

# Making Kenya's Water-Energy- Food Nexus More Sustainable

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POLICY BRIEF

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## Summary

In recent years, the complex set of interdependencies among water, energy and food systems – known as the WEF security nexus – has emerged as a critical issue for developing countries as they pursue sustainable socioeconomic development. Kenya is no exception, as this dynamic frontier economy is acutely vulnerable to climate change and variability, given its geographical location and its dependence on largely rain-fed agriculture for nearly one-third of its GDP and over 60 percent of livelihoods. Kenya is poised to begin production of oil in 2017, which could have a substantial impact on the country's ensuing development trajectory. This brief draws on research that explores the major global and national drivers affecting the WEF nexus in Kenya and identifies the country's main water, energy and food security vulnerabilities. It argues that the development of indigenous oil resources presents an opportunity to bolster WEF security, but cautions that risks and trade-offs need to be carefully managed.

## Challenges for the policy-maker

- Water, energy and food security are under increasing pressure from an expanding population, rapid urbanisation and robust economic growth.
- Kenya is highly vulnerable to climate change and variability, including periodic droughts and floods triggered by El Niño/La Niña episodes.
- Droughts undermine agricultural production, food and water security, and constrain hydroelectric power generation.
- Floods can damage crops and infrastructure such as roads and bridges.
- Deforestation leads to reduced moisture retention, topsoil loss, and siltation of dams.
- Energy security faces risks from dependence on imported oil and exposure to global crude oil price volatility.
- Dependence on food imports means that global food price volatility is a risk for Kenya's food security.
- Development of oil resources presents economic opportunities but also risks, including possible negative environmental impacts that can affect local livelihoods.

## Actions for the policy-maker

- Enhance vertical and horizontal integration of policies and planning, informed by a nexus approach, in order to maximise synergies and address trade-offs.
- Utilise a Sovereign Wealth Fund based on oil revenues as a vehicle for investments in sustainable WEF nexus infrastructure.
- Bolster water security by preventing siltation of existing dams, investing in new dams, expanding irrigation and distribution systems, and building more water and wastewater treatment plants.
- Further expand geothermal, solar and wind power to reduce reliance on drought-prone hydropower and oil-based electricity.
- Refurbish domestic oil refinery so as to substitute for imported refined fuel products.
- Promote the development and adoption of drought-resistant crop varieties.
- Invest in food storage facilities and improved transport systems to enhance food security.
- Improve efficiencies throughout the water, energy and food value chains.
- Purchase insurance against climate-related nexus risks such as droughts and floods.

## Insights from research paper

### **The WEF nexus**

The WEF nexus refers to the linkages and interdependencies among water, energy and food systems. For example, energy inputs are required at all stages of the food value chain (including on-farm production and harvesting, storage, processing and distribution to consumers) and the water system (including abstraction, conveyance, purification, distribution and wastewater treatment). Water is an essential input for agricultural production and food processing, and for various forms of energy production and power generation. In some countries – although currently not in Kenya on any significant scale – one or more agricultural crops are converted into biofuels. Furthermore, certain energy industries and agricultural production can have adverse impacts on water and soil quality. The chief nexus interlinkages in Kenya are the dependence of food production, hydropower generation and biomass energy on water supplies, and the reliance of food and water distribution on transport fuels.

### **Drivers**

Many of the major drivers of the WEF nexus in Kenya are familiar to most developing countries, especially in sub-Saharan Africa. On the demand side these include population growth (at a rate of about 2.6 per cent per annum),<sup>1</sup> rapid urbanisation (at approximately 4.3 percent per annum),<sup>2</sup> and rising incomes associated with economic growth, all of which increase demand for water, energy and food. On the supply side, the most important factors are resource limitations, especially with regard to freshwater and forests.

### **Vulnerabilities and risks**

Kenya's WEF security vulnerabilities stem from endemic conditions, including deficiencies in water, energy and food access and consumption levels, as well as from specific risks emanating from external threats such as climate variability (including the El Nino Southern Oscillation and climate change) and international oil and food price shocks. In terms of baseline conditions, both demand and supply side factors play a role. On the one hand, extensive poverty, which afflicts a quarter of Kenya's population, restricts the ability of many citizens to meet their daily requirements for water, energy and food. On the other hand, there is a lack of sufficient modern infrastructure to deliver water and energy services, and to provide and distribute adequate food supplies.

### **Oil resources**

The nascent development of Kenya's oil resources brings opportunities, risks and trade-offs. The major prospective benefits are new export and tax revenues, and a boost to energy security in the medium to longer term through substituting domestically refined oil for imported fuels. The risks relate both to environmental factors such as water usage and pollution, and economic and political factors encapsulated in the resource curse. Kenya could use its oil resources to modernise and mechanise its agriculture sector to boost yields, but this could cause damage to soil health in the long term and disrupt the social fabric, considering the extensive reliance on agricultural livelihoods and the likely increase in rural-urban migration that

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<sup>1</sup> World Bank. 2016. World Development Indicators. <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>.

<sup>2</sup> Cira, Dean A., Kamunyori, Sheila W. & Babijes, Roderick M. 2016. *Kenya urbanization review*. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/639231468043512906/Kenya-urbanization-review>

mechanisation would engender. Conservation agriculture, sustainable intensification and agroecological farming techniques are being promoted by institutions such as the U.N. Food and Agriculture Organisation to improve the yields and sustainability of farming, including the small-holder sector.<sup>3</sup>

Mitigation of potential negative environmental impacts of oil production requires effective environmental and health regulations. These could include requiring oil companies to conduct Environmental Impact Assessments and to produce credible Environmental Management Plans; the government should also ensure that a Strategic Environmental Assessment by unbiased experts is conducted. Laws should be enacted that ensure the liability of oil companies for any pollution impacts, and to require companies to rehabilitate land and water resources affected by exploration and extraction activities. Effective environmental monitoring and enforcement of pollution abatement measures is essential. Another option is to incorporate the full environmental costs of oil extraction, transport and use in the price of fuels

To mitigate the risk of negative social repercussions from oil extraction, the Kenyan government should ensure that the benefits accrue fairly among the broad population, while locals who experience the costs (such as adverse health, environmental and economic impacts) should be adequately compensated. Part of the revenues could be set aside for the districts in which the oil production takes place. This could include a dedicated fund for reskilling local inhabitants who lose access to land or water resources that are currently relied on for agricultural livelihoods. Transparency in the allocation of oil revenues can help to improve accountability and reduce the risk of social conflict. Another option is to allocate a portion of oil revenues directly to citizens in the form of a basic income allowance (which would be included in their taxable income).

### **Insuring against risks**

The long-run costs arising from floods and droughts in Kenya have been estimated to be roughly 2.4 percent of GDP per year.<sup>4</sup> In addition, “the costs arising from water resources degradation represent at least about 0.5 percent of the Nation’s GDP and probably much more than that”.<sup>5</sup> The Stockholm Environment Institute estimated that the net additional cost of climate change could reach almost 3% of GDP per annum by 2030.<sup>6</sup> The SEI (2009) also estimates that climate adaptation costs were in the region of USD 500 million per annum in 2012, potentially rising to USD 1 to 2 billion by 2030. It would therefore be prudent for the Kenyan government to insure against climate-related natural disasters, covering an amount of its choice, possibly up to a maximum of 3% of GDP. Assuming a 13.5 percent insurance premium, the annual cost of insuring 3% of GDP could be on the order of KES 28.4 billion.<sup>7</sup>

*For further evidence-based research on the WEF nexus and other topics, please consult the QG Knowledge Hub: <https://quantumglobalgroup.com/knowledge-hub/research-papers/>*

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<sup>3</sup> Godfray, H.C.J. 2015. The debate over sustainable intensification. *Food Security*, 7: 199–208. De Schutter, O. 2012. Agroecology, a Tool for the Realization of the Right to Food. In *Agroecology and Strategies for Climate Change* (pp. 1-16). Springer Netherlands.

<sup>4</sup> Mogaka, H., Gichere, S., Davis, R., & Hirji, R. 2006. Climate variability and water resources degradation in Kenya: Improving water resources development and management. World Bank Working Paper No. 69, Washington, D.C.

<sup>5</sup> *Ibid*, p. 78.

<sup>6</sup> Stockholm Environment Institute (SEI). 2009. *Economics of Climate Change Kenya*. p. i.

<sup>7</sup> The African Risk Capacity (ARC) had implied premium rates of 13.2 and 13.9 percent in 2014/15 and 2015/16, respectively. See ARC (2016). See [https://www.wto.org/english/tratop\\_e/agric\\_e/arc91116\\_e.pdf](https://www.wto.org/english/tratop_e/agric_e/arc91116_e.pdf)