Input to SANEA panel discussion on Food Energy Water Nexus.
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See also: http://www.wwf.org.za/what_we_do/food_energy_water_nexus/

I am going to give a flavour of some of the conceptual work that WWF SA has done on the Food Energy Water (FEW) nexus and the **importance of a holistic approach** that can deliver food-energy-water *security for all, equitable and sustainable growth* and a **resilient and productive environment**.

As a water-scarce country with little arable land and dependent on oil imports, which must be purchased with a fluctuating currency, South Africa's economy is testing the limits of its resource thresholds. **Strategic reserves of food and water, and security of energy supply,** contribute is essential for a resilient economy and to maintain social stability.

There are **complex and extensive couplings** between water, energy, and food security that are situated **within a larger nexus of developmental agendas and environmental considerations**. Inevitably, this complex set of interdependencies will be **exacerbated by climate change and increasingly erratic weather patterns**. Until recently, much of analysis and policymaking focused on each resource in isolation, resulting in **underappreciated risks**. A more holistic approach is needed to identify and analyze this nexus effect and propose corresponding policy measures.

Increasing **resource price inflation and volatility** in recent years have highlighted this **interconnected and interdependent nature of energy, water, and food resources**. In addition, having endured **electricity interruptions and rising electricity prices** for the better part of a decade, various areas in South Africa has also been battling **catastrophic drought**. The intensity of the current El Niño event and associated decline in rainfall is expected to continue into the next planting season. **Water is a critical resource** in South Africa, with **40% of our freshwater resources in a critical condition and 80% that are threatened.**

There is of course a **social and political dimension** to the nexus, particularly in how each of these resources and their interdependencies are **managed at a landscape level and, ultimately, at the level of the household**.

At a household level, South Africa's history of **social exclusion and economic inequality determined on the basis of race has resulted in discriminatory natural resource access**. This legacy has compounded poverty, adding an additional challenge of addressing historic imbalances to the natural resources management task.

At a landscape level, South Africa's geography plays a key role. The country is extensive and natural resources are **not evenly or conveniently distributed**. Moreover, the physical locations of some of the richest sources **overlap geographically**.

The result is that some of the **highest yielding agricultural production areas in the country are under threat from coal mining.** In the northeast of the country, a total of 750,000 hectares of maize, soya beans, sunflower, sorghum, and pasture production are potentially endangered from expanding coal mines. Apart from being some of the SA's best farmland, is it is also the source of South Africa's major inland rivers.

Accordingly, the **continued dependence on coal** for meeting electricity requirements directly conflicts **with food production and impact the quality of water resources**.

Unidirectional conversion of productive land from agriculture to mining has become a clear trend, raising concerns for the future management and sustainable use of natural resources. It is also indicative of a **political power imbalance that favours the mining sector**. This is, in part, rooted in the history of the two sectors, but it is also due to the fact that agriculture's contribution to the gross domestic product (GDP) has **waned significantly from 17% 100 years ago to less than 3% today. The mining sector, by contrast, contributes about 9% and the largely coal-fired energy sector's contribution to the GDP is 15%**.

Although, agriculture is by far the largest water user, consuming more than **60% of all water stored resources compared to the 2% water use of the energy sector and 2.5% for mining**. This, is not the full story. Mining's water demand may be comparatively low, but a simplistic percentages allocation equation hides a massive economic burden. Mining is widely considered to have the **greatest impact on water quality**, even to the extent of rendering the water unfit for other uses. **Water contamination from coal mining in the Olifants Catchment area**, where Kusile is also located, is such that it cannot be used in coal fired plants.

New energy sources such as non-conventional oil and gas production through hydraulic fracturing of fracking, and technologies such as carbon capture and storage (CCS), which can lower the carbon emissions of coal-fired power plants by 80–85%, **are water intensive and will only add to the pressure on water resources**. Fracking could use up to 5 million gallons of water (1 gallon = 3.78 litres) per well. The southern portion of the Karoo Basin, which is potentially favourable for shale gas, has fragile water supply systems and most farmers in the region are dependent on well points for their water supplies.

The **vital interdependencies** between food, water, and energy were **recognized as early as 2011** in the World Economic Forum's Water Security Report. In South Africa, however, there has been limited recognition of the synergies and trade-offs in managing these resources in local and regional planning. Coupled with **short-term planning horizons, this sector-specific approach has exacerbated supply risks and made the management of these resources a foremost challenge for sustainable development.**

Acknowledging the interdependencies and complex coupling is only a first step toward such integration.

The interdependencies are numerous.

- Water is a prerequisite for food and energy production and the quantum required is immense.
- Energy is an important input in producing fertilizers and agricultural chemicals, growing crops, raising livestock, and accessing marine food resources.
- Both water and energy are required throughout the food value chain to process, package, transport, store, and dispose of food.
- Furthermore, water supply consumes energy at every stage of the production and supply chain: abstraction, treatment, distribution to end users, wastewater reticulation, and treatment.
- Both energy and food production can significantly affect the quality of water bodies.

- From the perspective of the country's water scarcity and deteriorating water quality, there may be the need to pump deeper and longer for groundwater, to recycle wastewater, to desalinate, and to treat brackish water, all of which will require energy and trade-offs between water and energy security.
- Water is of course an indispensable for hydropower
- And biofuels sit slap bang in the critical intersection of the food-energy-water nexus. Biofuel production will require trade-offs, balancing the need to address food security and optimal allocation of water with the potential of new jobs and livelihoods and possible climate mitigation.

The real solution lies in **governance: in managing multiple intersecting developmental objectives within resource thresholds**. Yet governance remains the biggest concern for effectively addressing concerns created by the nexus.

Critically, development planning at the national level is not integrated. The best example of this comes from South Africa's National Planning Commission's National Development Plan (NDP), which seeks to **eliminate poverty, deliver environmental protection, and promote economic development** in the country by 2030. It identifies a number of broad-ranging and ambitious interventions in addressing food security, with job creation and agricultural productivity as priority responses. It also calls for achievable measurable outcomes related to food, water, and energy, among other things. However, the plan fails to fully explore the interlinkages and trade-offs in achieving the stated goals for each of these interdependent resources.

With a view to generating rural jobs, the **NDP and the Industrial Policy Action Plan** propose a substantial increase in agricultural activity without explicitly acknowledging the concurrent burden on the water system. With less than 3% truly arable land area, increasing irrigated agriculture is the only means of expanding viable farmland. Commercial agriculture production is already heavily dependent on irrigation. Ninety percent of vegetable, fruit, and wine production and 12% of the total area under wheat are irrigated. There is a total of 1.5 million hectares under irrigation, and although this is 1.5% of the country's land surface, it accounts for 30% of the country's crops.

Agricultural policymakers expect the required water to come from water savings in the agricultural sector. The water sector, in contrast, sees little possibility for achieving the required level of savings and there is little additional water for irrigation allocated in the **National Water Resources Strategy (NWRS**). And if savings can be made, the water sector sees these as potential available allocations for other uses.

A similar absence of strategic insight is evident in the fact that no policy measures are undertaken to either manage the cost of energy for farms or enable them to adopt alternate energy sources such as renewable energy (RE). While the government is focused on RE-based power generation for the electricity grid, no policy interventions have been made to encourage the roll-out of RE-based applications for farms. This failure to consider the implications of increased water demand and associated energy requirements is just one of the indications that, at the highest level, a failure of coordination can be seen between the water, energy, and food sectors.

Essentially, the NDP's vision for the future is based on the current economic model's assumption of the **infinite availability of these and other resources**. The reality is that there is limited water and fertile land resources, and there has been steady degradation of the environment and associated ecosystem resilience.

Improving governance is, however, not simply a mechanical matter of better coordination between government departments, although this is necessary**. It requires a change in the very approach to dealing with these resources and revisiting the mechanism that determines what issues are addressed, when and how. For example, while energy-related decisions in South Africa go through the economic or infrastructure ministerial decision-making cluster, agriculture- or food-related decisions tend to go through the social cluster**. Once again, this imbalance may not be unique to South Africa and arises from the value attached to different resources and energy being considerably more prized economically.

The challenge will be to effectively respond to the complexity of better managing the **synergies and trade-offs** between food, water and energy and **recast the governance approach**. . If the necessary transformation is to occur, it must be based on sound science, accurate data and integrated, effective national policies and regulations that are consistently enforced.

To conclude the FEW Nexus is not so much about the resources themselves as it is about the relationship between them. Nexus problems cannot be tackled in silos—each resource on their own—but will require **cross-sectoral forms of partnership and participatory management involving government, private sector, civil society and local communities. It requires a shift towards a more inclusive society, to address poverty without damaging those services and sectors that are central to securing the livelihoods of the poor.** Political choices and technologies will help, but a transformation of social values and of relations between different social actors will also be necessary.