



‘Water-Energy-Food’ nexus information note

Background document for the Implications of global megatrends in the Western Balkans region: Scoping workshop, Ljubljana 10-11 April 2017

The focus of the European Topic Centre on Inland, Coastal and Marine Waters (ETC/ICM) project ‘*Water Use in the Western Balkans: regional outlooks and global megatrends*’ (project reference EEA/PAN/16/002) is on water in relation to energy and food trade-offs: nexus approach. For more information on the project see the separate document: *Project overview: Water Use in the Western Balkans: regional outlooks and global megatrends*¹.

This note summarises descriptions and definitions around the nexus approach and current understanding of what the ‘water-energy-food’ nexus (WEF nexus) is, as well as how it can be used to frame thinking around implications of global megatrends in the Western Balkans.

Understanding the ‘water-energy-food’ nexus

The concept of the ‘water-energy-food’ nexus emerged at the Davos Summit through the *Global Risks 2011* report which noted that in dealing with global resource scarcity and security “*Any strategy that focuses on one part of the water-food-energy nexus without considering its interconnections risks serious unintended consequences*” (World Economic Forum, 2011). In recent literature looking at these three areas simultaneously is often referred to as the ‘water-energy-food’ nexus. In ‘*Security implications of future water use in Western Balkans: the challenge of hydropower development*’ the EEA (2015) describes the “*water-food-energy nexus*” as follows:

“...water is essential not only for drinking, but also for food production and electricity generation, such as in the case of hydropower or when it is used as a coolant in power plants. Globally growing populations and increasing demand in food, energy and other resources converge with climate change impacts, aggravating its impact.”

A closer review of literature reveals that although the correlation between water, energy and food is recognised it is not well-understood, while there is limited guidance on how to tackle with these complex relationships in policy-making, assessment and decisions on actions to be taken. The International Institute for Sustainable Development (IISD) report ‘*The Water–Energy–Food Security Nexus: Towards a practical planning and decision-support framework for landscape investment and risk management*’ (Bizikova et al, 2013), notes that:

“Recently, more attention has been devoted to developing frameworks that will help in describing the linkages in the WEF nexus, as well as assisting in conducting case studies and, ultimately, identifying policies and action.”

¹ Available from: <http://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017-west-balkan-project-gmt/2017-1st-workshop-gmt-west-balkan-region-1/background-documents>

Indeed, since 2012 a number of examples started emerging where a nexus approach has been used. These cases are commonly found in a developing country context and are closely linked with literature on sustainable development (Bizikova et al, 2013; Flammini et al, 2014; FAO, 2014; Rodríguez et al, 2015; Allouche et al, 2014; Retief et al, 2016; UNEP, 2014). In this context the WEF nexus is mainly discussed as a tool in planning and decision-making for security and sustainability. There are multiple examples of the nexus approach being used in countries of Latin America, the Caribbean, Central Asia and South Africa. Limited examples also exist in developed countries. For instance, a nexus approach was used in California, USA, a state where there are strong connections between water and energy and where climate change and worsening droughts are a constant threat to water security.

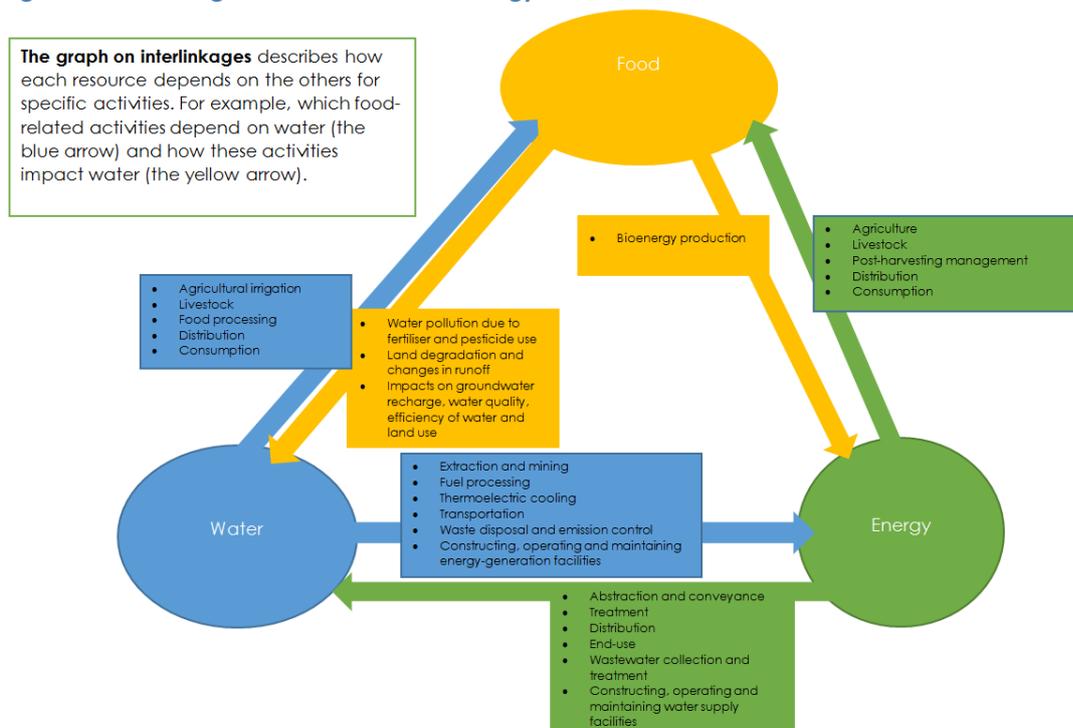
The nexus approach

According the Stockholm Environment Institute (SEI) the nexus approach recognises and tries to understand the interactions between water, energy and food and what their implications are for resource security.

“The nexus focus is on system efficiency, rather than on the productivity of isolated sectors. The nexus approach highlights the interdependence of water, energy and food security and the natural resources that underpin that security – water, soil and land.” (Hoff, 2011)

Figure 1 illustrates the types of interconnections that may be seen between water, energy and food when considered as a nexus. These interconnections give rise to risks and opportunities at a national and regional level which is why understanding them is so important.

Figure 1: Interlinkages in the water-food-energy nexus



Source: FLIS Platform (<http://flis.waat.eu/>) based on Mohar and Daher (2012), and World Bank (2013)



Why is the nexus approach useful?

The nexus approach is a dynamic approach that focuses on the interconnected challenges and opportunities across all three domains of the WEF nexus. As such it offers a roadmap towards an integrated decision-support framework for policy makers, governments, investors and NGOs when assessing impacts and planning for policies, investments or actions. The IISD (Bizikova et al, 2011) notes that in the future integrating elements of the WEF nexus will become increasingly important for resource security. It identifies the following elements as key in each area:

Table 1: Review of WEF security nexus [Bizikova et al, 2011]

Food security	The elements of food security are: (1) food availability : influenced by production, distribution and exchange of food; (2) access to food : including affordability, allocation and preference; (3) utilization : nutritional value, social value and food safety (4) food stability over time (see e.g., Ericksen, 2008; Schumidhuber & Tubiello, 2007).
Water security	The elements of water security are: (1) water access ; (2) water safety ; and (3) water affordability so that every person can lead a clean, healthy and productive life, while ensuring that the natural environment is protected and enhanced (Global Water Partnership, 2000).
Energy security	The elements of energy security are: (1) continuity of energy supplies relative to demand; (2) physical availability of supplies ; and (3) supply sufficient to satisfy demand at a given price (Department of Energy & Climate Change [DECC 2009; International Energy Agency [IEA], 2001).

A “nexus-oriented approach” can therefore help “proactively address the causes, rather than the symptoms, by identifying effective points for intervention in underlying structures and systems” (World Economic Forum, 2011 in Bizikova et al, 2013).

According to UNEP (2014) and the United Nations World Water Assessment Programme (WWAP, 2014) it can further:

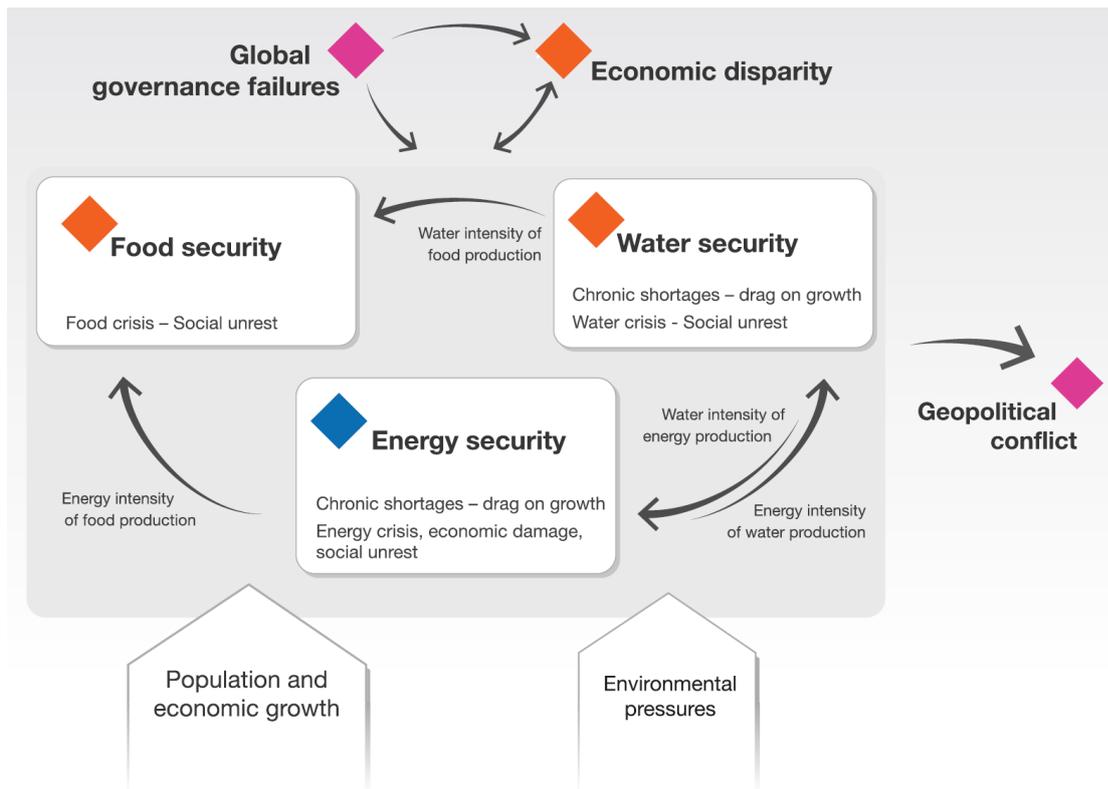
- Enhance understanding of interdependencies, co-benefits and trade-offs
- Offer an integrated approach to deal with key issues across sectors
- Support policy and build institutional capacity
- Identify knowledge gaps and promote actions to address these
- Enhance dialogue, collaboration and coordination
- Support sustainable development goals (SDGs)
- Bridge scales and levels from implementation at local communities to regional perspectives, including trans-boundary challenges and solutions
- Enable comprehensive impact monitoring, evaluation and reporting

Existing WEF nexus frameworks

Various approaches to the nexus exist; some bring in aspects of land use and climate change while others bring nexus activities into an ecosystem-based approach. The integration of perspectives, the realisation of interlinkages, synergies and trade-offs and the system perspective is what appears to be key in any nexus approach or framework.

The IISD report (Bizikova et al, 2011) provides a brief overview of conceptual WEF nexus frameworks (e.g. World Economic Forum, ICIMOD etc.). The approach suggested by the World Economic Forum considers chronic resource shortages as well as economic, social and environmental pressures. The policy recommendations focus on regional infrastructure development, stakeholder engagement and innovation.

Figure 2: WEF nexus approach



Source: World Economic Forum, 2011

Examples of practical applications of the WEF nexus framework also exist. The Global Canopy Programme (GCP²) (Mardas et al, 2013) has worked with governments and regional partners in Amazonia (and elsewhere), using a WEF framework developed by FAO (2014)³ to:

1. Evidence the role and importance of achieving regional water, energy, food and health security in the context of climate and land-use change;
2. Assess the coherence of existing development, conservation and climate policy objectives, across national and subnational scales and public-private actors;
3. Develop policy recommendations to improve natural resource governance.

(GCP, 2017)

² <http://globalcanopy.org/projects/amazonia-security-agenda>

³ *The Water-Energy-Food Nexus: A new approach in support of food security and sustainable agriculture*



For the further development of the WEF nexus approach the European Commission (Rodríguez et al, 2015)⁴ has identified four “*transversal elements*” with a particular high influence on its future evolution:

1. Governance and policy aspects;
2. Economic and financial aspects;
3. Implementation aspects;
4. Social aspects.

The report notes “*These transversal aspects are highlighted as equally - or sometimes even more important - than technological advances to drive real change in the future water, energy and food security outlooks, as well as to create a path towards integrated and resilient solutions*” (Rodríguez et al, 2015).

Challenges related to applying the WEF nexus approach

Some of the key challenges of the WEF nexus approach are listed below (from Rodríguez et al, 2015), together with indications of how these challenges may relate to the Western Balkans region:

- **Governance and Policy:** The “*lack of political awareness about and engagement with the nexus*” is identified as a potential cause and an important barrier in the use of integrated water, energy and food approaches.

In the Western Balkans governance and policy related to the WEF nexus is likely to require participatory governance (including all relevant sectors and stakeholders in decision making), the use of collective regional intelligence and information sharing, and effective management of transboundary waters, e.g. through sound water allocation and water diplomacy.

- **Financial and economic aspects:** “*Water, food and energy prices are emphasized as highly influential factors with high levels of uncertainty and strong implications on one another*” (EC, 2014)

In the Western Balkans region, economic development (and differences within the region) may drive water, energy and food demand and increased competition and/or pressure on prices in the region. Water and energy prices will in turn increase food production and distribution costs and therefore increase the cost of food.

- **Implementation challenges:** Bridging the gap between scientists and policy makers and enabling technology transfer, adoption and ownership.

In the Western Balkans, policy and regulatory coherence, monitoring and enforcement may be key regional implementation challenges.

⁴ *The water-energy-food nexus: Foresight for Research and innovation in the context of climate change*



- **Disruptive events:** Identification and evaluation on the impact on the WEF nexus (e.g. resource security triggered migration)

Disruptive events may occur inside or outside the Western Balkans region, and the current project will help to identify and explore, in particular external global factors (drivers and trends) that may be influencing the region.

- **Capacity needs:** Considering the complex interactions between the different spheres included in the nexus the application of a nexus approach “*will require new institutional capacity both in industrialised and developing countries*” (Also in Bazilian et al, 2011)⁵

Institutional capacity may be an important issue in the Western Balkans region, in relation to the management of water, energy and food issues. The current project will help understand where there may be key gaps in current understanding or management of regional issues (especially those being influenced by global trends), and can help determine future capacity development needs.

Applying a nexus approach in the study on Water Use in the Western Balkans: regional outlooks and global megatrends

Task 1 of the project *Water Use in the Western Balkans: regional outlooks and global megatrends* is intended to focus on water in relation to energy and food trade-offs, using a nexus approach. In this task the methodology developed in ‘*Mapping Europe’s Future: understanding the impacts of global megatrends at the national level*’ (EEA, 2017) will be adapted and implemented to a regional case for the Western Balkans. In considering a WEF nexus approach, this task has:

- Undertaken a literature review to identify regional issues and vulnerabilities related to water, energy and food security.
- Considered which GMTs may be most relevant to the water-energy-food nexus, in particular in relation to issues and vulnerabilities identified in the region.
- Used qualitative visualisations (mind-maps) to explore how individual global megatrends as analysed by EEA in SOER 2015 may be connected to and influencing these identified regional issues.

More information on this approach and the outcomes will be presented at and form the basis of discussion during the Scoping workshop to be held in Ljubljana, 10-11 April 2017.

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⁵ *Considering the energy, water and food nexus: Towards an integrated modelling approach*



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