



# TIPS FORUM 2017

## INDUSTRIALISATION AND SUSTAINABLE GROWTH

**TITLE: FRAGMENTED SECTORAL APPROACH ON WATER,  
ENERGY AND FOOD IN SOUTH AFRICA**

**June 2017**

**Authors: Ntombi Radebe-Tsotetsi**

**Paper presented at the TIPS Annual Forum 2017.**

**The Annual Forum 2017 is being hosted by Trade & Industrial Policy Strategies (TIPS) in partnership with the South African Research Chair in Industrial Development, based at the University of Johannesburg, and in association with the Green Economy Coalition (GEC). It is supported by the European Union and the Department of Trade and Industry.**



**the dti**

Department:  
Trade and Industry  
REPUBLIC OF SOUTH AFRICA

## Abstract

There have been clear indications that the demand for water, energy and food is growing and will continue to grow due to “population growth, economic development, urbanisation, growing demand for food and diversified diets, climate change, resource degradation and scarcity” (WWF, 2014). With backup of published literature, it is safe to say that, water, energy and food are interrelated and have impact on each other. This has therefore given a rise to the Water-Energy-Food nexus concept that was mainly acknowledged in 2011 by several countries including South Africa. Although South Africa has embraced the WEF nexus concept, implementation approach on the three sectors is still fragmented as the regulatory custodians are located in separate departments. The WEF nexus has not been fully prioritised by other departments except for Department of Water and Sanitation. Through the Water and Research Commission, substantial work that seeks to outline the benefits of the WEF nexus approach has been completed. The key question therefore remains, since adoption of WEF Nexus in 2011 why are there no talks of developing WEF policy document that will guide implementation and deal with complexities of governance structures(fragmented)?

This study therefore seeks to respond to the question raised above. Firstly, the paper will provide overview of the key priorities for each sector, and then outline efforts made thus far on the implementation of WEF nexus in South Africa. It will further detail why is WEF nexus not elevated to the policy level and the key recommendation on how this concept can gain momentum and high level recognition in South Africa.

## About the author/s

**Body copy:** Calibri 11 pt with line spacing of 1.1

**Paragraphs:** 6pt between paragraphs

## Contents

1. INTRODUCTION.....	5
1.1 Methodology.....	6
1.2 Problem statement .....	6
2. LITERATURE REVIEW: WATER-ENERGY-FOOD SECTOR IN SOUTH AFRICA.....	6
3. WATER-ENERGY-FOOD NEXUS .....	8
4. ANALYSIS OF THE PROBLEM .....	10
5. RECOMMENDATIONS .....	11
6. CONCLUSION.....	11

## **Abbreviations**

<b>BORDA</b>	<b>Bremen Overseas Research Development Association</b>
<b>DAFF</b>	<b>Department of Agriculture, Forestry and Fisheries</b>
<b>DEWATS</b>	<b>Decentralised waste water-treatment system</b>
<b>DOE</b>	<b>Department of Energy</b>
<b>DPME</b>	<b>Department of Planning, Monitoring and Evaluation</b>
<b>NDP</b>	<b>National Development Plan</b>
<b>SA</b>	<b>South Africa</b>
<b>WER</b>	<b>Water Energy Food</b>
<b>WRC</b>	<b>Water Research Commission</b>
<b>WWF</b>	<b>World Wildlife Fund</b>

# 1. INTRODUCTION

Numerous interconnecting factors place pressure on environmental systems on which society and ecosystems depend. With continuous population increase and economic growth, challenges on securing sufficient energy, water, and food supplies to meet the demand are also growing. The close connections of the three sectors give rise to the need for tackling the challenges with a nexus approach. A nexus approach seeks to integrate management and governance across sectors, it assist organisations to avoid operating in silos in addressing sustainability issues.

The water–energy–food (WEF) nexus was first brought to the attention of global leaders at the Davos World Economic Forum through the Global Risks (2011) report, of which South Africa was a part (WRC, 2015). Subsequently, a series of dialogues and in depth research on the linkages, challenges, opportunities between these three key sectors has been increasing. However, in South Africa the nexus approach remains mainly paper work due to lack of proper framework.

Although at the National level the Water Research Commission has initiated discussions as well as pilot projects on the WEF nexus, like most developing countries South Africa have separate ministries for water, energy and food sector. This has therefore led to having separate policy documents and conflicting priority programmes that unintentionally can threaten the security of the other sector/s. Moreover, the discussions have not fully cascaded down to provincial and municipal level where the programmes and projects are mostly implemented.

In the recent past South Africa has been grappling with its quest for energy security. If the challenges for food, energy and water continues to be addressed in isolation “there is a real risk of adding water and food insecurity to the country’s growing list of challenges and contributing to growing social insecurity”(WWF, 2014). Two years later, South Africa finds itself “under threat of a lack of sufficient water, while water quality and availability issues are becoming more acute” (WRC, 2017). Water is being used in agricultural irrigation and food processing. Agriculture in South Africa remains one of the important sectors despite its relatively small contribution to the gross domestic product (GDP). Also water is essential for energy generation, on which fossil fuel is still the largest source of energy in South Africa.

This being said, South Africa has adopted the National Development Plan (NDP), which set out the country’s vision. The NDP’s vision for the future, which “includes access to affordable food and safe, affordable and reliable water and energy services, is based on the current economic model’s assumption of the infinite availability of these and other resources” (WWF, 2014:7). This is not a true version of the reality, thus there is a need to advocate further and ensure that the WEF nexus approach is understood and implemented at the municipal level thereby pushing for bottom-up approach to this concept.

## 1.1 Methodology

The paper employs a qualitative approach to understand the specific underlying factors on why the nexus approach has not being elevated in South Africa. Secondary data contained in published academic journals and studies conducted by the institutions that have interest in the security of water, energy, food and sustainable development has been used. The paper will provide overview of the key priorities for each sector, and then outline efforts made thus far on the implementation of WEF nexus. It will further detail why is WEF nexus not elevated to the policy level and the key recommendation on how this concept can gain momentum and high level recognition in South Africa.

## 1.2 Problem statement

Dialogues and advocating for the WEF nexus is not going to be helpful if the challenges hindering implementation are not resolved. The silos/ fragmented approach in implementing and ensuring future security of water energy and food is the key challenge.

# 2. LITERATURE REVIEW: WATER-ENERGY-FOOD SECTOR IN SOUTH AFRICA

South Africa is a Constitutional Democracy with a three-tier system of government and an independent judiciary. The national, provincial and local levels of government all have legislative and executive authorities in their own spheres, and are defined in the Constitution as "distinctive, interdependent and interrelated" (South African Government,2017).

The development challenge in South Africa revolves around how to grow the economy in a manner that creates jobs for a relatively poorly educated and unskilled workforce (WWF, 2014). South Africa has separate ministries for water, energy and food sector. This has therefore led to having separate policy documents which are implemented independently thereby threatening the security to the other sector.

## 2.1Energy Sector

The mandate of the department of energy is "to develop and implement policy imperatives that **ensure the security of supply** and improving access to sustainable energy by all South Africans. This we have done through, amongst other manners, ensuring that we develop and implement appropriate policies that address the gaps in our regulatory framework, **keeping the lights on**, ensuring that refineries produce adequate supplies and the acceleration of the development of renewable energy resources to achieve a more sustainable energy mix"( DOE,2017).

The Draft 2012 Integrated Energy Planning Report (DoE 2013a) highlighted that primary energy supply in South Africa is dominated by coal (67%), followed by crude oil (20%). Nuclear, natural gas and renewable energy (including hydropower and biomass) play a smaller role in the total energy mix, collectively contributing the remaining 13%. When considering electricity specifically, about 90% of electricity is generated from coal, followed by just less than 5% from nuclear energy. Other sources of electricity including hydropower, petroleum products (diesel), natural gas and other renewable energy sources (i.e. solar, wind, biomass, bagasse and landfill gas), which collectively

contribute a very small proportion of the total installed capacity for electricity generation (WWF, 2014).

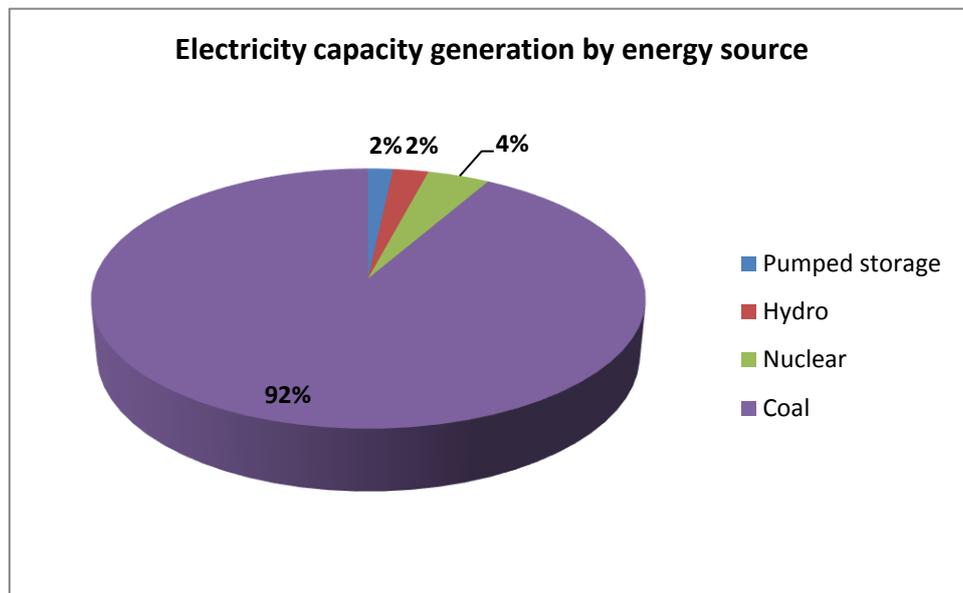


Fig 1: Source: World Wildlife Fund, 2014

World Wildlife Fund further highlights that, a model for water is acknowledged within the energy planning scenarios and water use is reported however it is not given sufficient focus and is not properly considered in the context of full supply-chain and quality impacts.

## 2.2 Water Sector

The department of Water and Sanitation strive to ensure that all **“South Africans gain access to clean water and dignified sanitation”**. It also seeks to **promote effective and efficient water resources management to ensure sustainable economic and social development**. It further has a vision of being “a dynamic, people centred department, leading the effective management of the nation's water resources, to meet the needs of current and future generations” (Department of Water and Sanitation, 2017).

The department of water and Sanitation has an agency called Water Research Commission (WRC) that is mainly responsible for water research and innovative technologies and systems for ensuring sustainability, funding, knowledge creation and dissemination.

Water-Energy-Food review study (WWF, 2014) outlined estimated water demand across the country as follows; agriculture uses 61% of the water, urban households use 22% and mining and power generation use 6% and 2% respectively. Although South Africa is experiencing water deficits and has major problem with the quality of water, still most of the water used across the different sectors as outlined in Fig 2 below is freshwater.

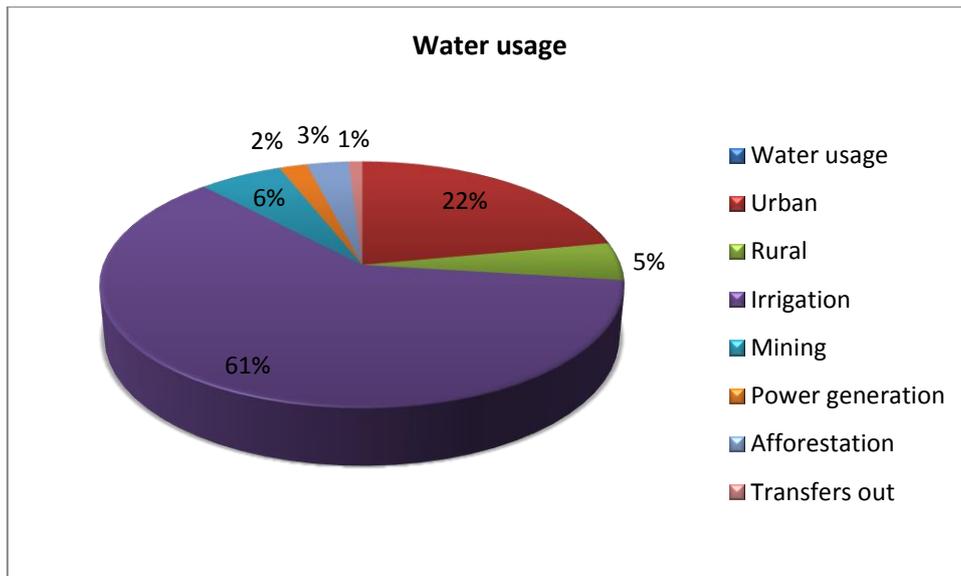


Fig 2: Source: water energy food review study

### 2.3 Food sector

The department of agriculture, forestry and fisheries has prioritised three focus **areas which are food security, job creation and contribution to the gross domestic product** (DAFF, 2017). Although agriculture has small contribution towards gross domestic product (GDP), the National Development Plan (NDP) has identified agriculture as one of the priority sectors that has a potential of creating massive number of jobs due to its nature. Although figure 2 above shows that agriculture has highest demand for water through irrigation, a need to enhance this sector has been prioritised. This therefore demonstrates conflicting messages given that South Africa is water stressed country.

### 2.4 Discussion

Based on the high level review across the sectors outlined above, one thing that stands out is that there are dependencies within these sectors and water seems to be at the centre. Therefore, in order to ensure security, there is a need for an integrated approach coupled with distinct monitoring and evaluation systems. Implementation of policies independently is not the best solution for South Africa as it will lead the country to multiple crises.

## 3. WATER-ENERGY-FOOD NEXUS

During 2011, South Africa embraced the water–energy–food (WEF) nexus which was first “brought to the attention of global leaders at the Davos World Economic Forum through the Global Risks (2011) report, of which South Africa was a part” (WRC, 2015). Subsequently, a series of dialogues and in depth research on the linkages, challenges, opportunities between these three key sectors has been increasing. However, in South Africa the nexus approach remains mainly paper work due to lack of proper framework on how to implement this approach given the complexities surrounding the governance structures and the development priorities.

Most of the studies conducted on the WEF nexus concept in South Africa were intended at understanding the linkages, dependencies, and trade-offs associated with the core elements of the nexus. Fig 3 below seeks to summarise the inte-linkages within the South African context.

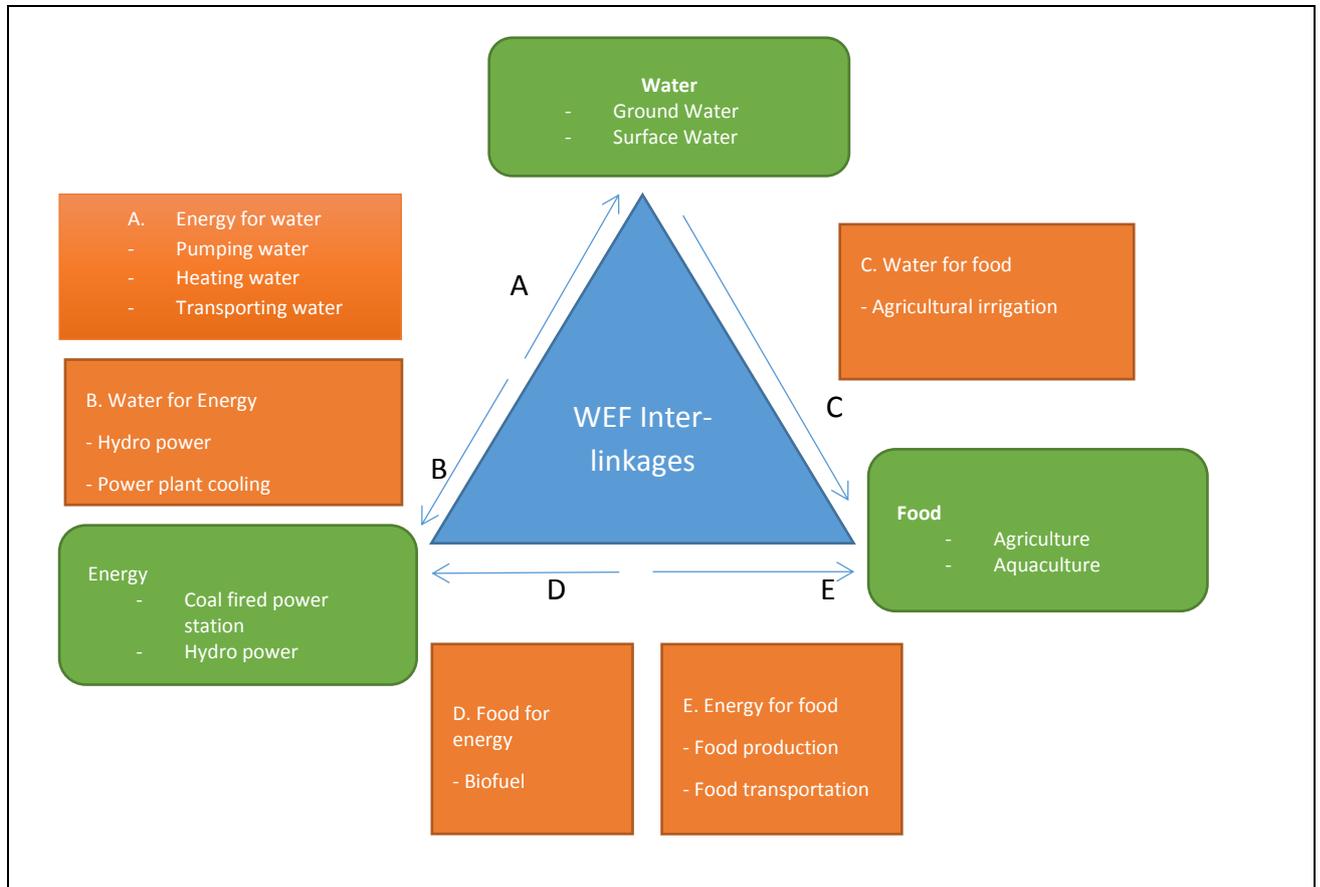


Fig 3: Dynamics of WEF nexus

Source: Aiko Endo, Burnett Kimberly: 2015

In addition to identification of linkages through in depth research, there have been projects implemented. The following two projects are some of the examples of WEF Nexus approach and are currently underway.

### (a) Sun farming

The Sun farming Food & Energy Project is a PPP project that was implemented by the partner company Alensys in South Africa for the first time with the help of KfW / DEG on behalf of the German Federal Ministry for Economic Cooperation and Development.

This unique combination ensures effective food production and, at the same time, a sustainable energy supply through photovoltaics. The Food & Energy Training Project provides knowledge transfer in food production in greenhouses for master trainers and students. In resource-poor areas or in crises, people from the region are trained as foremen in special food production in food & energy facilities. The income situation of the people is sustainably improved (DAFF, 2017).

## **(b) Decentralised waste water treatment system**

Governments and development agencies are recognising the need to harness the innovation and resources available to the private sector through partnerships in order to achieve developmental outcomes in countries with limited capacity and resources. At the local level, there is an excellent example of the benefits to be derived from a nexus-based approach. The University of KwaZulu-Natal and the Bremen Overseas Research and Development Association (BORDA) have been collaborating in the design and construction of a decentralised waste-water treatment system (DEWATS) at the Newlands-Mashu Permaculture Learning Centre. The eThekweni Municipality is using the resources provided by treated waste water to support urban agriculture based on organic farming principles and low input costs.

This project falls under the municipality's Agro-ecology Programme. The DEWATS, which receives up to 40 m<sup>3</sup> /d of domestic waste water from 85 households in the surrounding residential area, runs on gravity, requiring no energy inputs. Instead of using energy, the system produces biogas which is used in the community for cooking. An innovative project involving old mines and energy generation is being tested by VIASPACE13 /Selectra14 in South Africa.<sup>15</sup> The aim of the project for Selectra is to remediate and produce energy on land that has been altered by gold mining in South Africa. Selectra's goal is to use Giant King™ Grass as a feedstock for either anaerobic digestion or direct combustion to produce electricity and therefore create value from these mine dumps, or "slimes dams", for themselves and their partner gold-mining company. Mine dumps or slimes dams are composed primarily of crushed rock. They contain minimal organic matter, and traces of chemicals and contaminants from gold processing. It is thought that the Giant King™ Grass may take up heavy-metal contaminants from the slimes dams and contribute to remediation (WWF, 2017)

## **3.1 Discussion**

Considering the period that South Africa acknowledged the concept, it is clear that additional effort is still required in order for WEF nexus approach to be treated as a normal way of doing business. More awareness at provincial and local level also needs to be created. It will be prudent to target the nexus approach on the planned projects so as to avoid further distress on these three sectors especially water as some parts of the country are already facing major water crises. Against this background, the section below will focus on assessing why development of Nexus approach is taking off on a snail pace.

## **4. ANALYSIS OF THE PROBLEM**

In South Africa triple challenge of poverty, unemployment and inequality are symptoms of the unique socio-economic characteristics created by decades of colonialism and apartheid. Although significant progress have been made but the structure of the economy has not changed, with the productive sectors not growing fast enough and ***jobs not being created at the same rate as the labour market growth rate*** (Nine point plan, 2017). The recent Quarterly Labour survey released by Stats SA highlights that the unemployment rate has increased to 27, 7%, the highest it has been since 2003.

Based on the current situation of the country, who then will entertain WEF nexus approach if it does not necessarily directly respond to the biggest challenge of unemployment. Being a developing country with limited financial muscle and already experiencing resource difficulties on these three sectors, makes it more complex to take decisions that are future driven. However all is not lost, innovative options on how to ensure integration across the three sectors without even trying to disturb the current government structures need to be explored.

## 5. RECOMMENDATIONS

In South Africa there are clusters and forums in place to promote policy integration and effective planning, for instance all draft policy documents and implementation plans are discussed at length through clusters<sup>1</sup> and inputs are incorporated prior approval of the policy documents and plans. With the department of Water and Sanitation having prioritised the WEF nexus approach through the Water Research Commission, makes it possible to ensure that interconnectedness of these sectors are highlighted and incorporated into the future programmes and projects through clusters.

This being said another limitation then arise which is effective implementation and monitoring. In order to avoid the WEF nexus to be just paperwork, it will be prudent for the department of Water and Sanitation to have resources that will be allocated to the major programmes approved at cluster. The allocated resources need to identify synergies and work with the relevant province or municipality. In addition, the department of Water and Sanitation need to work on convincing the Ministry for Planning, Monitoring and Evaluation within the presidency which is responsible for monitoring outcomes to assist in monitoring WEF nexus, thus emphasising its importance. For the reason that if this approach is not seriously considered, honestly, the objectives of NDP or the efforts of trying to alleviate the challenges facing South Africa might not even see the light of day and will lead the country into multiple crises.

## 6. CONCLUSION

Water, Energy and Food sectors seem to be the most critical sectors in South Africa as the water scarce country with high level of poverty and major plans radically growing the economy that is dependent of energy that is mostly produced from coal. To this date there is a common understanding on the importance of WEF nexus approach, but is the concept well understood by the superiors and everyone who works within this space. Further dialogues and discussions are required so as to simplify the concept and make it less intimidating. Moreover consideration of the recommendations above is also important.

---

<sup>1</sup> Clusters “foster an integrated approach to governance that is aimed at improving government planning, decision making and service delivery. The main objective is to ensure proper coordination of all government programmes at national and provincial levels”(DPME,2017)

## References

Allouche, J., Middleton, C. and Gyawal, D. (2014). Nexus Nirvana or Nexus Nullity? A dynamic approach to security and sustainability in the water–energy–food nexus.

Department of Agriculture, Forestry and Fisheries, 2017: Media release [Online]. Available from [www.daff.gov.za/daffweb3/news-room/media-release](http://www.daff.gov.za/daffweb3/news-room/media-release) [Accessed: 29 May 2017]

Department of Energy, 2016: Annual Report [Online]. Available from [www.energy.gov.za/files/publications\\_frame.html](http://www.energy.gov.za/files/publications_frame.html) [Accessed: 29 May 2017]

Department of Water and Sanitation, 2017: About us [Online]. Available from [www.dwa.gov.za/about.aspx#vision](http://www.dwa.gov.za/about.aspx#vision) [Accessed: 29 May 2017]

Endo, A., Burnett, K. (2015) Methods of Water-Energy-Food Nexus.

South African Government, 2017. Structure and functions of SA government [Online]. Available from [www.gov.za](http://www.gov.za) [Accessed: 29 May 2017]

Statistics SA, 2017. Quarterly Labour survey.

Taljaard, A, 2015: Press Release : WRC water-energy-food nexus dialogue [ Online]. Available from [www.wrc.org.za](http://www.wrc.org.za)

World Wildlife Fund, 2014. The food energy water nexus: Understanding South Africa’s most urgent sustainability challenge.

World Wildlife Fund, 2014. Understanding the food energy water nexus: Through the energy and water lens

World Wildlife Fund, 2014. Water, Energy and food: A review of integrated planning in South Africa

World Wildlife Fund, 2014: Water as an input in the food value chain

Wits University, 2017: Africa needs to manage food water and energy in a way that connects all three [Online]. Available from [www.wits.ac.za/news/latest-news/in-their-own-words/2017/2017-01/africa-needs-to-manage-food-water-and-energy-in-a-way-that-connects-all-three.html](http://www.wits.ac.za/news/latest-news/in-their-own-words/2017/2017-01/africa-needs-to-manage-food-water-and-energy-in-a-way-that-connects-all-three.html) [Accessed: 28 May 2017]



**TIPS is a research organisation that facilitates policy development and dialogue across three focus areas: trade and industrial policy; inequality and economic inclusion; and sustainable growth. The Annual Forum is platform for researchers, policymakers and other stakeholders to present research and engage in dialogue on policy-relevant issues. The Forums have overarching themes and have been running since 1997.**

**For details of past Forums and copies of research presented go to Forum Papers**

**[info@tips.org.za](mailto:info@tips.org.za) +27 12 433 9340 [www.tips.org.za](http://www.tips.org.za)**

