

WEF NEXUS

Experts explore links between planning for water, food and energy and decision-making

The water-energy-food (WEF) nexus strategy is gaining recognition globally as an intersectoral approach to resource management and sustainable development. During a recent event, local experts explored how this approach helps keep natural resources in circulation for longer. Article by Jorisna Bonthuys.



South Africa needs to ensure that its natural resources remain in circulation for longer to alleviate food insecurity and deal with its challenges concerning water and energy. This was highlighted by Dr Luxon Nhamo, a Research Manager with the Water Research Commission (WRC), during a recent webinar focused on the WEF nexus. The event, held on 1 October, was hosted by AgriSA and *Farmers' Weekly*.

The WEF nexus is an approach that considers the interactions, synergies and trade-offs of water, energy and food when managing these resources.

In their presentations, the panellists provided perspectives on how this approach helps address some of the country's most pressing issues.

Water, energy, and food securities are inextricably linked, with the usage of resources within one sector influencing the use and availability in the adjacent sectors. "Currently, more than half of South Africa's households are food-insecure," Nhamo said. Furthermore, 98% of the country's available water resources had already been allocated, while 86% of its energy is generated by coal.

“We know that South Africa is the thirtieth driest country in the world and has serious water scarcity challenges,” Nhamo added. “There is little room to manoeuvre.” There is also a threat of novel infections and diseases spreading. The COVID-19 pandemic provides a recent example of this, he said.

These and other challenges are being compounded by climate change. Some of the strongest drying projected globally in terms of climate change is found in southern Africa. This is a region that is projected to become drastically warmer and, at the same time, generally dryer. As a result, the country is particularly vulnerable to the impacts of climate change on water, food security, health, human settlements, infrastructure and ecosystem services.

These challenges and their impact on livelihoods and wellbeing require transformative and integrated solutions to achieve sustainability. Nhamo said: “We need to understand the drivers of change, the risk and exposure level, nexus planning and sustainable food systems.

“We have socioeconomic changes that are taking place and also environmental changes. There are also external drivers within these drivers that are causing exposure and sensitivity.”

Since 2012, the WRC and several universities have conducted studies focusing on this nexus. This includes work in the Umgeni River catchment in KwaZulu-Natal and the Berg River catchment in the Western Cape. Studies are underway to explore the potential, challenges, and opportunities for nexus planning, including the municipal level. Researchers are now focusing on technical and policy issues related to this approach.

A useful approach to strengthen livelihoods and wellbeing

Dealing with the challenges related to food, water and energy, and its interlinkages, trade-offs and effects also directly impact the household and farm level, Prof Stephanie Midgley highlighted. Midgley is an extraordinary associate at Stellenbosch University’s Department of Horticultural Science and scientist for climate change and risk assessment in the Western Cape Department of Agriculture.

She pointed out that water, energy, and food cannot be considered in isolation as water is crucial for energy generation and food production. Notably, crop production is the largest regional consumer of freshwater resources and currently consumes a lot of energy. Water, in turn, is required to generate energy. Land can also not be optimally developed to help drive local economic and social development without access to water.

According to Midgley, the nexus approach offers a useful approach to strengthening local livelihoods and wellbeing. “These three resources are inextricably interlinked and interdependent — changes in the availability, usage and affordability of each component can either help or harm the other two components,” she said.

“If we cannot find a balance between the challenges related to water, food and energy soon, this (water crisis) will become a reality.”



Several studies on the water-energy-food nexys have been conducted in catchments such as the Umgeni River.



Achieving household food security is an important goal of water-energy-food nexus activities.

While national policies increasingly address the nexus, many farmers and communities on the ground are not yet experiencing the intended benefits. “By far, the most important determinant of livelihood-WEF security is the affordability of water, energy and food in relation to total household income and other expenses,” she said.

Decision-makers need a framework to understand the interdependencies, the trade-offs and the synergies between water, food and energy. From an agricultural and rural development perspective, the WEF nexus approach can help ensure more coordinated management and efficient use of natural resources across sectors and scales. This can enhance the integration of policy, planning, financing and governance, she said.

Adopting a WEF nexus approach will allow for balanced and sustainable increases in agricultural productivity, Nhamo added.

WEF nexus approach supports sustainable development

Prof Tafadzwa Mabhaudhi, the Co-Director of the Centre for Transformative Agricultural and Food Systems at the University of KwaZulu-Natal, provided an overview of progress towards achieving sustainable development goals through nexus planning.

The nexus approach is defined as an approach that integrates management and governance across sectors and scales. Mabhaudhi said that some of the United Nation’s Sustainable Development Goals (including those related to zero hunger, clean water, and sanitation and no poverty) are directly linked to the WEF nexus.

Mabhaudhi has been developing a framework for linking the WEF nexus to the Sustainable Development Goals (SDGs), emphasising SDG 2, 6 and 7. In his presentation titled ‘Assessing Progress towards Sustainable Development Goals through Nexus

Planning’, he explored how the WEF nexus approach can help to improve food and nutrition security.

Activities in one sector may influence or even constrain economic growth in the others. South Africa is, for instance, still highly dependent on coal for energy generation. The majority of coal is mined in Mpumalanga, which has some of the most arable land in the country. Therefore, energy-related decisions that do not consider the trade-offs these decisions might have on food and water resources could have adverse effects.

Mabhaudhi said the nexus approach provides a valuable transformative adaptation decision support tool for integrated resources management. Nexus planning also offers the potential to monitor progress towards achieving SDG targets. “It is all about resource security for sustainable development,” he said.

He indicated that data scarcity at different spatial scales is the major limitation to the success of nexus planning. There is also a need to upscale the use of nexus planning as a decision-making tool. This can help to leverage the implementation process and progress towards SDGs and subsequent monitoring and evaluation at the same time.

“The nexus approach essentially allows for you to have that sort of integration during the planning stage, which means you can mitigate some of those trade-offs,” he said. “You can identify potential synergies that you can then leverage and maximise. So, it is very useful in terms of investment planning. It talks a lot about wanting to use that infrastructure as a catalyst for economic development and job creation.”

“The scale of the challenges South Africa faces require innovative solutions to build resilience and attain development goals,” Mabhaudhi said.

Moving towards policy convergence

The presenters indicated that the COVID-19 pandemic had revealed the deep fragility of many aspects of South Africa’s food, water and energy systems.

There is a need to move towards policy convergence instead of the current ‘silo’ approach, which requires the strategic engagement of the relevant departments at the decision-making level. “The pandemic has ushered us into the Fourth Industrial Revolution,” Nhamo said. “We need to act now, and we need to act fast.”

Agri SA’s head of natural resources, Janse Rabie, agreed, referring to projections showing that South Africa would be unable to provide water to 17% of its population by 2030. “If we cannot find a balance between the challenges related to water, food and energy soon, this (water crisis) will become a reality. It will also lead to further unemployment and inequality,” he warned.

Mabhaudhi said it was crucial to now move from “nexus thinking” to “nexus doing”. “Better planning in terms of the nexus approach can help us mitigate the trade-offs (between water, food and energy),” he said. “It can also be a catalyst to drive infrastructure development and job creation.”

There is a need for investment in integrated innovation, Mabhaudhi said. Moreover, following a circular economy approach would be helpful, addressing water and sanitation issues simultaneously. “Also, you could turn waste(water) into a useful resource in agriculture and address the issues of food security within those areas. So you can implement the nexus thinking at the village level to address some of the constraints of informal peri-urban settlements.”

Mabhaudhi considers the nexus approach useful in dealing with some of South Africa’s spatial planning issues. In addition, this approach can inform decisions about design and help create more sustainable and resilient cities.

Tackling resource planning holistically

Engaging with the WEF nexus approach requires holistic and integrated thinking about how natural resource planning is done.

In this regard, Rabe said South Africa could not afford shale gas exploration in the Karoo or hydraulic fracturing (‘fracking’) from a nexus perspective. This region is already known for its resource scarcity, particularly water resources, he pointed out. He also expressed concerns about the impact of such plans on the country’s already high per capita carbon footprint in the context of the climate crisis and South Africa’s international obligations to reduce its fossil fuel dependency.

Given global trends and the region’s severe water constraints, efforts to extract shale gas (and exploration for it) are not viable at this stage, he argued. Instead, South Africa should rather be exploring its renewable energy potential and investing in it.

Midgley said South Africa is under huge pressure globally to downscale its coal dependence and use and completely phase out coal. “The science is telling us that we have very little (fossil fuel) space left that we can exploit if we want to keep global warming to an acceptable, manageable level,” she said.

Midgley said she believes South Africa needs to be ambitious in reducing its carbon emissions. Momentum is building globally to a much more rapid transition from fossil fuels to renewable energy sources. The technologies are available to roll this out, and renewable energy offers significant opportunities, including at the farm level.

Nhamo said it is also time to rethink the value of wastewater. Dealing with water pollution related to energy production is necessary, he said. The WRC is currently funding several projects to determine how to turn polluted water into water that can be used for irrigation purposes.

Midgley said the pandemic illustrated how important it is to plan in a connected way.

“The pandemic has underlined the vulnerability in our system,” Rabe added. “Unemployment is increasing. Our ability to pay and afford basic services and commodities are becoming more and more inaccessible to people. I think that’s the biggest thing that we’ve learned — the system is under stress.

“It is not just a planning issue. I think it’s the way we are thinking or the way we interact with one another. And I think that’s probably the most valuable contribution that nexus thinking can bring to addressing these issues. A host of issues in South Africa requires this kind of integrated thinking.”

Midgley said that many of the solutions and the technologies to deliver integrated solutions are already available. “Energy is a potentially unlimited resource. The sun is an unlimited resource. After many years, we started to see that the massive rollout of renewable energy technologies is feasible. So I think there is a great reason for hope.”

Many of South Africa’s water, food, and energy problems cannot be solved using traditional sector-based approaches. “What we need is more coordination, better coordination and collaboration,” Mabhaudhi said.

Service delivery must be improved across the country, the panellists emphasised. “Water and food cannot be made cheaper - the opportunity lies in energy,” Midgley said. “We need to look at affordable resources, but this is something that politicians must do. Service delivery, specifically infrastructure, is key to this.”

The need to upskill municipal officials to help strengthen service delivery will help to ensure uptake of this nexus approach.

Options to enhance resource use efficiency include increasing the land under irrigation, improving agronomic practices and exploring alternative water resources. “But is it feasible to increase the area under irrigation in South Africa to enhance food, water and energy security under the prevailing challenges?” he asked. “Do we have the land, energy and water resources?”

“The National Development Plan says plans are intended to increase the land under irrigation by about 40 000 ha by 2030. Do we have the resources to do that? Where is the water? We are saying 98% of the water resources are already allocated. There is little room for development.”

Midgley indicated some of the low-hanging fruit that decision-makers can address to improve resource use include reducing wastage, including water leakages and food wastage.

Improving water, energy and food security

Mabhaudhi believes the nexus approach helps to improve South Africa’s water, food and energy security. This approach helps decision-makers understand resource complexities, synergies and trade-offs. “The lack of balance exists because of planning that was unaware of what the trade-offs were and decisions that were taken without considering the trade-offs — only the benefits.

“The nexus approach allows for that sort of thinking during the planning stage to mitigate some of the trade-offs. It is very useful in terms of guiding our investment planning.”

“Adopting a WEF nexus approach will allow for balanced and sustainable increases in agricultural productivity,” he concluded.