



WORKING PAPER



Making governance work for water–energy–food nexus approaches

By Andrew Scott



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About this Working Paper

Accelerating the shift to climate compatible development is CDKN's business and improving the lives of the most climate-affected people is our mission. A multi-year, GBP 130 million programme funded by the British and Dutch governments and many others, CDKN works to support climate compatible development in Asia, Africa, Latin America and the Caribbean.

Our programme provides technical assistance to governments as well as research-into-action projects that fill gaps in our understanding of climate change impacts and solutions. A further, crucial part of CDKN's programme is knowledge management and policy engagement, an effort to which this Working Paper contributes. We synthesise information on the collective performance of governments, as well as non-state actors, in tackling climate change. We convene online discussions and in-person events to assess how climate actions are serving the most climate-affected people and how climate action could be more ambitious and effective. Find more CDKN thought leadership, including news of our latest events, on www.cdkn.org or follow us on twitter @cdknetwork

What is climate compatible development?

Climate compatible development is defined as "a 'development first' approach that minimises the harm caused by climate impacts while maximising the many human development opportunities presented by a low-emissions, more resilient, future".¹ In other words, development, climate adaptation and climate mitigation should go hand in hand, and one should not undermine the others.

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Rice farmers in Aceh, Indonesia

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Guide to acronyms

CDKN	Climate and Development Knowledge Network
CIDP	County Integrated Development Plan (Kenya)
IPCC	Intergovernmental Panel on Climate Change
RPJMN	<i>Rencana Pembangunan Jangka Menengah Nasional</i> (National Medium-Term Development Plan) (Indonesia)
WEF	water–energy–food
WRMA	Water Resources Management Authority (Kenya)

Executive summary

The concept of the water–energy–food (WEF) nexus has become widely used to help understand interdependencies among the three systems, and how they can be managed sustainably to meet growing demand. The WEF nexus has especially been advocated to address conflicts among the sectors. However, governance in the WEF nexus has not received much attention in the literature, particularly the institutions and politics governing the WEF sectors. This paper synthesises findings from CDKN-supported research that has sought to improve understanding of how governance affects the effectiveness of nexus approaches – that is, approaches that understand the links between sectors, recognise these in decision-making and promote integrated policy-making. The paper draws from findings in Indonesia and Kenya to show that the effectiveness of the horizontal (cross-sectoral) and vertical (between levels of government) coordination that is essential for a nexus approach is determined by institutional relationships, which can be influenced by political economy factors. The capacity of governing organisations to understand nexus links and to collaborate with each other is also critical. The paper suggests that aiming for the ideal of comprehensiveness and integration in a nexus approach may be costly and impractical. Nevertheless, horizontal and vertical coordination are essential. Local-level decision-making will determine how trade-offs and synergies in the WEF nexus are implemented. The capacities of local government organisations and decision-makers need to be strengthened to enhance their capacity to adopt nexus approaches and coordinate vertically.

Introduction

The natural resources used for water, energy and food are under increasing pressure across the world. Growth in both population and incomes is increasing consumption globally, stretching towards the planet’s ecological boundaries.² At the same time, millions of people, predominantly in developing countries, lack adequate access to water, energy and food. Climate change exacerbates the pressure on all three resources, and makes millions of people more vulnerable to insecurity in their availability.

These trends are cause for debate about the best way to manage the natural resources used for water, energy and food. To help meet growing demand and enhance the sustainability of limited water, energy and food resources, innovative approaches are required. To achieve the Sustainable Development Goals, and ensure that everyone has enough clean water, energy and nutritious food, changes will be needed in the ways they are produced and consumed.

The challenges of water, energy and food security are interrelated. Climate change is likely to intensify the risk of insecurity and the significance of interdependencies.³ The challenges need to be addressed simultaneously. Understanding and managing the links among food, water and energy is therefore essential for formulating policies for more resilient and adaptable societies.⁴ The concept of the water–energy–food (WEF) nexus has become widely used to help understand the complexities of these interdependent systems.

Because of increasing resource scarcity and the threat of climate change, policy-makers and planners have given greater recognition to the links between water, energy and food systems in recent years. Proponents of the WEF nexus as an approach to planning and resource management highlight the need to improve efficiencies in resource use to reduce environmental degradation and maximise the social and economic benefits of increasingly scarce natural resources. The WEF nexus has been advocated especially as a way to address conflicts or trade-offs among the water, energy and food sectors.

Climate compatible development approaches reflect synergies and trade-offs among poverty reduction, climate change mitigation and adaptation to climate change.⁵ Water, energy and food security are central to the pursuit of climate compatible development.⁶ The three sectors are all vulnerable to the effects of climate change and they all contribute to climate change through

greenhouse gas emissions. Climate change affects medium-term water availability, agricultural potential, and the production and consumption of energy.⁷

The direct impacts of climate change on human development can be clearly seen in each sector, for example through changes in water availability and crop production. Climate change affects water, energy and food security indirectly through effects on prices and industrial production. Among the key risks for future development, identified by the Intergovernmental Panel on Climate Change (IPCC), are “food insecurity and the breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes, particularly for poorer populations in urban and rural settings”, and “loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions”.⁸

The concept of the WEF nexus enables a more coherent or integrated approach to the management of natural resources and can assist in the identification of synergies and conflicts in the pursuit of climate compatible development objectives.⁹ Climate compatible development approaches would be enhanced when explicit account is taken of synergies and trade-offs between the WEF sectors.

The core premise of the WEF nexus approach is that the policy objectives in one sector (water, energy or food) can interact with those in other sectors, because they are either preconditions for the realisation of another sector’s objectives, or one sector (system) imposes conditions or constraints on what can be achieved in the other sectors. In other words, some policy objectives have synergies across sectors, while others require choices to be made between objectives in different sectors. Objectives in different sectors can also reinforce action towards objectives in other sectors.¹⁰

The nexus concept embraces socioeconomic links between the sectors, as well as ecological links, providing analytical frameworks to understand trade-offs and synergies, help increase efficiency, and improve governance in food, water and energy systems.¹¹ The governance context, along with the formal and informal rules that dictate how decisions affecting the allocation of resources are made, determine the outcomes of a nexus approach.¹² This context includes civil society and private sector actors, as well as the public sector.¹³

In the absence of nexus thinking in planning and policy-making for water, energy and food resources, interactions between the systems have been overlooked. Such siloed approaches have resulted in incoherent policy-making, contradictory strategies and the inefficient use of natural resources.¹⁴

Until very recently, governance questions related to the WEF nexus have not had much consideration in the literature, particularly in the context of the institutions and politics governing the WEF sectors.¹⁵ Indeed, there is very little evidence about how the nexus approach has worked in practice. Leck et al. provide a brief history of WEF nexus thinking,¹⁶ and Weitz et al. (2016) review the literature on “integrative environmental governance” to fill in some of the gaps.¹⁷

Research supported by CDKN has sought to improve understanding of how governance affects the effectiveness of nexus approaches. Specifically, the research has explored the extent to which policies and plans for the three WEF sectors are coordinated or integrated in Indonesia and Kenya.¹⁸ CDKN also supported research on nexus integration in the Amazon basin.¹⁹ The findings from this research highlight the importance for a nexus approach of vertical coordination, across levels of government, as well as horizontal coordination across the WEF sectors. They also point to the need to strengthen the capacity of local government organisations to adopt a nexus approach.

This paper synthesises the findings from the CDKN-supported research, relating these to the wider nexus literature and drawing lessons for the promotion of climate compatible development. The next section provides the background to WEF nexus approaches and the role of governance in the nexus. The third section discusses vertical and horizontal coordination and integration. This is followed by a brief discussion of the application of nexus knowledge. The final section presents conclusions.

Background

Food, water and energy systems are inextricably linked. In this water–energy–food (WEF) nexus, actions in one system, or sector, affect the other two. The production of food requires water and energy. The supply and distribution of clean water requires energy and land-based ecosystems. The production of energy requires water and land. Choices about food production affect the use of energy and water, while choices about water and energy supplies affect land use. Moreover, these interdependencies are dynamic.²⁰ However, policies and actions tend to be decided in each sector without due consideration of the consequences for the other sectors in the nexus.

Policies and actions decided in one sector can aggravate resource constraints by overlooking their impact on other sectors. In South Asia, for example, agricultural policy has increased grain production, as intended. But subsidies have resulted in the overuse of water and energy, putting huge pressure on water and energy resources, and weakening the sustainability of the food system.²¹ Deforestation in the Amazon basin, in pursuit of food production and the development of energy resources, has a negative effect on rainfall and water resources.²² Similarly, in Indonesia an assessment of nexus links found that resource trade-offs between different sectors could undermine achievement of policy objectives for water, energy and food security.²³ A WEF nexus perspective or approach introduces the question of how to minimise conflicts (i.e. trade-offs) between the three sectors, and how to promote synergies.

What is a nexus approach?

There is no consensus interpretation of what a WEF nexus approach is. In his 2011 seminal paper,²⁴ Hoff suggests that nexus thinking is concerned with addressing externalities across sectors. Instead of a focus on productivity within a sector, a nexus approach focuses on overall system efficiency. Similarly, Rasul describes the nexus approach as “a system-wise approach that recognises the inherent interdependencies of the food, water, and energy sectors for resource use”.²⁵ Allouche et al. suggest that a WEF nexus approach seeks to integrate sectors by making the interdependencies visible, addressing externalities that link the sectors.²⁶ In a CDKN thought piece, Dupar and Oates suggest that nexus thinking might be a shorthand way to reflect a “confluence of trends” and the need for explicit choices and trade-offs in policy-making.²⁷

The idea that natural resource sectors are interdependent is not new.²⁸ It is inherent to the thinking of many environmental organisations and is axiomatic for people living in rural communities. Nor are nexus approaches entirely new.²⁹ The WEF nexus is similar to concepts that have been used previously in development policy and planning, such as integrated water resources management. In the 1960s, ‘integrated rural development’ was the term used to describe multi-sectoral interventions that required a single administrative framework.³⁰ At the local level, integrated approaches have been practiced for many years, though they may not have been called nexus approaches.³¹

The nexus approach has also been defined in terms of its absence. Without an integrated approach, interactions between the WEF systems may be overlooked. This can lead to incoherent policy-making and contradictions in the implementation of policies in different sectors.³² In other words, through understanding of the interactions between the WEF sectors, a nexus approach helps strengthen coordination across them. When a nexus approach is followed, potential conflicts or co-benefits (synergies) can be identified, and it helps decision-making to optimise trade-offs and synergies. Treating the three sectors of the WEF nexus holistically would lead to a more optimal allocation of resources, improved economic efficiency, lower environmental and health impacts, and better economic development conditions.³³

Allouche et al. find that the WEF nexus approach treats the trade-offs between water, energy and food systems as an equilibrium model which can be used to help decision-making.³⁴ The association of much recent nexus thinking with integrated assessment modelling may partly explain this. The nexus approach encourages monetisation of natural resources and ecosystem services, to enable the assessment of trade-offs and synergies, but it does not reflect social externalities (e.g. inequalities and human rights). Local priorities and needs may be overlooked by the wider economic and nexus calculus.

The WEF nexus itself is not consistently interpreted, however. A nexus approach often begins from the perspective of one sector and then attempts to integrate others.³⁵ Literature that considers all three

sectors of the WEF nexus in detail, from a social science theoretical or applied angle, is scarce. In some cases, the nexus itself has different dimensions, such as 'water, food and trade' or 'water, energy, food and climate'. When policies are designed to focus on multiple sectors, nexus analyses often focus only on two resources and two-way interactions.³⁶

The core of the idea of a WEF nexus approach, however, is one that (i) understands the links and interdependencies between the WEF sectors, (ii) explicitly recognises these interdependencies in economic decision-making, (iii) identifies integrated policy solutions that minimise trade-offs and maximise synergies, and (iv) ensures coordination across sectors and stakeholders.³⁷

Governance and the water–energy–food (WEF) nexus

Literature on the WEF nexus tends to discuss management of the nexus in order to achieve cross-sectoral integration, to decide trade-offs and exploit synergies.³⁸ Management of the nexus is largely seen as a question of understanding the links between the water, energy and food systems and making decisions about resources accordingly. Integrated planning across the WEF sectors is necessary to identify trade-offs between sectors and ensure the efficient use of resources.

A comprehensive, integrated approach to the management of water, energy and food resources, which a nexus approach demands, requires coordination, harmonising public policies, and the alignment of strategies, regulations and incentives.³⁹ It also requires platforms for cross-sectoral coordination, decision-making and implementation. In other words, a nexus approach requires the institutions and processes of governance.

Governance for the WEF nexus can be understood as the formal and informal processes and institutions for integrated policy- and decision-making across the WEF sectors. This has similarities with environmental governance, which may be described as the regulatory processes and organisations used by different actors to influence environmental actions and outcomes,⁴⁰ and the governance of food security, described by FAO as the "formal and informal rules and processes through which interests are articulated and decisions relevant to food security in a country are made, implemented and enforced".⁴¹ However, the nexus literature does not provide much analysis of governance questions.

Nexus research largely overlooks explanation of the presence or absence of integrated approaches and cross-sectoral coordination, or the factors that influence nexus governance.⁴² Although governance is important for decision-making relating to interdependencies between the WEF sectors, in practice cross-sectoral links in policy-making and policy implementation are often weak.⁴³ Barriers to integration include "historically entrenched vertically structured government departments"⁴⁴ and sector-based policies and regulations, as well as spatial differences between jurisdictions and ecosystems.

Two aspects of nexus governance are worth noting from the literature. The first stems from the technical, managerial perception of nexus decision-making found in much of the literature, which has the premise that more information about links between the sectors aids rational decision-making. Weitz et al. suggest that this "distances itself from the reality of decision-making processes and governing".⁴⁵ However, decisions about access to and use of natural resources are politically salient. In situations of increasing scarcity and potential conflict over resource use, these decisions "occur within politically charged and contested realities".⁴⁶ Consequently, the political economy context of nexus decision-making influences the way nexus approaches are implemented. Vested interests and unequal power relationships can determine how WEF nexus interdependencies are handled, affecting the effectiveness of coordination and decision-making.

The second important aspect of nexus governance from the literature is recognition that nexus approaches require coordination or integration across levels of government, as well as across sectors.⁴⁷ This means coordination between central and local governments within countries. When the ecosystems in question cross borders, it can entail coordination between national governments. The elements of a nexus approach may also need to vary between levels of government, or between policy-makers and policy implementers.⁴⁸ For example, for national policy-makers the emphasis may be on embedding nexus principles in policies, while for mid-level administrators it might be on the practical application of nexus thinking through policy instruments, such as planning guidelines, planning approvals and environmental impact assessments.⁴⁹

To begin to fill the gap in the literature, research supported by CDKN explored nexus governance questions, relating these to promotion of policies for climate compatible development. The next section discusses the findings from this research regarding the challenges of vertical and horizontal integration in contexts of changing governance frameworks, in Indonesia, Kenya and the Amazon basin.

Coordinating horizontally and vertically

Nexus approaches entail integrated policy-making and implementation across the WEF sectors and across levels of government. At a minimum, this involves the coordination of multiple actors in each of three sectors at both central and local government levels. The complexity of the challenge is illustrated by the examples of Indonesia, Kenya and the Amazon basin, where reviews were undertaken of the coherence of policy frameworks for the nexus.

A strong legal architecture connects the WEF sectors in Indonesia (see Box 1). Water security is a priority for all the WEF sectors, though there are differences between them in the priority given to the various means to address it. Strategic plans for the energy and agriculture sectors, for example, do not prioritise forest conservation for improving water security, while national water objectives do. This is despite the potential synergies for emission reductions in the agriculture and energy sectors (depicted in Figure 1). Overall, the terrestrial environment and forestry sector is particularly well connected legislatively with the water and energy sectors. The energy sector is the least well connected.⁵⁰ For all sectors, the legislation is oriented towards maximising production, and there is little recognition that environmental sustainability is important for maintaining water, energy and food security.

The legislation in Indonesia relies on the use of subsidiary regulations, which establish the frameworks for coordination. The links between WEF sectors are often more explicit in sectoral policies and strategic plans, but there is also a lack of clarity on the relative hierarchy of various regulations, policies and plans. The complexity of the legal framework and varying levels of decentralisation between sectors heighten the coordination challenge.

Box 1. The water–energy–food nexus in Indonesia⁵¹

Sustained economic growth in Indonesia has been achieved by exploiting the country's abundant natural resources – including 98 million hectares (ha) of forest, 57 million ha of agricultural land, substantial renewable water resources and large hydrocarbon reserves. Over a quarter of GDP is directly based on natural resources and most manufacturing is dependent on them.

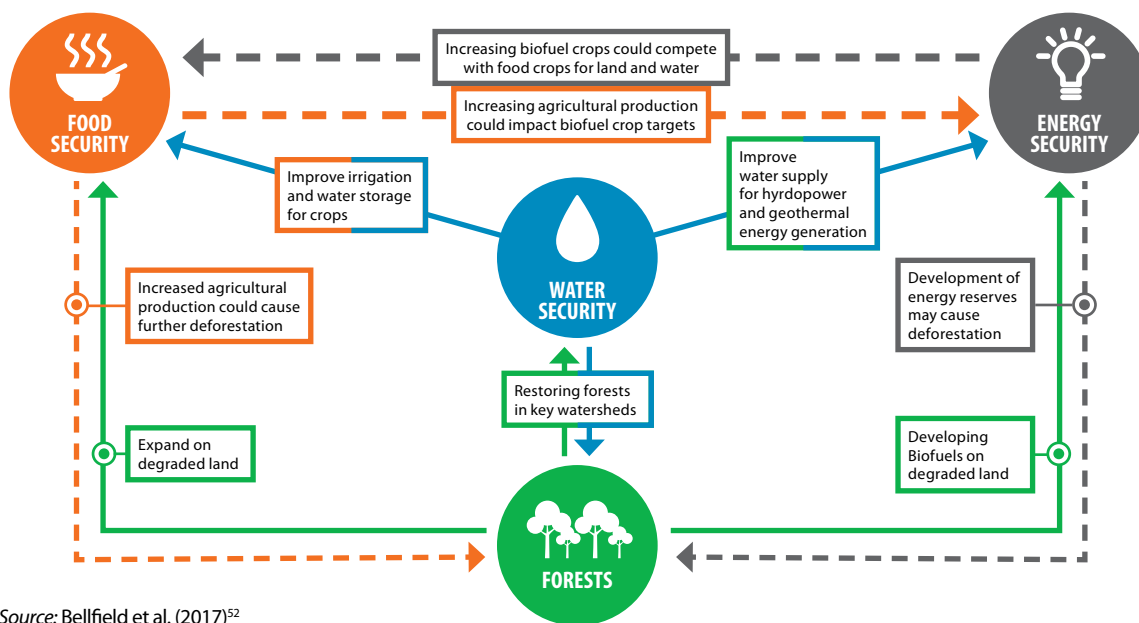
Indonesia has the highest rates of deforestation in the world. Between 1990 and 2012, an average of 918,678 ha of forest was lost each year. The drivers of deforestation include oil palm and industrial timber plantations, illegal logging, mining and agricultural expansion. Deforestation has contributed to widespread watershed degradation and high rates of river sedimentation, as well as greenhouse gas emissions. Seasonal forest fires to clear agricultural land have resulted in national and regional air pollution, with devastating health impacts.

Water resources, which are abundant if unevenly distributed, are critical to food security and energy security. However, water quality and supply are dependent on forest ecosystem services. Limited water storage capacity, the depletion of groundwater, and the degradation of watersheds are important challenges for improving water supplies, one of Indonesia's development goals. Climate change is likely to increase pressure on water resources through changing rainfall patterns and extreme weather events.

Indonesia's domestic hydrocarbon-based energy production cannot currently meet demand. The main targets for energy security in the National Medium-Term Development Plan, *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN), are to maintain energy supply and achieve universal access to electricity. This includes increasing production of coal and gas, while raising substantially the share of renewables in the energy mix. Biofuels for transport and water resources for hydropower will be part of the strategy to achieve this.

Indonesia, where a third of under-fives are malnourished, aims to improve food security and achieve self-sufficiency in staple foods through increased domestic production, with targets for rice, soy, maize and sugar. This is to be achieved by increasing productivity, expanding the area under crops and protecting cultivated land from conversion to other land uses.

Figure 1. Trade-offs and synergies in the Indonesian WEF nexus



Source: Bellfield et al. (2017)⁵²

The implementation of development plans in Indonesia is primarily at the provincial or district level, with local governments having authority to define their own development priorities. A review of the coherence of the country’s WEF nexus policies and regulations found a disconnect between the national legal framework and implementation at provincial and district levels.⁵³ Local government development plans tend to see the RPJMN – Indonesia’s principal development planning instrument – as a set of options to choose from rather than a framework to follow. However, local governments have significant responsibilities for natural resource management and land-use planning, and their decisions will determine whether national water, energy and food security objectives in the RPJMN will be achieved.

In Kenya (Box 2), devolution under the 2010 constitution has resulted in a range of national and county actors having responsibility for WEF nexus matters. Figure 2 illustrates the variety of nexus stakeholders identified in just one county. The governance of natural resources “incorporates a multitude of structural and regulatory forms across a variety of different stakeholders”.⁵⁴ However, sectoral legislation has yet to be fully aligned with the devolved responsibilities. One consequence has been confusion and disagreement about the roles and responsibilities of the various institutions involved in water planning, which has delayed legislative approval for a new water bill. The review of policy coherence for the WEF nexus in Kenya found that, in the absence of a legal framework for integrated approaches, coordination and collaboration across sectors is dependent on the behaviour of individual actors.

Development planning at the county level in Kenya is through the County Integrated Development Plan (CIDP), which must reflect sectoral plans and be developed with public participation. The CIDP, for example, addresses food security, including a variety of agricultural projects and technical support services.⁵⁵ Counties are also expected to develop a climate change response strategy that is aligned with the National Climate Change Response Strategy.

At the county level, integrated planning across WEF sectors was found to be quite limited. The lack of cross-sectoral coordination found at the national level has been duplicated in the counties, with fragmented and sometimes duplicative project implementation.⁵⁶ Integrated planning for competing water needs was particularly weak, with the new (2010) constitution and the old Water Act operating in parallel. The national Water Resources Management Authority (WRMA), for example, is responsible for water licences, catchment and sub-catchment plans, and water quality testing. The county governments are responsible for water projects (e.g. dams and boreholes) and water conservation. Lack of clarity about roles results in national water needs taking priority over community water needs. More generally, county governments were found not to be driving development strategy within their counties because central government bodies have stronger decision-making power.⁵⁷

Box 2. The water–energy–food nexus in Kenya⁵⁸

Sustained economic growth in Kenya over the past decade, combined with rapid population growth, have substantially increased demand for water, energy and food resources. GDP growth in 2016 was around 6% and the population reached 48 million. Kenya’s *Vision 2030* aspires to “a high quality of life for all of its citizens by the year 2030”, with the generation of more energy, higher incomes from agriculture and investment in water infrastructure. The country’s development pathway is leading to increasing competition between sectors and social groups for land and water. Climate change will exacerbate the pressures on natural resources, and the government has recognised its threat to future development.

Kenya is already a water-scarce country. About 80% of the country is arid or semi-arid, and surface water resources cover only 2% of its total surface area. Agriculture, which has the greatest demand for water, employs 75% of the labour force and provides about a quarter of GDP. Only 16% of land is arable. Most is rainfed (2.4 million ha) and vulnerable to rainfall variability. Irrigated agriculture is quite limited (0.1 million ha), but the Government plans to invest heavily in irrigation to ensure food security, placing greater demands on the country’s water resources.

Wood fuel and biomass account for 68% of Kenya’s primary energy consumption, and are expected to remain the main source of energy for the foreseeable future. Energy demands affect the food and water sectors primarily through deforestation, which leads to land and water degradation. A critical trade-off is the use of limited arable land for food cultivation for food security, or tree cultivation and biofuels for energy security. An additional source of resource competition is between the demands of hydropower and irrigation, notably on the Tana River.

Figure 2. WEF nexus stakeholder map for Laikipia county, Kenya



Guide to acronyms, above. ACK: Anglican Church of Kenya. ALN: Africa Legal Network. AWF: African Wildlife Foundation. BAT UK: British American Tobacco. CETRAD: Centre for Training and Integrated Research in ASAL Development. CFA: Community Forest Association. KFS: Kenya Forest Service. KWS: Kenya Wildlife Service. NEMA: National Environment Management Authority. NDMA: National Drought Management Authority. NWSB: Northern Water Services Board. PRC: Protestant Reformed Church. SACDEP: Sustainable Agriculture Community Development Programme. TILT: Tree is Life Trust. UNDP: United Nations Development Programme. UNEP: United Nations Environment Programme. WRMA: Water Resources Management Authority. WRUA: Water Resource Users Association.

Source: Byakika et al. (nd)⁵⁹

Lack of coordination between sectoral departments at the national level has been duplicated at the county level, perpetuating fragmented implementation and duplication of responsibilities.⁶⁰ Technical departments tend to be inward-looking, focusing only on their own budgeted activities.

Several reasons explain the absence of coherence in governance of the WEF nexus in Kenya. The legislative framework does not adequately clarify the functions of different governance institutions between sectors and between central and county government. The resources available to some institutions are inadequate for them to fulfil their mandate. At county level, there is a real or perceived lack of capacity to follow a nexus approach. Central government institutions are reluctant to devolve responsibilities, and therefore lose power, to the counties.

A review of policies in countries of the Amazon basin (Brazil, Colombia and Peru) found a degree of coherence between climate and conservation policies at national and local government levels. This was attributed to strong top-down, vertical coordination.⁶¹ However, this is not uniform across the region, and local governments may also have development objectives that are not consistent with national climate change commitments.

Challenges for policy and planning coherence

Analysis of the experience of WEF nexus governance in Indonesia, Kenya and Amazonia highlights two major challenges for improving coordination and integration – institutional/power relations and capacity/capabilities.

In Kenya, devolution under the new constitution has substantially altered the architecture of governance. However, the devolution process did not begin in earnest until after the 2013 general election, and remains unfinished. Competition continues between national and county government departments, over mandates, and thus power and influence. Contestation over the functions of national- and county-level institutions has resulted in conflicting plans, duplication of effort and poor relationships.⁶² This was particularly noticeable around responsibilities for water resource management, where the scarcity challenge is most severe. The research found that several key actors competing for mandates at county level were opposed to, or undermining, integrated planning around the WEF nexus. Insufficient appreciation of the value of nexus approaches contributed to this.

The Kenya study also found that development cooperation agencies, donors and non-governmental organisations preferred to work through national organisations, partly because of a perceived lack of accountability at county level. This no doubt contributes to the competition for mandates and could be seen as an obstacle to effective devolution.

In comparison, the national framework for policy-making and planning for the WEF sectors in Indonesia is quite well established, though complex and constantly evolving. Devolution of responsibilities to local governments (provincial and district) began three decades ago, reinforced by the 2014 Law on Local Government (No. 23/2014). Although inconsistencies in the legal framework across sectors and levels of government mean there can be a lack of clarity, this is due less to competition for influence and more to provisions in the sectoral laws and regulations. However, there are gaps in the capacity of local government bodies to pursue a nexus approach. For example, Provincial Water Councils, to facilitate the implementation of water management plans, have yet to be established throughout the country.

Options to improve coordination and integration

There are three ways to strengthen nexus coordination and integration. The institutional structure for nexus decision-making can be changed – what Weitz et al. call ‘organisational instruments’.⁶³ The procedures, rules and standards for decision-making and policy implementation can be changed – ‘procedural instruments’; and the vision or mindset of policy- and decision-makers can be changed – ‘communicative instruments’. In practice, the latter of these are deployed more often than organisational or procedural instruments, which may be more threatening for established interests.⁶⁴

The assessment of WEF nexus coherence in the Amazon basin concluded that an organisational instrument is needed to improve coordination. The study proposed the establishment of ‘nexus groups’

comprising senior experts from different ministries and sectors, to share information, identify policy gaps, and define priorities.⁶⁵

One of the challenges for integration in Kenya was found to be the absence of an overall national development agenda that takes a nexus approach and thus provides the basis for national and county governments, as well as non-state actors, to coordinate and integrate their work. At the county level, there is need for more cross-sectoral working to ensure, especially, that the water security needs of communities are addressed. In Indonesia, better governance (coordination) at the local government level was identified as a priority, to improve land-use and ecosystem planning. These challenges will require a combination of organisational, procedural and communicative instruments to improve coordination and integration.

Pragmatically, it makes sense to build on what is already in place. In Kenya, there are two main mechanisms for integrated planning across sectors at the county level: the CIDP process, which brings the different sectors together; and county Technical Working Groups, which comprise organisations working on environmental issues in the county. The CIDP process is relatively new and faces the challenge, already described, of county departments operating in silos. In the counties of Laikipia and Narok, stakeholders felt the CIDP process to be too hurried to allow enough cross-sectoral interaction. However, there are signs that county governments are beginning to coordinate across sectors, at least with respect to water resources development.

The county department responsible for water in Laikipia has a working group to identify water sector issues, provide oversight and provide policy advice to the county government. This involves other stakeholders including the county's agriculture department, the National Environmental Management Authority, the WRMA, the Centre for Integrated Research in ASAL [arid and semi-arid land] Development, the Lutheran World Federation, and water companies. In Narok, severe drought conditions stimulated county government departments to work with the National Irrigation Board and WRMA to address food security.

Although existing governance structures can provide a platform for improving coordination and integration, using the instruments described above, these institutional mechanisms face a number of challenges. It is also possible to strengthen coordination through more informal means. Researchers in Kenya found that by enabling individuals to interact with each other through capacity-building workshops, relationships could develop that built trust and helped reduce the sense of competition between stakeholders at county level. Platforms for sharing knowledge and information can help build the relationships and trust between stakeholders that will facilitate implementation of nexus approaches.

Related to the question of instruments for horizontal and vertical coordination is the capacity to operate in a more integrated way and adopt a nexus approach. This is a question of financial and human resources. In Kenya, the county government budgets are inadequate for fulfilling the responsibilities they have been given under the 2010 constitution. They also have limited technical capacity, including understanding of WEF nexus interdependencies. The priorities of national government departments and donor agencies may therefore determine which development activities are implemented, and whether they follow a nexus approach.

Applying nexus knowledge

Integral to the concept of the WEF nexus is the premise that greater understanding of the links between water, energy and food systems is necessary for sustainable natural resource management. Knowledge of the interdependencies between sectors enhances decision-making by identifying potential trade-offs and synergies. But is knowledge of the nexus used in policy- and decision-making? Weitz et al. identify institutional capacity to learn and assimilate this knowledge as a potential barrier to a nexus or integrated approach.⁶⁶

The research in Kenya initially found very limited understanding of WEF nexus interactions in the three counties. There was a general lack of awareness of different actors' roles in and impacts on the WEF nexus, which was itself perceived to be too complex to be widely understood. Lack of knowledge and

capacity to plan in an integrated way added to the competitive behaviour of government organisations and prevented the adoption of nexus approaches.

Workshops held in each of the counties, in March 2016, aimed to provide the skills to apply 'integrated nexus planning' to representatives of national government departments, such as WRMA and the National Environment Management Authority, county departments and non-state WEF actors. Stakeholders found the knowledge provided to them to be appropriate, practical and relevant to their context and needs, and on their own initiative participants embarked on the formulation of action plans immediately after the workshops.

In Laikipia, the workshop participants shared their knowledge about the WEF nexus approach with the county government and other stakeholders. In response, they initiated the planting of seedlings to increase tree cover in the county, with the assistance of the Kenya Forestry Research Institute and the World Agroforestry Centre (ICRAF). In Machakos, the participants formed a climate-WEF nexus forum to share the nexus approach with others in the county and promote integrated planning within the county. The forum, hosted by an office of the (national) Ministry of Agriculture, has identified 50 WEF nexus stakeholder organisations in the county, and is lobbying the county government for a budget to implement climate change projects. In the third county, Narok, a steering committee for implementing the WEF nexus approach has been formed, with representatives from national and county organisations. This resulted in the county's water resource user associations travelling to the Naivasha basin to learn about how water catchment protection and climate change adaptation projects are implemented there.

The workshops in Kenya demonstrate that knowledge and capacity to adopt nexus approaches to planning and implementation can be enhanced with appropriate interventions. When the advantages of an integrated approach and the mechanisms to follow it were understood, coordination across sectors was taken up with enthusiasm. However, this county-level coordination does not necessarily address all the challenges of vertical integration or resolve contested organisational mandates.

In the countries of the Amazon basin, the absence of standardised information hampers understanding of about the WEF nexus.⁶⁷ The Indonesia research project focused on an assessment of the difference that knowledge about inter-sectoral links could make to decision-making, if it is available. The project found a high correlation between the incidence of floods in an area and the proportion of land given over to oil palm plantations. In Aceh province, between 2010 and 2015, floods displaced 233,000 people and caused economic losses conservatively valued at over US\$136 million.⁶⁸ The analysis concluded that plans to increase palm oil production by extending the area under plantations did not take these costs into account, and that increasing production through improved productivity would be more economic. Greater knowledge of the nexus implications of plans to increase oil palm and rice production could help influence decision-makers to change their plans from a business-as-usual approach to one that is more resilient and environmentally sustainable.

Conclusions

The investigations in Indonesia, Kenya and the Amazon basin show that the adoption of a WEF nexus approach in policy-making and planning faces some critical barriers. Institutional relationships, often influenced by political economy factors, can make vertical and horizontal coordination or integration particularly challenging. The capacity of governance organisations to understand nexus links and collaborate with each other is also critical.

WEF nexus decisions are political

A WEF nexus approach recognises that trade-offs between water, energy and food systems – that is, choices between objectives in different sectors – are inherently associated with the competing demands for water, energy and food resources for human and economic development. In contexts of increasing resource scarcity and climate change, these trade-offs become more significant. For the WEF nexus, governance is concerned with how these trade-offs are decided, informed by knowledge of the links between sectors. Win-wins (synergies) may also be possible, but trade-offs are the source of contestation. The notion of a trade-off implies that someone or something (e.g. an ecosystem) loses out. Therefore decisions about trade-offs are political. Asymmetry of knowledge about links in the nexus could reinforce

inequalities of access and political influence. A nexus approach should be used to make decisions about trade-offs transparent, ensuring that the cross-sectoral consequences of a decision are understood.

Practical approaches may be better than striving for the ‘ideal’

An implicit question raised by the literature is whether the appropriate focus is on governance of the nexus, or governance *in* the nexus. Governance of the nexus implies policy- and decision-making that takes comprehensive account of the links between sectors and seeks to make decisions in the light of implications for all aspects of the nexus systems. As Rasul suggests, this would call for a paradigm shift in decision-making.⁶⁹ The political nature of decision-making about WEF nexus resources mitigates against such a paradigm shift. Indeed, Leck et al. point to the highly ambitious aims of the nexus becoming its downfall.⁷⁰ Aiming for the ideal of comprehensiveness and integrated approaches for all decisions affecting the use of natural resource may be too difficult and too costly. Local-level decision-making does not necessarily need sophisticated modelling and comprehensive data collection and analysis – the residents of any community have knowledge of the links in their locality. A more pragmatic approach, that allows for some inconsistency in policy-making and planning, but is integrated when critical cross-sectoral links are concerned, may be more realistic. An effective nexus approach may be as much a mindset for decision-makers as they are instruments of governance.

Paradox: More coordination can lead to centralisation

While the effective pursuit of a nexus approach – the integration of policies, strategies and plans across WEF sectors – may require a mindset that is open to working across sectors, in practice it also requires coordination between actors in different sectors, and between actors at different levels of government. The examples of Kenya and Indonesia demonstrate the complexity of this coordination challenge within countries. As well as entailing significant costs, comprehensive coordination for a nexus approach could risk centralising power and influence in the nexus. Even when many responsibilities have been devolved from central government, imbalances in power and resources between central and local government could mean that strong coordination leads to more decision-making at the centre.

Need to strengthen capacities of local government institutions

It is decision-making at the local level that will largely determine how trade-offs and synergies in the WEF nexus are implemented. This highlights the importance of adoption and promotion of nexus approaches by local governments, which provide the planning framework for decision-making by local public and private organisations. The findings from Indonesia and Kenya point to three key factors for the effectiveness of nexus decision-making by local governments: knowledge of the (ecological and socioeconomic) links between the sectors; technical and administrative capacity to apply nexus knowledge and adopt a nexus approach; and mechanisms for coordination, horizontally and vertically. Research findings also show that the capacity of local government organisations and decision-makers in these three areas needs to be strengthened. The devolution of responsibilities to local government, under way in many countries, may be accompanied by capacity-building initiatives, presenting an opportunity to promote a nexus approach. Strengthening the capacity of local government organisations may also mitigate against the risk of centralisation of power and influence through nexus integration and coordination.

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