

Sustainability in the Water-Energy-Food Nexus Bridging Science and Policy Making

KEY POLICY MESSAGES

- **OPERATIONALIZE.** The need for a nexus approach to managing water, food and energy is widely recognized as pressures mount on these highly interconnected resources in ways that are hard to anticipate. The problem is how to make that nexus operational in a world of disciplinary silos and widespread mismanagement of resources.
- **GLOCALIZE.** The WEF nexus calls for holistic and integrated approaches that simultaneously maintain relevance to local stakeholders, stressors, and scales.
- **INTEGRATE.** To reduce our response time to challenges and facilitate the rapid implementation of research driven policy, we must address the fragmentation between scientific and policy communities, across disciplines and within organizations.
- **ANALYSE.** Effective dialogue among stakeholders concerning the trade-offs and opportunity costs of resource allocation decisions requires the adoption of scenario assessment and communication tools that quantify interconnections between resource systems.

© Levi Morsy - unsplash

WI and IWRA Policy Briefings are published by IWRA with the support of Routledge. They aim to provide high quality analysis and practical recommendations for policy makers on important development issues.

• Access *Water International* by becoming a member of IWRA: www.iwra.org -> Members tab

• or subscribe only to the journal at: www.tandfonline.com/toc/rwin20/current

IWRA Policy Briefs are based on WI Special Issues and are for the purpose of stimulating discussion and awareness; IWRA, as a neutral forum, does not necessarily endorse the views expressed.

 **Routledge**
Taylor & Francis Group

RESOURCES STRESS, UNCERTAINTY AND THE CHALLENGE OF INTEGRATED ALLOCATION AND MANAGEMENT

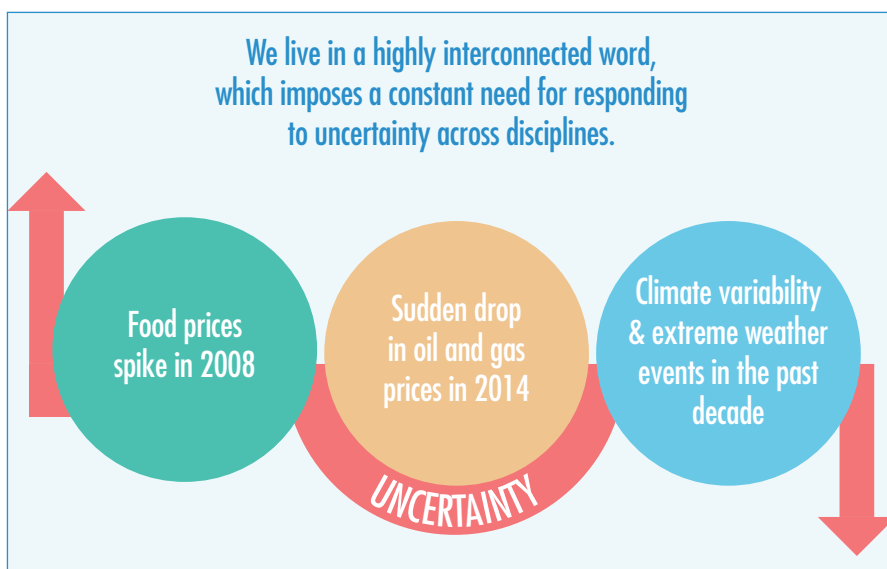
Water, energy, and food security underpin nations' well-being, and global sustainability. Awareness of the tight interconnections between these three resource systems is not new. Nevertheless, a combination of intensifying demands on resources, increasing uncertainty of external pressures, and resource scarcity have intensified the interlinkages and amplified the cost of inaction and mismanagement.

Policy decisions made within one sector are felt across all others connected to it. A clear understanding of how future policy decisions will impact all three of the interconnected WEF sectors is vital. To reach this understanding, we need to quantify the linkages between these sectors, underpinned by a thorough understanding of how these linkages vary between regions and across time. If we fail to do this, governments face the risk of unintentionally developing resource strategies that compete with one another; further exacerbating tensions among the resource systems.

TOOLS FOR ADDRESSING CHALLENGES ACROSS THE WEF NEXUS

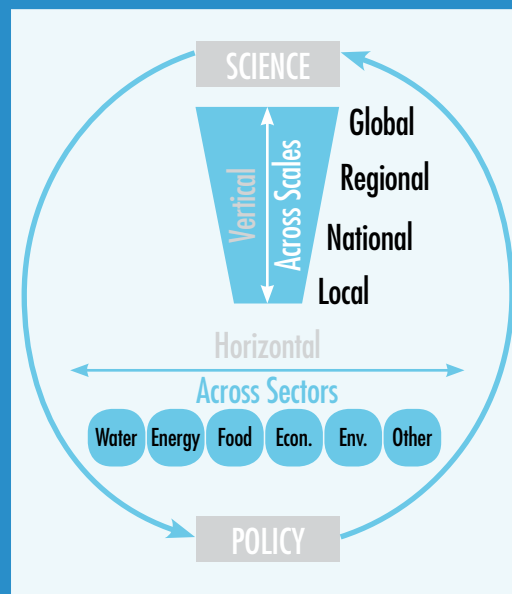
Across the WEF nexus there are a number of critical challenges (nexus hotspot), each with their own focal point, scale and stakeholders. Some focus on food security on a national scale, while others seek to address renewable energy deployment in a specific region. To inform decisions concerning these challenges meaningful analytics must be developed to answer specific stakeholder questions.

It is a challenge to find a one-size-fits all model capable of capturing resource interactions and trade-offs for such diverse cases. However, using a suite of available and new tools, the scientific community could lead the way by undertaking data analysis relevant to the scale of each challenge. Those analytics would then serve as an engine for a dialogue, urgently needed among representatives from businesses/industry, government and civil society.



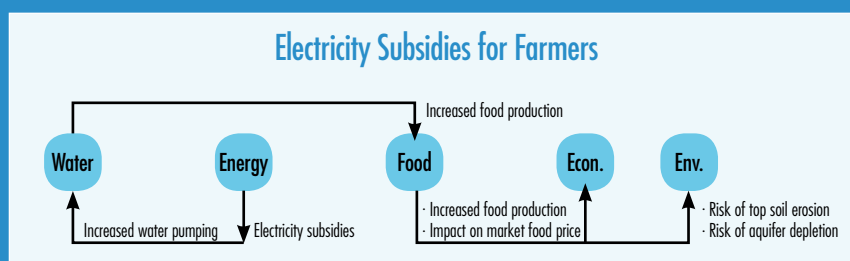
CHALLENGES WITHIN THE SCIENTIFIC SPHERE

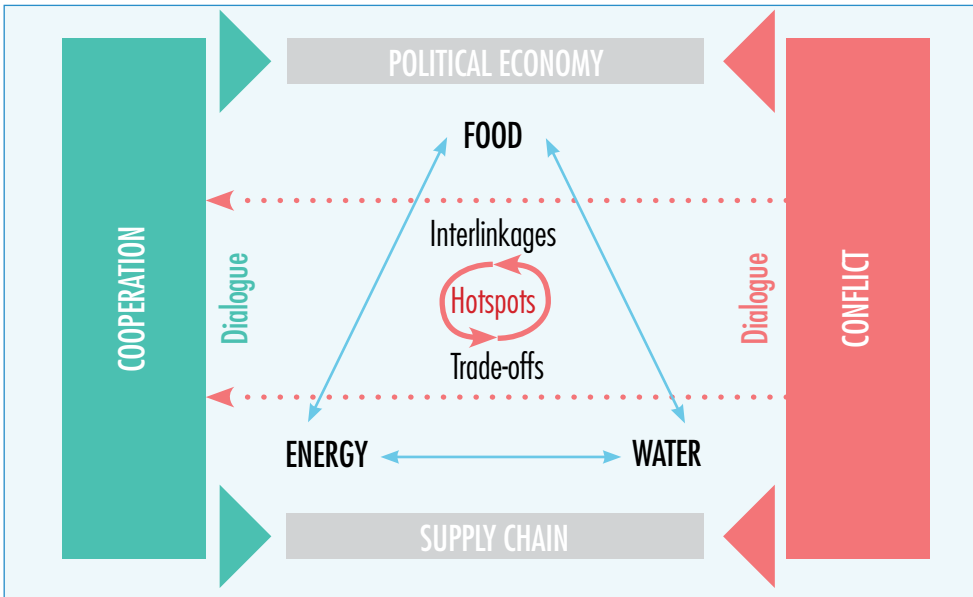
- **Communication across various disciplines**, needed to develop multifaceted nexus friendly solutions.
- **Limited breadth of inter-sectoral knowledge** and programs that produce professionals capable of understanding the complexity and multidimensionality of resource allocation challenges.
- **Proper identification of knowledge gaps within the policy domain**, to ensure bridging these through targeted research.



DELAY IN SCIENCE-POLICY RESPONSE AND FEEDBACK

- **Shortage in effective communication mechanisms** within and between policy and scientific spheres.
- **Dissimilar time frames, agendas, and priorities cause a disconnect between the science and policy spheres.** We need to encourage and enhance communication at the interface of these spheres. This would bridge disparate outlooks and improve interactions between the WEF sectors, allowing challenges that require interdisciplinary technical expertise and swift policy action to be effectively addressed.





■ Figure: WEF Nexus Framework (Mohtar & Daher, 2016). Reference: Rabi H. Mohtar & Bassel Daher (2016). Water-Energy-Food Nexus Framework for facilitating multi-stakeholder dialogue, Water International, DOI: 10.1080/02508060.2016.1149759

■ Jidaiyubori Park, suburban Tokyo, Japan June 2016 © James E. Nickum.

IMPLEMENTING SUSTAINABLE DEVELOPMENT GOALS

The United Nations General Assembly met in September 2015, to announce a list of 17 new Sustainable Development Goals (SDGs). The list includes three SDGs dedicated to water, energy and food, under which are 19 quantifiable targets to be achieved by 2030.



As nations move toward implementing this post-2015 agenda, it is critical that proposed strategies take into account potential areas of conflict amongst targets. The level in which we could reach set water targets, for example, is directly linked to the decisions being made in attaining both energy and food targets (both being direct consumers of that resource).

A critical, contextualized look is necessary in order to avoid increased pressures across sectors. This calls for a continuous dialogue on the trade-offs across different decision making entities and stakeholders.

IMPLEMENTING THE PARIS CLIMATE CHANGE AGREEMENT

The implementation of the historic Paris Climate Change Agreement, if not approached holistically, could potentially interrupt progress of other, interconnected goals.

Although the shift to renewable energy is now a globally agreed upon goal, the choice of technology and the extent of its deployment will vary according to region and scale. For example, arable land used for solar panel “farms” does not produce food. Stakeholders need to consider the cross-nexus opportunity costs to agricultural production from renewable energy strategies. The entities responsible for driving planning and implementation of the Climate Change Agreement, whether at a national or international scale, need to ensure that the trade-offs of various different paths forward are assessed holistically, yet within localized contexts.



EXAMPLES OF FRAGMENTATION WITHIN THE WEF POLICY MAKING SPHERE

- **Disconnection and lack of coherence in policies across scales.**
A national energy subsidy for farmers, which results in incentivizing water pumping for agriculture, may conflict
- **Lack of integrative protocols and coordinated planning across different sectors, at the same scale with city or basin level water regulation policies.**



REFERENCES

From *Water International*, September - October 2015, Issue 5-6: *Sustainability in the Water-Energy-Food Nexus* (Bhaduri et al., Eds.)

- Bhaduri, A., Ringler, C., Dombrowski, I., Mohtar, R. & Scheumann, W. *Sustainability in the water-energy-food nexus.*
- Mekonnen, D.K., Channa, H. & Ringler, C. *The impact of water users' associations on the productivity of irrigated agriculture in Pakistani Punjab.*
- Daher, B.T. & Mohtar, R.H. *Water-energy-food (WEF) Nexus Tool 2.0: guiding integrative resource planning and decision-making.*
- Mirzabaev, A., Guta, D., Goedecke, J., Gaur, V., Börner, J., Virchow, D., Denich, M. & von Braun, J. *Bioenergy, food security and poverty reduction: trade-offs and synergies along the water-energy-food security nexus.*
- Mayor, B., López-Gunn, E., Villarroya, F.I. & Montero, E. *Application of a water-energy-food nexus framework for the Duero river basin in Spain.*
- Sullivan Graham, E.J., Jakle, A.C. & Martin, F.D. *Reuse of oil and gas produced water in south-eastern New Mexico: resource assessment, treatment processes, and policy.*
- Kibaroglu, A. & Iba Gürsoy, S. *Water-energy-food nexus in a transboundary context: the Euphrates-Tigris river basin as a case study.*
- Meza, F.J., Vicuna, S., Gironás, J., Poblete, D., Suárez, F. & Oertel, M. *Water-food-energy nexus in Chile: the challenges due to global change in different regional contexts.*
- Bekchanov, M., Ringler, C., Bhaduri, A. & Jeuland, M. *How would the Rogun Dam affect water and energy scarcity in Central Asia?*
- Halbe, J., Pahl-Wostl, C., Lange, M.A. & Velonis, C. *Governance of transitions towards sustainable development – the water-energy-food nexus in Cyprus.*
- Gain, A.K., Giupponi, C. & Benson, D. *The water-energy-food (WEF) security nexus: the policy perspective of Bangladesh.*
- Hensengerth, O. *Where is the power? Transnational networks, authority and the dispute over the Xayaburi Dam on the Lower Mekong Mainstream.*
- Hack, J. *Application of payments for hydrological ecosystem services to solve problems of fit and interplay in integrated water resources management.*

TECHNICAL AND GOVERNANCE CHALLENGES TO BE ADDRESSED MOVING FORWARD

'Homework' for the Scientific Community

- **COMMUNICATE.** Scientists have the responsibility of effectively communicating to policy makers. This may be achieved through the development of demonstration tools, policy briefs or presentations.
- **CREATE.** The academic world has the responsibility of creating a new generation of interdisciplinary professionals, skilled in understanding the tight interactions across resource systems and thus equipped to solve the complex challenges facing our global community.
- **REFORM.** Academia, and the reward systems operational within it, do not favour interdisciplinary or action oriented field-based-learning. Cross departmental collaboration must be incentivized.

'Homework' for the Policy Making Community

- **INVEST** in building institutional capacity across scales. This would assist integrative planning and collective decision making leading to the development of more sustainable policies and effective use of scientific knowledge.
- **DEVELOP** protocols and mechanisms among different decision making entities, across scales, which encourage dialogue and integrative planning.

ACKNOWLEDGEMENTS

Author: Bassel Daher,
WEF Nexus Research Group, Texas A&M University
Editors: Elia Guy, Ignacia Deregibus and James Nickum
Layout: Nathalie Lyon-Caen

