

The Water, Energy & Food Security Nexus

How to Govern Complex Risks to Sustainable Supply?

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In its 2013 report “Global Trends 2030”, the US National Intelligence Council described the interconnected risks in water, energy and food supply security as a “megatrend” that will gain global momentum in the near future. By 2030, demand for food, water and energy will have increased by 35, 40 and 50 percent, respectively. This will create new shortages and worsen those that already exist. The probable consequences – water scarcity, and food and energy crises – could endanger human health and destabilise political systems both within individual countries and beyond national borders. This comment focuses on the political dimension of such complex risks and outlines options for and barriers to their integrated governance.

The water, energy, and food sectors each face their own specific supply risks and corresponding political challenges, but they are also interdependent as part of the *water, energy and food security nexus* (WEF nexus). The agricultural sector, for example, consumes 70 percent of all freshwater worldwide. This water goes mainly into the production of food, but it is also increasingly used to grow biomass for energy. Demand for energy is increasing – partly because the global population is continuing to expand at a high rate, but also because more and more of the world’s population is becoming able to afford modern consumer goods such as mobile phones, televisions, refrigerators and air conditioning. More goods are being transported and individual mobility is also increasing. Furthermore, enormous quantities of water are required in energy pro-

duction processes, for example, in hydro-power generation, the cooling of power plants, biofuel cultivation and the extraction of oil sands and other unconventional types of oil and gas. Treating seawater and wastewater and producing artificial fertilisers for the agricultural sector are also extremely energy-intensive processes.

Population growth, changing lifestyles and diets and climate change are the main *drivers* of current developments in the WEF nexus. Climate change affects the distribution of water and the productivity of agriculture. It is making extreme weather events (storms, floods, droughts) more likely; and in the long term, rising sea levels and disappearing glaciers will reduce the amount of available freshwater even more.

The resulting challenges are highly complex and involve a great deal of uncertainty,

so it is difficult to gauge possible effects. Risk-based analysis provides a good foundation for informed decision making because it assesses probabilities, impacts and costs. In light of current trends, losses and damages in the WEF nexus will become both more likely and more severe in the future. Increasing globalisation and rising interdependencies add to the complexity of risks and risk management, creating the need for more international cooperation, as well as stronger links among the global, national and local levels.

The WEF nexus and its cross-sector connections and cross-border impacts pose a major challenge to policymakers. Often the main problem is not the scarcity of a resource or the lack of solutions, but the lack of political will to consistently implement integrated long-term measures for managing resources and risks sustainably. Therefore, the issue is both to increase the political will and to enhance the capacities to manage the WEF nexus adequately.

Cross-sector and cross-border governance of the WEF nexus?

Although it is easy to demonstrate the interconnectedness of the tasks of supplying the world with water, energy and food, there is no corresponding “nexus” of institutional capacities at the political level to address these interlinked needs and issues. If the supply challenges in the WEF nexus are to be dealt with properly, then cross-sector and cross-border cooperation and coherence of efforts will have to improve. Politicians have recognised this need and have discussed possible strategies at a number of international conferences, first and foremost during the “Bonn2011 Nexus Conference”.

Policymakers have also acknowledged the WEF nexus as a relevant area for the post-2015 development agenda and the sustainable development goals (SDGs) that are currently being discussed by the UN. In a recent poll of UN member states on their main priorities for the SDGs commissioned

by the UN Secretary-General, food, water and energy were the top three issues.

The *food sector* has the most experience with monitoring the supply situation and assessing supply risks at the international level. Since agricultural commodities are tradable goods, national and European Union (EU) policies affect the global market and agricultural policies are subject to large-scale regulation through trade regimes such as the World Trade Organization (WTO). Within the EU, agriculture is a common policy, which means that there is scope for reasonably strong, centralised control, and thus for policies that take the WEF nexus into account. For example, the EU cut back on its support for biofuels because they affect land and water use and thus also harm food supply. EU measures that link payments from the Union’s agriculture budget to performance in water and environmental protection (*cross-compliance* and *greening*) are also capable of playing a role in addressing the WEF nexus. However, not all efforts to implement these measures have been successful. Effective monitoring and sanctioning systems are lacking, and, at the same time, the bureaucracy involved creates obstacles; the EU will have to find solutions to these implementation challenges. Unfortunately, within the agricultural sector, which continues to receive the lion’s share of the EU’s budget, any proposed reform will inevitably face stiff opposition from the largest beneficiaries of the existing EU agricultural policy (France, Germany, Spain and Italy), which is unduly focused on expanding production.

Awareness of the WEF nexus is highest in the *water sector*. Nevertheless, implementation of corresponding policies is deficient at all levels. For instance, most bilateral agreements on transboundary watercourses focus on regulating how the water should be shared, rather than envisioning a complex, consistent cross-sector and cross-border system for managing WEF resources. Political institutions and policies are thus lagging behind the concepts, assessments and tools developed by experts, such as

integrated energy and water evaluation and planning systems or integrated water resources management (IWRM) and benefit sharing. At the local level, poor infrastructure holds back potential for integrated and sustainable resource management.

While the *energy sector* is quite powerful, it is currently under severe strain due to uncertainties in the supply situation and widely fluctuating prices. All of the new high-profile energy sources (biofuels and unconventional oil and gas) require substantially increased quantities of water and/or more land, adding to the need for a WEF nexus concept that can address these issues. The fact that policymakers in many countries are willing to accept these side effects on water and land-use underlines, however, that the issue of energy supply still generally takes precedence over other concerns. Three other features of the energy sector characterise risk governance as it currently stands. Firstly, most countries place priority on the security of their *national* energy supply. Although stronger links between countries and greater diversification would theoretically reduce the risks involved, policymakers are unwilling to accept the dependencies that this would create. Secondly, market logic dominates the energy sector – and this is coupled with, thirdly, a fragmented governance landscape consisting of multiple actors and institutions. All of these factors make it difficult to create a comprehensive networked system of global governance.

Continuing with a business-as-usual approach, however, will increase the supply risks associated with the WEF nexus. By contrast, the benefits of boosting cooperation and coordination would extend beyond simply improving the way the three resources are managed. But this kind of collaboration faces major obstacles of a practical political and geostrategic nature. Regional studies show that domestic *politics* and cross-border *conflicts of interest* are hindering cooperative and integrated approaches to WEF risk governance.

Hydropower *dams*, for example, combined with irrigation farming offer a great deal of development potential for the Himalayan region. But large dams also pose many risks – not only to the WEF nexus, to humans and to the larger environment, but also to cross-border relations in the region. Only after such (side-)effects and risks have been appropriately regulated will there be a realistic chance that this potential can be exploited in a sustainable and peaceful way. Local interests and clientelistic politics, however, often prevent this from happening.

It is well known that the management of *transboundary rivers* can be extremely fraught with conflict. At the heart of the political disputes between the countries on the Nile, for instance, are disagreements about how to share the water, which is in increasingly high demand. This conflict is hampering attempts such as the Nile Basin Initiative to develop an integrated and cross-border system of governance for the Nile water resources. Despite this, several bilateral cooperation agreements have been signed, most of which focus on the agricultural or energy sector. If these approaches help to ease the growing demand pressure on water resources, then they could also help to defuse the conflict over the water in the Nile. Rapid growth in regional populations and changes in consumer habits, however, create high levels of national demand for water, food and energy. This makes it more difficult to reach cross-sector and cross-border solutions that are based on benefit sharing. Given these pressures, it is also unclear whether existing bi- or plurilateral contracts and cooperative arrangements on international rivers will hold in the future.

Increase political will by setting agendas and goals

Far from being an inevitable fate, the complex risks associated with the WEF nexus can, in many cases, be managed and alleviated substantially through human action. For this to happen, however, existing poli-

cies and practices must be changed. First and foremost, WEF nexus supply risks must be placed on the *political agenda*. To facilitate this, interested actors from government, business and civil society should work together on improving risk communication while encouraging the broadest possible public participation. They should make it clear that the WEF nexus is a cross-sector and cross-border issue, and should call for a preventive and coherent political approach to addressing it. Only once the public recognises the interconnected cross-border risks – and opportunities – associated with the WEF nexus and pushes for a serious response will politicians be prepared to implement adequate measures.

When it comes to mobilising this political will, the UN's *post-2015 agenda* and the post-Rio+20 process of formulating SDGs for the water, energy and food sectors will play an important role. In September 2015, the UN General Assembly will be meeting to adopt a set of universal global sustainable development goals, detailing specific priorities for subsequent action. These goals should be measurable and set within a clear timeframe. Member states will then need to translate these goals into national targets and report their progress in relation to specific indicators. Cross-links within the WEF nexus should be kept in mind throughout this process – for example, by following the concept of cross-compliance and including for each individual sector goal supplementary provisions dealing with the other sectors within the nexus.

A *review process* should be set up to ensure that the international community can actually follow up on and work with the goals. This would involve analysing, for example, whether countries had been able to reduce the risks emerging from the WEF nexus in the process of working toward the goals. If the results showed that this had not been possible, the next step would be to identify where improvements and support are needed. As the review process would require *reliable data* on the selected indicators, capacities in this area must be built up and

expanded. If the risks, the need for action and the options for action become more transparent and visible through such a review, this could also increase the political will to intervene and to scale up action.

Unlike the current Millennium Development Goals (MDGs), the SDGs will be universal, and developed countries will also have to comply with their commitments. For these countries, one of the main aims must be to *decrease levels of consumption and waste*. They should develop *best practices and innovative technologies* to reduce the risks in the WEF nexus and then share these solutions with other countries. In regard to the *means of implementation*, they should also make financial resources available to countries in need – firstly, to uphold human rights by guaranteeing access to water, energy and food for all, and secondly, to enable developing countries to make the “leapfrogging” transition to sustainable management of resources in the WEF nexus.

Making this transition a reality will be costly in the short term. Unfortunately, political decision makers operate within short-term election cycles and tend to avoid taking on extra burdens within that time span. Looking further ahead, however, the interconnected and cross-border risks involved imply that it will be in the informed interests of every country to help change the way the world handles the WEF nexus.

Policy recommendations

Although the connections between water, energy and food security are obvious, there is still no corresponding “nexus” of capacities to address and manage the resulting challenges at the international political level. But if policymakers are to sufficiently assess and tackle risks in the WEF nexus, they will need to develop comprehensive and coherent governance measures, both within each of the three sectors and across them. This is the bottom line of our policy recommendations, which are as follows:

► The connections and interactions in the WEF nexus point to the need for *coherence in policies and institutional structures* that address resource supply and sustainable development. When policymakers are dealing with supply risks in one of the sectors, they should keep an eye on the other two sectors and ensure that their activities do not increase the risks there. Given the existence of non-linear and potentially crisis-prone developments, governance of the WEF nexus should also become more *adaptive* and should always follow the *precautionary principle*.

Good approaches for achieving this exist in all three sectors, as well as in international sustainability policies. In most cases, however, the approaches are not implemented consistently. The clearest example of this is surely in international *climate protection*, where development interests and distributional conflicts are severely hampering global agreements and efforts to put mitigation measures into practice. Comprehensive measures for climate change *adaptation* and for *disaster risk reduction* should serve as key components of a coherent political response to the complex risks associated with the WEF nexus. It is essential, for example, to increase resilience to water related disasters like floods or droughts.

► An integrated perspective is crucial for *data collection and analysis* and for risk assessments, since misjudgements are inevitable if side effects are not taken into account. Foundational efforts in this area have been made in the food sector and in disaster management systems. To draw on and expand these approaches, efforts should be made to promote cross-sector exchange between existing information systems.

A permanent *Intergovernmental Panel on Global Sustainability* should be set up to collect and analyse data on complex risks. The panel could then use the data, for example, as a basis for ex-ante and ex-post *nexus impact assessments*. This information could be fed into the global sustainable development

report that is supposed to inform the new high-level political forum on sustainable development.

► While *access* to water, food and energy for all must be guaranteed, the *planetary boundaries* should not be ignored but must be integrated into a nexus approach. To avoid or at least minimise these conflicting goals and trade-offs, the world must become vastly more efficient in the way it consumes resources. Developed countries must, in part, reduce their consumption in absolute terms so as to avoid overexploitation.

The political processes on the *post-2015 agenda and the SDGs* – both currently being negotiated at the UN – have the potential to put these politically delicate matters and distributional conflicts on the agenda and to cultivate the necessary will to undertake reforms. Germany and the EU should campaign for ambitious goals for the sustainable management of water, energy and food resources. Obviously, these goals must take account of the *interlinkages* within the WEF nexus. By 2020, for example, the agricultural sector and the energy production sector should both become at least 20 percent more efficient in their use of water. The amount of water being treated worldwide must also rise by at least 20 percent in this period, while water pollution and food waste must be reduced by at least that amount. Beyond this, the international community should set even more ambitious goals for 2030. The 2013 Stockholm Statement calls for a doubling of global water productivity by 2030, i.e. to globally double the value derived from each litre of water used. The Secretary-General's initiative "Sustainable Energy for All" promotes the goal of achieving universal access to modern energy, doubling the share of renewable energy in the global energy mix, and doubling the global rate of improvement in energy efficiency by 2030. The first two targets, however, will require supplementary provisions dealing with water and land use.

Efforts to implement such goals at the national level and the accompanying review processes should take account of specific local and sector conditions.

► A number of political and economic *instruments* exist for handling complex risks in the WEF nexus. They need to be more consistently applied, however. Above all, *subsidies* that cause undesirable side effects in the WEF nexus must be abolished or restructured. The goals and requirements of neighbouring sectors should also be taken into account (cross-compliance). The EU's "greening" approach to agricultural policy should be further developed and implemented, and there should be tougher penalties for those who violate the rules.

The EU proved that public subsidy systems can be restructured when it changed the rules on its funding measures for bio-fuels. *Harmful fossil fuel subsidies* that undermine sustainable development should be eliminated, and Germany should focus on encouraging the G20 to speed up its efforts in this regard. A classification of subsidies could also be considered as a means to restrict those with a negative impact on the WEF nexus, based on a system similar to the existing WTO catalogue of subsidies' trade effects. In the end, appropriate sustainability criteria must be set for all energy sources. They should be adaptable to local conditions, such as the amount of water or land that is available. This will require setting up a database, for example, in the form of a global map of stocks and shortages.

Moreover, the EU *trade and investment* policies should be adapted. Safeguard clauses could be introduced, for example, in order to create exceptions in cases of local crises and to allow poor countries to suspend exports if they need the goods for their own population.

► *Price incentives* can help to reduce resource consumption and boost efficiency. What is needed here are prices that fully reflect negative externalities within supply chains

or "nets". This would mean, for example, that calculations of food prices would include energy costs, water costs, land use, and contributions to climate change or biodiversity loss. The true costs of meat production, for instance, should be reflected in the price of meat products.

These reforms should also always take account of the *social dimension*. If necessary, effective compensatory measures will need to be put into place. For example, energy and water prices could be socially differentiated and staggered. Such a system would be based on a basic tariff, and each household would receive, according to its size and income, a reasonably priced allocation to cover its essential needs. This could help to raise public acceptance of higher prices.

► Maintaining or improving *ecosystem services* (ESS) should be rewarded. As far as the WEF nexus is concerned, these include activities that help to preserve and regenerate soils or that focus on the natural filtration and storage of rainwater. ESS is a controversial concept; some countries and NGOs reject ESS on the grounds that it is inappropriate to put a value on nature in this way. However, when goods and services are not given a monetary value, this often results in overexploitation and leaves the general public to shoulder the costs and consequences. Current ESS programmes should be evaluated to help policymakers better assess their impact – including potential negative side-effects – and develop best practices.

► *Development policies* should promote measures that reduce vulnerability and increase resilience to complex risks in the WEF nexus.

One way of doing this is to take a more systematic approach to monitoring *demographic* risks and chances. Countries that have high levels of population growth should receive targeted support for their efforts to promote family planning and sexual and reproductive health. In addition, taking demographic aspects fully into

account would also mean using managed migration schemes as adaptation strategies to better cope with WEF risks.

Beyond that, the focus should be on providing coordinated support for *infrastructure* measures, which might include constructing more efficient irrigation systems or systems for collecting and storing (rain)water, replacing leaky water lines and inefficient power lines, expanding decentralised renewable energy systems and improving supply chains in order to prevent losses.

Nexus solutions need to be *context-specific*. It is important to assess local needs and capacities, demand and supply, as well as interests and power structures at the local level. *Capacity development* could involve clarifying land rights issues, promoting good governance and fighting corruption. More specific support with processes such as the transition to drought-resistant crops should be provided to minimise particular risks to local farmers.

► Enormous *inefficiencies* exist in the way that water, energy and food are produced, stored, processed, distributed and used. All countries will need to undertake domestic efforts to reduce these problems, which will require support of *research and innovation* on how to further reduce resource consumption and waste. Solutions might include more efficient methods of irrigating land, conserving and treating water, and growing crops. Supply chains and transport and marketing channels should also be assessed for improvements. Countries worldwide must be given access to the most efficient technologies and must be equipped with the capacities to implement the best policy frameworks. To scale up the impact of these efforts, *funds* should be allocated to the transfer of technologies and best practices.

► It is also important to pick up on constructive ideas and voluntary initiatives by *non-governmental pioneers*. For instance, business networks such as the World Economic Forum or the (particularly risk-sensitive)

insurance industry have been monitoring potential supply bottlenecks in the WEF nexus for quite some time already. Various civil society organisations and public-private partnerships for sustainable development have been testing and evaluating promising concepts, tools, and pilot projects. The Global Water Partnership (GWP), for example, supports the implementation of integrated water resources management through a tool box and regional or country partnerships. The Alliance for Water Stewardship (AWS) develops an international standard on the socially equitable, environmentally sustainable and economically beneficial use of water resources. The International Union for Conservation of Nature (IUCN) and the International Water Association (IWA) have initiated the Nexus Dialogue on Water Infrastructure Solutions to identify innovative approaches to the use of infrastructure, technology and finance to deal with challenges in the WEF nexus.

Concepts developed by such actors or organisations could be reviewed and should receive support if appropriate.

► The relevant national, regional and international *institutions* should cooperate more closely and increase their focus on cross-sector and cross-border collaboration in the WEF nexus. To keep administrative costs down, coordination and cooperation should be focused on those areas that are most interdependent. *Dialogue platforms and interagency mechanisms* could offer potential starting points. Incentives are needed to make such inter-sectoral cooperation attractive for all sides. One incentive would be to link the allocation of funds for (coordinated) projects to “nexus criteria”.

At the UN level, Germany and the EU should call for the new *high-level political forum on sustainable development* to be equipped with the capacities to fulfil its mandate and to address cross-cutting issues such as the WEF nexus and to provide political guidance to the relevant UN institutions. In this context, Germany and the EU should also advocate an effective *review*

process for the post-2015 goals on sustainable development to be included among the forum's tasks.

At the EU level, the different timeframes for defining policies and negotiating budgets in the relevant sectors should be kept in mind and used at the right time.

► In the case of *regional conflicts*, cross-border collaboration in monitoring supply risks can create transparency and build up trust. *River commissions* for transboundary watercourses should be set up wherever they do not already exist and should include representatives of all countries and stakeholders affected. The commissions would help to negotiate fair agreements on water sharing and should also review whether a given situation lends itself to forms of transboundary and local-level benefit sharing within the WEF nexus, for example, by swapping electricity for food. Conflicts might be easier to deal with if the benefits from the cooperation were shared rather than the water being divided between the parties. Moreover, such commissions should include a dispute resolution mechanism.

► The UN *Convention on the Law of the Non-Navigational Use of International Watercourses* offers a good basis for this kind of cooperation. Germany and the EU should use 2013 – declared by the UN as the International Year of Water Cooperation – to encourage their partner countries to ratify the convention.

In addition and as already agreed in 2003, the member states of the United Nations Economic Commission for Europe (UNECE) should now formally approve opening up the *Convention on the Protection and Use of Transboundary Watercourses and International Lakes* for accession by non-member states. This could be an important part of the recent initiative by the Council of the EU on *water diplomacy*.

This SWP comment is a summary of the findings of a SWP research paper (in German):

Marianne Beisheim (ed.)

Der Nexus Wasser-Energie-Nahrung. Wie mit vernetzten Versorgungsrisiken umgehen?

SWP-Studie 11/2013 (82 pages), with contributions by Steffen Angenendt, Marianne Beisheim, Susanne Dröge, Sybille Röhrkasten, Bettina Rudloff, Tobias von Lossow, Christian Wagner, and Kirsten Westphal

For further reading, see also:

Susanne Dröge and Kirsten Westphal

Shale Gas for a Better Climate?

The US Fracking Revolution Challenges European and International Climate Policy

SWP Comments 25/2013, August 2013

Hanns Günther Hilpert and

Stormy-Annika Mildner (eds.)

Fragmentation or Cooperation in Global Resource Governance?

A Comparative Analysis of the Raw Materials Strategies of the G20

SWP Research Paper 1/2013, March 2013 (204 Pages)

Bettina Rudloff, Arno Engel and

Lisa Oberländer

Contingency planning for food crises

SWP Working Paper FG 2, 2012/No. 3

Marianne Beisheim

Post-2015 Sustainable Development Goals. UN Negotiations Begin

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