



## Exploring the relationship between water, energy and food

*The term 'water-energy-food' nexus is increasingly being bandied about in global discussions on sustainability. In this article, Research Manager and coordinator of the Water Research Commission's water-energy-food nexus programme, Dr Sylvester Mpandeli, shares some information about the Commission's work in this field.*

**T**he WRC water-energy-food flagship programme or Lighthouse was first introduced last year. Lighthouses are transdisciplinary, multidisciplinary and inter-institutional mega-projects examining priority water issues across the innovation value chain.

Individually, food, energy and water are all vital for a sustainable future. However, these resources are also mutually connected or linked. So energy, for example requires water, often in large volumes for fuel production, mining, hydropower and power plant cooling. On the other hand, energy is needed for pumping, treatment and distribution of water as well as the collection, treatment and safe discharge of wastewater. In turn, both energy and water resources are required to produce food.

Figure 1 shows that the water

sector is heavily stressed compared to the energy and agriculture sectors. According to the National Water Resources Strategy 2 of the Department of Water Affairs, more than 60% of South Africa's fresh surface water is used by irrigated agriculture. However, while irrigated agriculture is the country's largest water user, the sector is also expected to contribute significantly towards poverty alleviation in the country through job creation, increased economic activity in rural areas and also sustaining natural resources management.

Previously, water, energy and food issues were championed independently, however, since the Bonn 2011 Nexus Conference in Germany several organisations have argued that there is a need to drive the water-energy-food nexus across the globe. This call has also been heeded by the WRC. Figure 1 strongly shows that water, energy and food issues are inextricably interlinked. This has given rise to a growing need for integrated natural resource management as suggested by several experts.

### WHY DOES THE WRC NEED A NEXUS APPROACH?

**S**everal studies indicate that improved water, energy and food

security can be achieved through a nexus approach – an approach that integrates management and governance across sectors and scales. Some of these studies further indicate that a nexus approach can also support the transition to a Green Economy, which aims among other things, at resource use efficiency and greater policy coherence.

However, given the increasing interconnectedness across sectors and in space and time, a reduction of negative economic, social and environmental externalities can increase overall resource use efficiency, provide additional benefits and also secure the human rights to water and food. Conventional policy and decision – making in 'silos' therefore needs to give way to an approach that reduces trade-off and builds synergies across sectors – a nexus approach. The business as usual is no longer an option.

### COLLABORATION AND PARTNERSHIP WITH OTHER KEY STAKEHOLDERS

**T**here is a growing recognition by several organisations including the WRC, Shell, WWF, Department

of Energy (DoE), Department of Water Affairs (DWA), Eskom and others that saving water saves energy. The WRC is not running the water-energy-food nexus in isolation. This initiative takes cognisance of the completed and ongoing projects across all the key strategic areas within the WRC.

In the WRC key strategic area dealing with water utilisation in agriculture there are ongoing projects that are directly addressing water-energy-food nexus issues. These include a project on water use of cropping systems adapted to bio-climatic regions in South Africa and suitable for biofuel production. Another project is looking to improve livestock carrying capacity with rainwater harvesting while conserving grasslands and generating biogas from manure. A third project is aimed at optimising electricity cost

for sustainable irrigation water use.

South African energy efficiency initiatives offer exciting opportunities for delivering significant water savings. Likewise, energy savings can be realised through water efficiency initiatives. Saving water also reduces carbon emissions by saving energy otherwise generated to move and treat water.

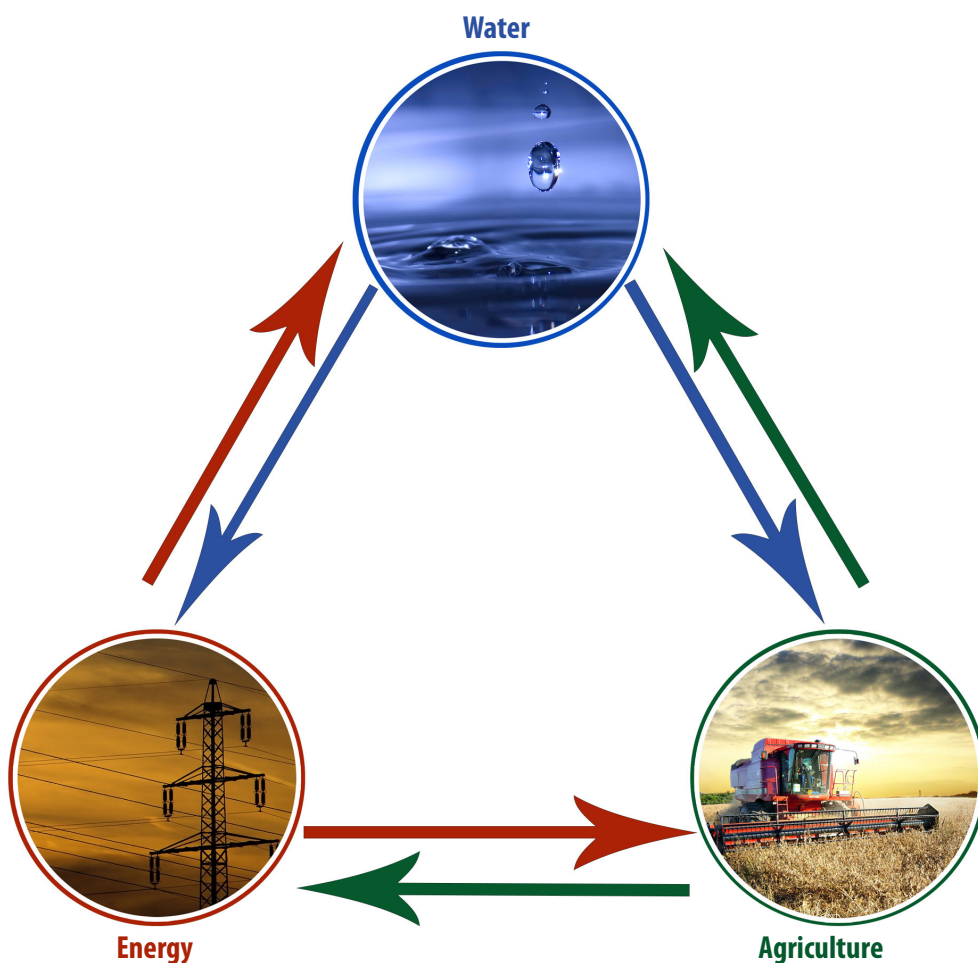
Water-energy-food nexus initiatives would also take cognisance of alternative sources of energy, including hydroelectric, solar power, and wind power. Through its nexus Lighthouse programme the WRC would identify key strategic partners to champion this issue in line with national priorities.

Since it started its water-energy-food nexus initiative, the WRC has already identified a few research gaps. This includes the need for a better understanding of the linkages

between water, energy, land and food or agriculture. Also required is more knowledge of the linkages between water, energy and food and the risks of climate change on water availability and energy supply. Thirdly, research is required on advanced technologies that save energy and water. Lastly, partnerships are required between government and private sector that move research and development from bench-scale to implementation.

It is important to note that some of these research gaps will be addressed by current studies conducted by WWF, Shell (scenario team) and University of Cape Town and also by new projects that the WRC is intending to drive during the 2014/15 financial year. It is hoped that these initiatives will go a long way towards ensuring a better water, energy and food future for South Africa. □

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**Figure 1**  
The interdependence between water, energy and food.