach in the region	<p>Trans-disciplinary committees should develop WEF national and regional strategies</p> <p>Participatory policy design should include socio-environmental aspects</p> <p>Nexus concepts should be integrated in all national policies</p>	<p><i>Establishing a committee of scientific experts in WEF and social sciences to map and assess available nexus strategies (at national/regional level) particularly focusing on:</i></p> <p><i>a) needs analysis</i></p> <p><i>b) mapping of stakeholders</i></p> <p><i>c) developing a comprehensive W-E-F strategy and setting a master plan (followed by implementation monitoring)</i></p>
	Lack of multi-disciplinarity and cooperation at the policy, research and management levels in each individual sector.	<p>Platforms facilitating policy, management and research cooperation in the 3 sectors (WEF) should be created.</p>	<p><i>Adopting development practices to achieve a sustainable integrated and comprehensive planning and management in the areas of water, energy and food security.</i></p> <p><i>Creating inter-sectorial committees of W-E-F experts at policy & management level for monitoring implementation of nexus approach, brokering scientific events (conferences, etc.) and promoting relevant mobility programmes.</i></p>
Social and cultural	Lack of tailored communication tools and strategies between Academia-Industrialist-Government for NEXUS	<p>Dissemination of success stories.</p>	<p><i>Enhancing best practices by: providing comprehensive description; standardizing them; adapting and replicating them in different environments.</i></p>
	Lack of awareness, inadequate communication and participation of all stakeholders, including civil society, in the challenges addressed by the nexus thinking	<p>Different stakeholders needs should be identified to better address WEF research cooperation gaps and strengths</p>	<p><i>Promoting and funding inter-sectorial deliberative spaces with clear implementation commitments by policy makers.</i></p>
		<p>Relevant stakeholders involvement in nexus related policy design and research and innovation activities should be fostered</p>	<p><i>Designing and implementing awareness campaigns especially addressed to relevant stakeholders; establishing a knowledge gateway and hub for exchange of good practices related to NEXUS adoption in policy, research and practice; supporting existing fora dealing with issues addressed by the nexus.</i></p>
	Nexus related communication should be improved	<p><i>Creating a EU-Mediterranean Network of existing public stakeholders; creating local multi-stakeholder and inclusive platforms.</i></p>	

Table 1 – The Log-frame (Nexus Main Problems-Specific Objectives-Suggested Actions) summarizing the Work Groups outcomes (continuation)

	Nexus Main Problems	Nexus Specific Objectives	Actions (both technical and policy related)
Technical/Practical/Capacity	Lack of capacity (education, training) among policy makers and practitioners	Education and training should focus on WEF system integration promoting trans-disciplinary approaches to research to identify Nexus related solutions	<i>Developing educational programmes and materials; developing targeted and demand-driven job training; organizing events (workshops, seminars, etc.)</i>
	No observatories, reference institutions and data (i.e. statistical analysis, scenario simulations, ...) are available (or easily accessible) to relevant stakeholders	A database of WEF common areas should be created	<i>Developing a data management plan for NEXUS and creating a comprehensive database.</i>
	Insufficient scientific knowledge and innovative research on the effects of water and energy resources on food security	Scientific research and innovation activity on food security in the nexus context should be encouraged.	<i>Creating a platform gathering Universities, RD centres, public organisations, SME's, food industries, stakeholders, end users, etc., aiming to develop and share knowledge and practices, and networking in the EU-MED area.</i>
		Innovations based on scientific and socio-economic knowledge to promote business opportunities should be developed	<i>Building a strategy for managing risks, opportunities and challenges taking into account the Nexus framework in a fast-changing environment.</i>
	Insufficient scientific knowledge and innovative research on the effects of Climate change and its relation with the WEF nexus and Lack of tools and mechanisms to integrate the different aspects in water management	Research in the field of climate change adaptation and mitigation should be supported and increased (developing models that include the "climate change" factor with the other WEF factors e.g. life cycle assessment of products, ... etc.)	<i>Bridging the knowledge gap on W-E-F by developing multi-disciplinary and multi-actor research; Creating a global water knowledge hub that is relevant, visible, credible and low-cost to facilitate the work of researchers in different disciplines.</i>
Multidisciplinary RDI (national and international) in water sector to include food and energy interfaces should be developed (i.e. set up coordination platforms involving the three aspects WEF at different operational levels; develop strategies that allows Integrated Water Management and planning for the future national resources).		<i>Demonstrating water management solutions integrating E, F nexus at the real level (demonstrative pilot project sites); extending the benefits of natural water infrastructures and/or nature-based solution of water management to energy and food nexus.</i>	

Table 1 – The Log-frame (Nexus Main Problems-Specific Objectives-Suggested Actions) summarizing the Work Groups outcomes (continuation)

	Nexus Main Problems	Nexus Specific Objectives	Actions (both technical and policy related)
Economy	Poor interaction between public and private sector due to insufficient funding to promote nexus approach.	Interaction between public and private sectors should be improved, including incentives for funding	<i>Creating a EU-MED platform for supranational exchange and transfer of best practices.</i>
	Lack of public/private and international organisations' partnerships to facilitate market access to nexus related new technologies .	Awareness for increasing cooperation between the public and private sectors should be improved	<i>Establishing a funding programme led by the EC promoting industry-academia/public-private cooperation in the W-E-F nexus approach.</i>
	Lack of market (and users) oriented solutions in nexus research	Identify specific markets niches where NEXUS solution can play a social and economic role.	<p><i>Developing a nexus labelling through Life Cycle Assessment approach as market criteria for products prices at MED level.</i></p> <p><i>Developing a tool (e.g. Decision Support System) to support producers/decision makers to select the most feasible solutions.</i></p> <p><i>Developing knowledge on the relation between food quality and foreign market regulations.</i></p> <p><i>Organizing one-to-one meetings between researchers and possible investors (brokerage events) to define market niches/needs and nexus approach.</i></p>

Following the above mentioned steps, the EMEG were asked to prepare **Recommendations**, both political and technical. The main recommendations have been summarized in a form of concept note that integrates both policy and technical aspects as follows:

NEXUS – NEXT GENERATION OF EXCELLENT WEF SOLUTIONS FOR SUSTAINABILITY

The current concept note summarizes the recommendations of the third EMEG meeting with the main objectives of how to employ WEF nexus to better address the societal challenges and ensure sustainability. Moreover, it emphasizes on considering the main two pillars of WEF nexus at policy and technical in an integrated manner. Without proper policies and adequate governance set up it is difficult to implement any technical solutions. In this context, the policy recommendations can be summarized as follows:

Policy recommendations

1. **Integrating the nexus concept in all relevant policies, legislation and regulations at all levels** by:
 - Promoting participatory policy design through a multilevel and participatory networks/fora;
 - Mapping and assessing existing national sectorial W-E-F policies to develop an integrated Nexus strategy including an effective implementation and monitoring plan;
 - Promoting the implementation of EURO MED strategy on NEXUS.
2. **Increase NEXUS communication and awareness among relevant stakeholders** by: multidisciplinary training and capacity building activities; dissemination of success stories, initiatives, good practices and innovative technologies; including Nexus related principles and concepts in educational system; creating a EU-MED platform (based on the MEDSPRING EMEG + additional players) for trans-boundary exchange and transfer of best practices.
3. **Increasing funding for multidisciplinary** and integrated research projects and initiatives and promoting cooperation between public and private sectors through financing and incentive schemes.

Once proper policies and common understanding on nexus aspects is established, it will be easier to move to the actions that is needed to support the actual realization of nexus on the ground and will help implement these policies. The main technical recommendations can be summarized as follows:

Technical Recommendations

To better articulate the technical recommendations, it was important to organize them in a sequential interrelated steps as follows:

STEP 1:

Understanding the current state of and interconnection among WEF nexus through DATA COLLECTION, STORAGE AND ANALYSIS, MODELLING

- Conduct survey about available data, identification of gaps, create a new database (nexus database of WEF relevant data)

- Develop data management plan for NEXUS including data collection, IT model and platforms
- Assessing the risks, opportunities and challenges taking into account the Nexus framework in a moving world (dynamic, multidisciplinary)
- Bridging the knowledge gap on WEF by concentrated multi-disciplinary research; create a global water knowledge hub that is relevant, visible, credible and low-cost to facilitate the work of researchers in different disciplines.

Analysis on WEF data availability, aimed to identify gaps (or redundancies), creating a ICT open-access, dynamic, interactive platform and database, to facilitate multi-disciplinary research, to assess risk, opportunities and challenges in sustainable resources management.

STEP 2

DEMONSTRATIONS AND PILOTS

- Highlighting and evaluating the best practices and document them.
- Standardizing the best practice.
- Demonstration of water management solutions integrating E, F nexus at the real level
- Develop a system to be used as a showcase to be replicated
- Applied examples are needed to convince the market of the benefits of the Nexus approach and its sustainability

Collecting, standardizing and evaluating the best practices and/or smart solutions (i.e. smart farms in the rural world, how to extend the benefits of natural water infrastructures and/or nature-based solution of water management to energy and food nexus,); to develop a system to be used as a showcase of water management solutions integrating E, F nexus at the real level (i.e. reed beds, water treatment, solar pumping stations, etc.), to be replicated by relevant actors and/or to be considered as prototypes to convince market of the Nexus approach benefits and its sustainability.

STEP 3

MARKET ORIENTED RESEARCH

- Investigation and deep analysis concerning virtual water to give the water the appropriate cost
- Developing a nexus labeling through LCA approach as market criteria for products prices at MED level.
- To develop a tool (DSS) to support producers/decision makers to select the most feasible solutions.
- Up scaling and replicating the high positive impact smart solutions

Support innovation project run by industry and academia (multi-stakeholders) to bridge the gap between research and societal needs. Project can target to WEF labeling, nexus smart greenhouses, WEF semi-arid biomass and soil management.

Support business creation in the MED area (co-production, co-generation, co-ownership, ...) on WEF products and services solutions

Developing a NEXUS-oriented labeling system (also using LCA approach, virtual water, ...) as market criteria for products prices at MED level.

Organize EU-Mediterranean brokerage events aimed to create research/SMEs-public/private partnerships on the marketable aspects of WEF nexus.

STEP 4

CAPACITY BUILDING - MULTILEVEL AWARENESS RAISING

- Developing the curricula to integrate NEXUS concept in Higher Education and Research Centers missions
- Integration of NEXUS concept in Higher Education curricula and Research Centers missions

To develop tools for new WEF skills (a new generation of “game changer” professional profiles), including Med Master as well as capacity building targeting decision makers, also using pilot cases (see step 2) and/or brokerage events aimed to create research-public/private partnerships on the marketable aspects of WEF nexus.

Conclusions

Adopting the nexus approach in a large-scale, system-wide manner may be challenging because we have a limited knowledge of how food, water and energy systems operate and interact.

A nexus approach provides more flexibility to confront complex challenges like natural resource depletion and climate change adaptation. Change can only happen if policy makers, enterprises/industries and consumers alike better understand these interconnections.

The existing knowledge gap in the W-E-F nexus needs to be bridged by concentrated active research to identify:

- **Inter-dependencies (Data and Analysis)** - In order to assess and analyze Nexus interactions, we need accurate, pertinent and timely data. In some cases there is a huge accumulation of data in all the sectors, but they are not or under-utilized due to a mismanagement and lack of coordination of the existing and planned observing systems around the world. At the same time, we need to support the development of new systems, tools and services. This will help to fill data gaps and to provide key data to decision-makers.
- **Current and future challenges (Scenario development)** - The cross-sectorial nature of the Water-Energy-Food Nexus indicates a need to create a shared understanding of the interrelations between water, energy and food as well as the underlying drivers. This can best be done through scenarios. A constant attention about the priorities in the Mediterranean, considering the market's today stand and future trends, should be paid.
- **Opportunities (Response options)** – Sometimes science and technological solutions to face the nexus challenges already exist; actions need to be triggered by developing policies. Often, separate bodies are in charge of different aspects that appear difficult to integrate into a unified policy frame. The working area should refer to a) the planning and implementation of new policies, regulations and incentives, capacity development and training, and technical interventions; and b) the process of evaluating and revising already existing policies and strategies.

- Appropriate and effective governance, institutional, and organizational frameworks (**Stakeholders dialogue**) - The stakeholder dialogue is a continuous process that brings together the different working areas through a participatory process of engaging with all relevant stakeholders and experts. The dialogues have to be designed for a specific context – regional, national, local or basin level – and problem, e.g. to evaluate a national policy on water, energy and food systems.

A regional approach should be considered through the Nexus, giving emphasis on “South-to-South” diversification, introducing innovation (e.g. ICT, biotechnologies and social innovation) that does not come into conflict with other aspects as human development, education and gender aspects.

Government policy, both at national and international level, must set the stage by improving data monitoring and gathering programs, overcoming the logic of isolated resource management and understanding how the water-energy-food systems and processes overlap through reports and studies.

The above mentioned steps must be combined with sensible policies and regulations that encourage cooperation between individual citizens, research bodies, governments and industry so that all decisions should be sustainable and legitimate. Improve consensus among different sectors (Research, Policy and Society) and stakeholders appears to be the best way to achieve a form of public ownership of knowledge about nexus.

Nexus should not just be another suit for multidisciplinary approach. As proved by several examples of “good practices” this already exists in many instances, especially at local scale.

We rather have to focus on other issues related to common socio-economic interests where common stakes may prove impacting positively policy makers’ decisions.

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