

Informing national and global responses to shocks to the energy-food-water-environment nexus

What challenges and opportunities do decision makers need to be aware of in order to find more resilient and inclusive responses to climate and weather related extremes?



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The Living With Environmental Change Partnership brings together 22 public sector organisations that fund, carry out and use environmental research and observations. They include the UK research councils, government departments with environmental responsibilities, devolved administrations and government agencies. The private sector is represented by a Business Advisory Board.

The concept of the energy-food-water nexus captures interconnections, dependencies and linkages between production and use of environment, energy, food, and water resources. Interlinkages within the “nexus” of environment-energy-food-water resources raise challenges to decision making for stakeholders. Global challenges such as climate change exacerbate issues of resource scarcity, which transcend sectors, scale and geography. Academics, policy makers and practitioners can learn from each other to shape and build more resilient responses to climate and weather related shocks.

What is the energy-food-water nexus?

The term “nexus” is increasingly being used within academic, policy and practitioner circles to describe the interlinkages between environment, energy, food and water resources. As a concept this is useful because it:

- Provides a lens through which we can gain a deeper understanding of how these resources are linked, how changes in one can affect another, and it highlights how complex the processes are that connect them.
- Provides a way to capture the interactions and interdependencies between the elements that define it as well as how stakeholders involved in nexus issues interact with each other.
- Enables a better understanding of (un)intended consequences of policies, technologies and practices that may arise around nexus issues whilst simultaneously shining light on areas of opportunity that may merit investigation.
- Provides a natural frame for rethinking sustainability as a way of analysing problems which can be approached more effectively when considered as a whole.
- Represents a multi-dimensional means of scientific enquiry which seeks to describe the complex and non-linear interactions between water, energy and food systems, with the climate.

What are “shocks” to the nexus?

The shocks we are considering are often unlikely (low probability), rare (low frequency) events but they have large, at times catastrophic consequences. They:

- Can vary in nature, and in the context of the energy-food-water nexus are often related to climate and weather extremes such as unexpected heavy flooding, heat waves, hurricanes.
- Arise from a variety of causes because of the nature of the nexus and the ways in which it is interlinked with finance, the economy, policy governance and demographics.
- Usually impact upon a number of people within and across country boundaries, in direct and indirect ways.
- Can either be endogenous (they have an internal cause from the nexus such as climate change risk, demographic trends and migration) or exogenous (they have an external cause such as financial instability and market bubbles).

Who experiences the impact of nexus shocks and how?

Nexus shocks:

- Affect everyone involved in the production, consumption, disposal and designing of decisions related to those resources. This means impacts can be felt globally, regionally and locally.
- Affect different stakeholders across different sectors, each characterised by different cultures, behaviours, priorities and processes.
- Impact upon decision making regarding the flow and availability of water, energy and food. Those involved in or affected by this include government, academics, practitioners, third sector organisations.
- May have a direct impact (eg damage to crops, increased vulnerability to infrastructure and buildings) or indirect impact (eg changes in resource prices, effects on people's wellbeing, health implications from flooded drains).
- May have a severe and immediate effect on sectors that rely on energy, food and water eg through damage to crops which affects production and, ultimately, have significant impacts on revenues.
- May have indirect impacts that are not necessarily instant but materialise several days, weeks or even months after an initial shock.
- Can be devastating, but can also highlight vulnerabilities of certain resources or people, and so shed light on areas where resilience needs to be improved to reduce potential future impacts (for example the 2015 winter floods in the UK).

What do current national responses to nexus shocks look like?

Current responses vary according to context and scale but may not be robust because:

- Decisions at national level may fail to consider implications for local or even international level.
- Decisions may not fully consider business supply chains which cut across and transcend national boundaries and may not be regulated by governments.
- Decision makers at the local and national levels have a tendency to focus on short term and sector-bounded problems/benefits which places less emphasis on long term implications for the system as a whole.
- Decisions made at the sector level can lack diverse participation mechanisms and can be taken with little consideration for other processes in place from other sectors and may have unexpected impacts on other sectors.
- There may be rebound, cascading, or other negative effects from decisions, mainly due to the mutual interdependence of these with, at times, unforeseeable implications for decision making processes.
- Evidence produced to inform decision making may not always be effective, or may not be shared appropriately between academics, decision makers and practitioners.
- National commitments to reduce greenhouse gas emissions have been outlined in Intended Nationally Determined Contributions, however there is a lack of an implementation framework for these, few equivalents in other areas and little effort to join them up.

What barriers exist to effective decision making in response to nexus shocks?

Communication and collaboration are vital to ensure the most appropriate and robust evidence informs decision makers at all levels within the context of a nexus shock. However this can lead to challenges in informing decision making, including:

- Lack of clarity on who leads which response and what degree of responsibility rests with individual stakeholders.
- Misaligned timescales between academics producing evidence and the requirements of decision makers impeding timely responses.
- Social and cultural dimensions of individuals and organisations that operate within the nexus and which are vulnerable to shocks that can lead to confusion about different stakeholders' needs, and can result in misaligned decisions.
- The challenge of what the most appropriate response should be; there may be overreliance on scientific evidence, which can be imprecise, fraught with uncertainties and is constantly evolving.
- How decision makers can reconcile timescales and how they can manage these in the context of rare but extreme events.
- Mismatches between origin and destination of risk, between who pays and who benefits, between risk and vulnerability.
- Lack of quantification of the resilience premium – ie the benefits of proactively mitigating nexus shocks.
- Individual interests being put first, often led by the desire to increase the resilience assets in a cost effective manner, with at times little consideration of implications of such processes for others within the nexus.

How could decision makers improve their response to nexus shocks?

Decision makers should:

- Employ strategic thinking, with greater emphasis on precautionary approaches (which can be risk-based) as opposed to reactionary ones.
- Increase collaboration between academics, policy makers and practitioners.
- Undertake greater engagement, co-production of aims, and deeper understanding of the way in which each operates in a nexus shock and non-shock scenario.
- Work with other stakeholders to understand how public responses to nexus shocks may make the problem worse and decision making processes more challenging.
- Consider the economic benefits of action and costs of inaction.
- Increase communication with other countries and regions with similar exposure to shocks to learn from their experiences and share best practice.
- Promote a re-negotiation of existing “social contracts” between society, assets and infrastructure, and with stakeholders involved in the nexus, enabling ordinary civilians to play a more active role in shaping responses to nexus shocks.
- Apply a holistic or systems approach to managing nexus shocks that will enable broader understanding of implications of decisions on other stakeholders and sectors.
- Seek to better understand the context within which their decisions are made and how these evolve over time, adopting an iterative approach open to flexible management of this process.

Further information

This Policy and Practice Note was written by Dr Candice Howarth, drawing on research “Informing decision making in response to nexus shocks” which brought together stakeholders under the Nexus Shocks Network and explored their experiences of managing responses to nexus shocks. The work was funded by the ESRC Nexus Network.

Useful resources:

Nexus Network website: www.thenexusnetwork.org

Centre for Evaluation of Complexity Across the Nexus (CECAN) website: www.cecan.ac.uk

Howarth, C. (2015) The Nexus Shocks Network: What we are learning. Global Sustainability Institute. http://www.thenexusnetwork.org/wp-content/uploads/2016/01/Nexus-Shocks-Network-What-We-Are-Learning_CandiceH.pdf

Howarth, C. & Monasterolo, I. (2016) Understanding barriers to decision making in the UK energy-food-water nexus: The added value of interdisciplinary approaches. *Environmental Science & Policy*, 61, 53-60. <http://www.sciencedirect.com/science/article/pii/S146290111630065X>

Howarth, C. & Monasterolo, I. (under review) Opportunities for knowledge co-production across the energy-food-water nexus: making interdisciplinary approaches work for better climate decision making and modelling

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