

The WEF Nexus approach: An imperative enabler for sustainable development in the MENA Region

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November 25, 2020 | Last updated: December 10, 2020 *Tags:* [Climate change and environmental sustainability](#), [MENA](#), [SDGs and Development Cooperation](#)

The water-energy-food (WEF) nexus approach has been widely accepted in the MENA countries as an appropriate solution for the sustainable management of these three vital sectors in reducing their trade-offs and building synergies. However, progress in its implementation in the region remains limited and faces many constraints related to the enabling environment. Four recommendations are presented. First, establishing a research network to bridge the nexus science-policy interface gap. Second, creating a forum for nexus governance best practices to bridge the institutional framework gap. Third, establishing collaborative capacity-building programs to bridge the nexus capacity gap. Finally, forming R&D teams to promote nexus technology implementation and incentivize the private sector to bridge the nexus investment gap.

Challenge

Water, energy, and food security are inextricably linked in all regions of the world, and perhaps even more in the MENA region, which is energy-intensive, water and food deficient (Amer et al. 2017), and one of the world's most economically and environmentally vulnerable regions to climate change (Verner 2012; IPCC 2014). The strong interdependencies between the three sectors, termed the WEF nexus, are intensifying with time as demand for resources increases alongside population growth and industrial expansion, changing lifestyle and consumption patterns, inefficient WEF supply chains, and the expected impacts of climate change.

Attempting to achieve security in one of these sectors independently without addressing the trade-offs with other sectors will endanger their sustainability and security. For example, achieving food security by domestic production without due consideration to the limitations of water resources will lead to over-exploitation, deterioration, and loss of water resources. Eventually, it will also lead to the loss of agricultural productivity and the deterioration of the agriculture sector. Hence, the strong interdependencies of the three sectors calls for replacing the existing conventional silos policy and decision making approach, when addressing the management of these three vital sectors, through nexus thinking and an approach that **integrates planning and management across sectors to reduce trade-offs and build synergies** (Hoff 2011). Such an approach will improve resource efficiency in the MENA region and provide larger sustainability levels for its resources. It will also help the region's countries achieve their commitments toward the Sustainable Development Goals (SDGs) and Paris 2015 Climate Summit.

However, to shift from the current conventional system toward a WEF nexus paradigm, several challenging issues will need to be addressed and overcome. **These challenges include bridging the science-policy interface, establishing appropriate nexus governance and institutional structures, building institutional and human resource capacities for nexus integrated planning and management, and incentivizing the private sector to spearhead nexus-related projects.**

Proposal

The WEF nexus approach is becoming an imperative enabler for addressing the resources challenge in the MENA region and achieving the countries' global mandates as defined by the SDGs and their NDCs. Implementing the nexus approach, that is, adopting integrated resource planning and management of these three vital sectors while minimizing environmental risks, will enable the MENA region countries' economies to transition to green, circular, and low carbon ones.

Such a paradigm shift in resource management is in line with the G20 commitment to tackle common challenges to the global community. These include achieving sustainable development and stability as well as working and establishing partnerships with low income countries (LICs). It is also in line with the G20 objective of improving resource efficiency (G20 2019). It will serve the G20 goal of enhancing universal energy access while promoting economic development. Furthermore, it will contribute to countries' efforts to lower their vulnerability to climate change and enhance their adaptation efforts and plans (G20 2017).

While a WEF nexus approach has been widely accepted in the MENA countries as an appropriate solution for the sustainable management of the three sectors, progress in its implementation remains limited. What is constraining the countries from implementing this approach? What is missing, and what is required to begin implementing this approach?

Currently, an enabling environment for WEF nexus thinking and an implementation approach do not exist in the majority of the MENA countries. The components of an enabling environment for a WEF nexus can be divided into four main categories:

1. WEF Nexus Scientific Aspects: the role of scientific research in bridging the nexus knowledge gap, quantifying nexus critical interlinkages and interactions, and identifying trade-offs and possible synergies to support evidence-based policymaking;
2. WEF Nexus Governance Aspects: establishing an appropriate nexus institutional structure for nexus planning and management and adequate mechanisms for mainstreaming nexus policies in existing sectoral policies;
3. WEF Nexus Capacity Aspects: the development of institutional and individual capacities for nexus planning and management; and
4. WEF Nexus Investment Aspects: formulating policies, legislation, and regulations to incentivize the private sector in implementing and adopting WEF nexus innovative technological project.

Bridging the Science-Policy Interface Gap

Policymakers in the MENA region need to ensure the integration of the policy cycle for the WEF nexus through a set of measures (Al-Zubari 2016), which include:

- Bridge the knowledge gap of the WEF nexus at the national and regional levels by understanding and quantifying the inter-linkages between water, energy, and food.
- Identify and analyze the WEF nexus cross-sectoral interactions, trade-offs, and risks.
- Adopt a WEF nexus approach policymaking to increase policy coherence among the three sectors and climate change policies to provide integrated solutions and mitigate nexus-related risks.
- Implement integrated planning and management that reduces trade-offs and builds synergies across the three sectors.
- Adopt the water-energy-food nexus approach in the planning and management of these three sectors to reduce the risk of supply in all three sectors and enable the region to move toward higher levels of resource efficiency, equity, and sustainability.

The G20 can take several steps to support the countries of the MENA region in this regard. It can encourage cooperative and coordinated scientific research among its members and MENA countries to bridge the WEF nexus knowledge gap. In particular, the G20 should promote the creation of a research network dedicated to characterizing the WEF nexus, identifying crucial cross-sectoral interdependencies, and analyzing trade-offs, risks, and potential management synergies.

Bridging the Institutional Framework Gap

While more integrated planning and management of resources may require new technologies, these can only be delivered through

appropriate and relevant institutions. Coordination and collaboration mechanisms among institutions, therefore, are vital factors in adopting an integrated nexus approach to resource management (Mansour et al. 2017). This is increasingly relevant in a new era of diminishing resource bases and escalating risks and threats associated with climate change risks. The institutional framework governing the elements of the WEF nexus in the majority of MENA countries is mostly fragmented. This has in the past, and even today, delayed the comprehensive and inclusive management of these interlinked three sectors. This fragmented institutional framework has also led to a sectoral approach to policy planning and, consequently, fragmented policies.

In some countries, there are at least six ministries that are both directly and indirectly linked, one way or another, to WEF management. This fragmentation is also found within the sectors themselves. A good example of this is the water sector in many MENA countries, where different sources (groundwater, surface water, desalination, and wastewater) and users (municipal, agricultural, and industrial) are governed by various institutions with limited coordination among them. Similarly, within the food and energy sectors, there are many organizations without institutionalized coordination mechanisms among them. Hence, the institutional framework governing the elements of the WEF nexus in the MENA region needs strengthening mechanisms for an effective WEF nexus approach. However, there are some countries that present various models for “integrated institutions.” In some, one body is responsible for two sectors, while others have established some sort of coordination and collaboration mechanisms among the WEF sectors.

Governance and institutional structures in the MENA region can be enhanced and strengthened for more effective and integrated resources management through:

- Analyzing current national institutional arrangements for a better understanding of the weaknesses and gaps that hinder the implementation of the WEF nexus approach in each MENA country.
- Empowering and strengthening existing institutions already active in developing and implementing strategies/policies related to WEF sectors to develop a comprehensive WEF nexus national strategy, a key element of which is data homogenization and sharing.
- Enhancing coordination and collaboration mechanisms among institutions to mainstream the WEF nexus approach at local, national, and MENA regional levels; this does not necessarily require the establishment of new institutions for the WEF nexus.

The G20 should promote the creation of a forum to exchange best practices for WEF nexus governance. This forum will be a platform for the exchange and production of international best practices, including coordinating mechanisms among institutions and mainstreaming nexus policies in sectoral policies and data homogenization and sharing.

Bridging the Capacity Gap

The management of these vital primary resources needs to be carefully designed to ensure that securing one of these primary resources does not compromise the other resources. Therefore, a multi-stakeholder platform is required to develop and explore science-policy-society linkages and opportunities. Understanding the complex interlinkages and dependencies of the WEF nexus and then being able to translate them into solutions and synergies requires increased nexus system thinking and problem-solving competencies. Furthermore, external pressures and drivers of the nexus, such as climate change, population growth, political unrest, and specific local conditions, among others, call for the impending need to create capacity building programs and knowledge management systems at all levels involved (Mohtar 2016). These platforms can only be created by building capacity at different levels, including institutional, academic, and private sectors. Many MENA countries have competent professionals in the fields of water, energy, and food/agriculture, and there is no need for new staff for the WEF nexus. What is necessary is inter-sectoral capacity building and cooperation among these professionals.

Furthermore, to achieve the goal of integrated policymaking, established multi-sectoral teams must be equipped with qualitative and quantitative frameworks to both understand the challenges and explore the potential synergies of the WEF nexus. In this context, many decision support tools are available to guide science-based policies and are valuable in cross-sectoral communication and trade-offs. Therefore, it is critical to create these competencies at the individual as well as institutional levels. WEF nexus system thinking and nexus mainstreaming into sectoral policies can be enhanced by:

- Developing specific institutional and individual capacity building programs across the three sectors. The main focus of these programs must be creating competencies in dialogue and conflict resolution, data management and analysis, and an understanding of the WEF nexus at technical and policy levels.
- Determining the right tools and data sets for scale specific conditions (local, national, and regional) and goals.

- Applying outcomes from holistic nexus tools and comprehensive data sets to guide the management of water, energy, and food resources.
- Creating training programs across the various sectors to build capacity for the analytics as well as negotiation aspects of the implementation of nexus solutions at different levels.

The G20 should support the creation of capacity building programs for integrated WEF approaches for professionals and relevant stakeholders, and the development of dynamic simulation tools for nexus planning and management at the national and regional levels.

Bridging the Investment Gap

Technology and innovation, driven by the private sector and established markets, play a critical role in addressing the water, energy, and food challenges. In general, the introduction of new and appropriate technologies can improve resource efficiency and productivity in the water, energy, and food sectors, and contribute to their collective security and sustainability. For example, implementing technologies to reduce food waste and enhance water use efficiency is an example of clear synergy among sectors. It shows how an efficiency enhancement in one sector can lead to less consumption in the others. However, technological and innovative solutions within the WEF nexus, where two or three components of the nexus are integrated as inputs to each other, not only enhance resource efficiency but also expand the available natural resource base. Thus, they contribute even more to the sustainability and security of the three sectors.

Technological and innovative solutions for the nexus are at their early stages of development in the MENA region. Nevertheless, there are some good examples of the adoption of innovative solutions within the nexus in many MENA countries. These include integrated seawater energy and agricultural systems, renewable energy generation from domestic wastewater, solar desalination, agriculture waste-to-energy, landfill-gas-to-energy, and aquaponics-energy production (Halalsheh et al. 2016) These pioneering projects demonstrate that the potential and benefits of technology and innovation are fully harnessed within the WEF nexus and must therefore be funded, scaled up, and replicated.

To enhance the role of technological innovation and incentivize the private sector in taking up WEF nexus projects, the following measures are necessary:

- Encourage the scaling up and replication of on-going WEF nexus related projects.
- Formulate policies and legislation to incentivize the private sector for implementing and adopting nexus innovative technology projects and support and provide incentives for strategic partnerships and cooperation between research centers and the private sector.
- Build capacity for policymakers and institutionalize regional knowledge management systems to share best practices on the WEF nexus.

The G20 should support the establishment of an innovative WEF nexus-related industrial base by encouraging collaborative and focused applied nexus R&D. This can be achieved by forming international research teams to promote technology transfers and launch incentives for potential alliances between the private sector and academia to promote WEF nexus innovation and technology projects.

Disclaimer

This policy brief was developed and written by the authors and has undergone a peer review process. The views and opinions expressed in this policy brief are those of the authors and do not necessarily reflect the official policy or position of the authors' organizations or the T20 Secretariat.

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Existing Initiatives & Analysis