INNOVATIONS in the SA water sector
Danish investment into water management in South Africa
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The World Wide Fund for Nature (WWF) is one of the world’s largest and most experienced independent conservation and environmental organisations, with over six million supporters and a global network active in over 100 countries.
Eight percent of South Africa’s landscapes provide more than half of its fresh water. Apart from their priceless water value, these water source areas are key biodiversity areas, rich in plant and animal species. Despite this, many of the water catchments within these landscapes are not protected and are often infested with alien invasive vegetation which absorbs vast quantities of water.

“To boost water quality and water security along the catchments we are engaging with landowners, local government, communities and agri-industry,” says Christine Culvin, Freshwater Programme Manager for WWF South Africa. “We are also working with partners to address the sanitation challenge we face in many towns. Dysfunctional sewage systems threaten water quality in many of our critical catchments. A positive trend is that an increasing number of commercial farmers, industries, communities and municipalities are willing to get together to discuss the co-management of water resources.”
INTRODUCTION TO THE PARTNERSHIPS

We rely on the natural environment to meet our needs – it is the foundation of human well-being. On a daily basis, living landscapes provide us with food and water. WWF’s vision is to build a future where all people live in harmony with nature.

WWF South Africa has a particular focus on freshwater, and aims to help build water security in South Africa, with healthy catchments sustaining people and nature, and supporting economic development in a time of climate change.

All countries face threats to their water security from pollution, growing demands, drought, changing land uses and climate change. In the future we will all need to do more with less, to feed a growing population in a warming world. Our water sector will need to be strengthened to enhance the quality and quantity of supply. Innovations in technology, land and water management systems, together with skills development, are needed to cope with our current challenges and ensure sustainable water for all.

South Africa and Denmark have a history of collaboration. From 1963 to 1994, the Danish government provided significant support to the victims of apartheid during the struggle for democracy. This included supporting educational initiatives for the disadvantaged, environmental management projects, good governance and democracy-building processes, as well as general human rights empowerment.

Since 1994, the first year of our democracy, the Danish government’s support has continued including significant investment in the implementation of integrated water resource management, in support of the South African National Water Act (1998) and the development of South Africa’s water sector.

This phase of bilateral support has come to an end, and, in recognition of South Africa's leading role on the African continent and in the BRICS developing countries association, a new relationship of trade and technical cooperation is beginning.

In 2013, the Royal Danish Embassy in Pretoria, South Africa, and WWF-SA began a partnership to enable Danish-South African collaboration in the water sector.

The project began with an exchange visit to Denmark by more than 20 representatives from South African water institutions and local government, including the Department of Water and Sanitation, and the South African Local Government Association. The South African delegation was hosted by State of Green, the official green brand for Denmark, and visited Danish companies and organisations implementing cutting-edge solutions to universal water issues. South African-Danish partners were then invited to submit proposals to collaborate on the development of innovative pilot projects to be tested in the South African context.

The projects that are summarised in this report were selected by WWF-SA and the Royal Danish Embassy to demonstrate innovation and skills development in the South African water sector. The projects have been implemented during 2014 and 2015 across the country, from the Western Cape to the far reaches of the Inkomati catchment in Mpumalanga province and a rural town in Limpopo province.

The water-energy nexus in these projects is addressed at the local government level, with improved energy efficiency in water management and wastewater treatment at Drakenstein Municipality by VCS, as well as in energy production with an assessment of new technology from Haldor Topsoe that can reduce Eskom’s water consumption in coal-fired power plants. Productive use of cleared alien plants has been made possible for farmers in the Western Cape with the use of a wood chipper from Linddana and improvements in water efficiency were tested in agriculture by Fyn Bloem in partnership with Grundfos. Water losses in the rural north can be mitigated with new leakage detection monitoring introduced by Kamstrup in partnership with the local municipality. DHI South Africa have established online flood prediction and monitoring in the Inkomati catchment, and have developed a new web tool to support farmers in water stewardship in the Breede catchment. The DHI projects have been carried out in partnership with new catchment management agencies which will be critical for South Africa’s sustainable water resource management in the future.

These pilots have demonstrated exciting new innovations in technology, skills and management systems that can support a stronger water sector and more efficient, productive water use. Water connects us all, and these projects have connected a range of committed partners from the north and south in building a more water-secure future.

Thank you to the people of Denmark and the Royal Danish Embassy for enabling this investment in our water sector. We look forward to experiencing the results of these incredibly important projects with you.
“Three years ago we had to start addressing a serious, escalating water problem with our cultivated proteas,” explains Beyers Beyers, CEO of FynBloem.

Situated between the villages of Greyton and Riviersonderend in the Western Cape, FynBloem farm has 83 hectares of established fynbos – including 27 different cultivars of proteas and 10 Leucadendron species – all grown for export, mainly to Europe where it supplies Marks & Spencer, Tesco and Sainsbury’s.

FynBloem was founded in 2009 as a partnership between Beyers and FynBloem’s Denmark-based director, Laurits Møller Larsen. Beyers and Larsen have known each other since 2000, when Beyers initially exported dried fynbos to Larsen.

“When drawing water from the Riviersonderend River for irrigation, we started picking up excessive levels of sodium and magnesium in the water at certain times of year. This can burn the roots of the plants, affect their water uptake and reduce their yield,” Beyers adds. “In response, we have had to use one and a half times the amount of water that these plants normally need in order to flush out the sodium and magnesium. This was simply not sustainable and we needed to address the problem more efficiently.”

With its water supply originating from the Theewaterskloof Dam, approximately 100 kilometres away, FynBloem is down river from a number of wheat farms where the lands are fertilised and the run-off heads down the catchment. Beyers believes that as upstream farming expands and becomes more intensive in soil preparation and fertiliser application, so the sodium and magnesium content downstream intensifies.

To address this growing problem he approached Charles Cherry, his local irrigation specialist and a civil engineer, who operates from the nearby town of Grabouw. He also consulted with Janeke Hoffmann, business development director for Danish pump manufacturer Grundfos.

“As Grundfos produce the best pumps, it was essential to match the best irrigation design with the best pump for optimal outcome,” says Beyers.

Cherry explained how this irrigation solution would provide an alternative water source to help dilute the overly salinated water as and when necessary: “In a low pressure pipeline over four kilometres, FynBloem is gravity-feeding water that comes from a mountain stream to the point of the river where water is currently pumped for irrigation.”

“In addition to better water conservation and management, we are in the process of installing solar technology for our pack house, with input from the Danish International Development Agency. The Danes are experts on renewable energy and they are also highly supportive of agriculture.”

In 2013, South Africa supplied 90 percent of the world’s 10 million stem protea market – and this demand is estimated to be 12 million stems in 2015. In 2013, FynBloem had a 30 percent share in this market which was expected to increase to over 33 percent by 2015.
“When the sodium and magnesium levels are high, we can now mix in the mountain water we need, and when levels are low we increase the amount of water coming from the river.”

“The existing pump has also been replaced with a vertical multi-stage Grundfos pump, making the whole system automatic. I can manage and monitor it from my office on the farm, or wherever I am in the world,” adds Beyers.

“None of this would have been possible without the investment from the WWF-Danish partnership, which is contributing one-third of the costs of this system, while we are inputting the rest.”

FynBloem is a local leader in social, environmental and financial sustainability standards. With a permanent staff of 162 people and 30 contract staff during peak season, FynBloem is also working on offering selected employees a stake in the company by way of the workers ownership trust, which will provide them with a more financially stable future.

“Success for me is measured by your people,” says Beyers. “At FynBloem we believe in rewarding our team for their commitment.”

Initial results

“The less water we use per hectare as a result of the new system, the more sustainable we become, both in terms of water and energy usage,” says Beyers. “With better quality water we should be able to pick more stems per plant, perhaps 15 percent more. We’ll be able to share the results from the first harvest. We are also planting an additional 13 hectares. These plants will give us a good indication of the kind of results we can achieve because they will be receiving the better quality water from day one.”

Guidelines for best practice learned in this project

Reliable, clean water means that FynBloem will be able to introduce carefully controlled amounts of fertiliser into the drip irrigation system, which they could not do before because when you add fertiliser to water with a high sodium and magnesium intensity, you substantially increase the overall salt intensity. “We are producing stems at a high rate so we need to use fertiliser but with lower sodium and magnesium levels we will be able to irrigate less and flush less and therefore also use less fertiliser,” Beyers explains.

To reduce its carbon footprint and as an inflation buffer, FynBloem's target from July 2015 is to send 30 percent of its flowers by sea freight.
The system has to be reliable because if it is inaccurate people won’t trust it the next time around,” adds Letshela. The data is also shared via a public website that includes a water resources information dashboard where flood forecasting will be highlighted.

The forecast is based on flow modelling of measured information from a range of sources, including weir gauges along the course of the catchment that determine the height of the water, rainfall, timing of flow peaks and flow waves, and satellite information. The information is received by the IUCMA’s operations centre in Mbombela, from where it is distributed to the municipal, regional and national disaster coordination committees. To understand the extent and reach of this project, the DHI team gives an overview of the catchment’s complex water management system.

“Competing water demands in the highly over-allocated Crocodile River catchment – including massive water demands from agriculture for irrigation in IUCMA catchment areas in South Africa – complicates the management of the catchment with its many unregulated tributaries and competing local, international and ecological demands," Hallowes explains. "There are frequently periods when water restrictions need to be implemented.”

Only one dam at the top end of the catchment, Kwena Dam, regulates the flow to some degree for water users on the main stem of the Crocodile River. The IUCMA and the Crocodile River Irrigation Board (CRIB) cooperate closely over the management of the water, but up until 2010 there was no system in place to inform them, in real time, about the flow in the different tributaries or the total water supply and demand. This made it almost impossible to manage the system in an optimal, sustainable manner. Too little or too much water would be released from the dam, impacting water security throughout the catchment.

The newly integrated system not only resolves many of the above issues, it also helps to ensure that all water users are complying with their water use allocation, and this has helped to reduce tension between competing water users. A public website displays all the relevant information on river and reservoir levels, weather data, modelling results, international obligations and environmental requirements to facilitate maximum transparency and buy-in.

**Initial results**

While the Inkomati catchment is still one of the most over-allocated catchments in South Africa, the difference is that the stakeholders know that a world-class management and flood forecasting support system is in place to help ensure their water is managed optimally to reduce the devastation from flooding.

**Guidelines for best practice learned in this project**

Getting all stakeholders on board to see the value of effective modelling systems is essential to the success of this kind of project. Meetings, discussions and presentations at every level – which include the CMA, CRIB, municipalities, regional and national disaster management authorities – have been well received and improvements are ongoing.

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**Useful Links**

Decision Support System: [www.inkomaticma.co.za](http://www.inkomaticma.co.za) & River Operations application

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Fish ladder in the Inkomati catchment, to facilitate fish migration through the river system. “With the addition of our new flood forecasting system we now have a catchment-wide system where we’re basing our decisions on information available, in real-time, at our fingertips, and we have far better knowledge of what’s going on in the catchment, and how to respond,” says Brian Jackson, IUCMA’s executive manager for water resources planning.
Wood Chips for Water

It is a shocking sight to see a river choked with alien invasive trees and biomass, the remains of woody invasive trees chopped down but never removed.

This river is in the Western Cape’s Riviersonderend catchment, which is in one of South Africa’s key water source areas and part of the critical eight percent of our land area that provides half the country’s fresh water. It is also one of the last remaining palmiet wetland systems in South Africa. Palmiet is an indigenous, semi-aquatic wetland plant that is essential for year-round water storage, sediment stabilisation and slowing down of flood waters.

“When it floods, the force of the water pushes these felled trees down the river, scouring both the riverbed and river banks. This is devastatingly changing the shape of the river structure and creates fast-flowing erosion channels instead of a diffused slow flow across the well-adapted palmiet wetlands,” says Dr Saskia Fourie, Water Balance Project Manager for WWF South Africa.

Water-thirsty alien invasive plants are also sucking up the water and destroying palmiet wetland systems, which should be anything from 50 metres to 200 metres wide.

The Big Issue

Alien plants such as wattle, pine and eucalyptus are a threat to water resources in South Africa because they invade catchments and use much more water than indigenous plants.

It is estimated that approximately 1.4 billion cubic metres of water are lost annually in catchments invaded by alien plants.

There are several clearing programmes, both government and private, that are attempting to eradicate alien plants. But once the wood is cut down it is often left behind, creating another risk for intense fires and damage to river systems in flood.

This project introduced a world-class wood chipper and demonstrates how value can be created out of ‘waste’ wood generated from clearing alien plants – while also saving more water.

Water saved through removal of invasive alien vegetation

Research conducted by South Africa’s Council for Scientific and Industrial Research (CSIR) shows that the national average for South Africa is 2 076 kilolitres of water gained per hectare cleared, and it is estimated that the clearing of invasive alien species in the entire Riviersonderend catchment can increase water yield by 13 million cubic metres annually.

“Fortunately the river system can still be saved with timeous intervention and restoration,” says Fourie who is overseeing this project alongside on-the-ground project manager, Eben Olderwagen, from NCC Environmental Services who is contracted by WWF-SA.

From October 2014 to October 2015, over 180 hectares of alien invasive trees – predominantly black wattle but also long-leaved wattle, golden wattle,
blackwood, beefwood, eucalyptus and pine – have already been cleared from the Riviersonderdend catchment, extending from farms above the Theewaterskloof Dam near the town of Villiersdorp to Meulrivier Farm near the village of Greyton.

The project has decades of alien invasive trees to clear, in partnership with the Department of Environmental Affairs, the Breede-Gouritz Catchment Management Agency, Nedbank, and the region’s landowners and farmers who are directly dependent on the river for their irrigation needs.

Without a viable method of dealing with the abundant biomass though, the river restoration project cannot make sufficient headway nor achieve the required landscape and water recovery.

Enter the TP 270 tractor-driven wood chipper, funded through the Danish Embassy and purchased from Danish company Linddana, renowned for its quality machines.

The wood chipper started working on Meulrivier Farm where chunks of alien invasives are fed into it and wood chips effortlessly flow from it.

“The wood chips provide extremely good mulch for our apple orchards. It protects the soil and increases its carbon content and fertility, which in turn, leads to a decrease in the use of fertiliser and better fruit production,” says farmer Carl van Lingen of Meulrivier Farm.

“We also do not need to irrigate as much when the soil is well protected because the water does not evaporate as quickly,” he explains.

“As part of the project we have trained up a team of four people to operate the wood chipper,” Olderwagen explains. “This creates jobs for people in the local communities, as does the South African government’s Working for Water clearing work which includes seven teams of 13 local people per team, 60 percent of whom are women and 60 percent young people."

“We are fortunate to have developed strong relationships with most of the farmers in the project area because they need to commit to follow-up management,” says Fourie.

“They need to ensure that the riverine areas cleared on their farms remain free of alien invasives and that the indigenous plant restoration project in the riparian zone is maintained.”

Initial results

The TP 270 tractor-driven wood chipper can chip wood up to 270 millimetres in diameter and produces about 24 cubic metres of wood chips per day. One tonne of wood chips contains an average 1.4 cubic metre solid content wood, though this varies between different types of wood.

Guidelines for best practice learned in this project

Partnerships with government are often demanding to administer. It is essential to have a reliable, professional project manager like Olderwagen in the field to ensure the projects are running properly and that each team is well managed.

The teams need to be thoroughly trained in a variety of skills – from chainsaw operating to herbicide application, first aid to health and safety. They also need training in professionalism and meeting project targets, based on Working for Water’s set of norms and standards.

Useful Links

Find out where your water comes from: www.journeyofwater.co.za
We have been focusing on this study with Eskom since April 2015 and we are completely confident of the technology,” says Rosenberg. “It has 20 years of operation behind it, and it is used in plants all over the world, including Denmark, Austria and Brazil. We look forward to the results of the study that will specify the savings for a power station like Majuba.

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**Guidelines for best practice learned in this project**

South African partnerships are a key factor — there will be a huge element of local content into possible future SNOX™ projects in South Africa. It is also very important to invest in skills development. Two exceptional South African chemical engineers with whom we have worked are Dr Emma Mokoena and Xolelwa Ntlango.
“Fruit farming in the Ceres area had been identified as a water risk hotspot in South Africa,” explains Dr Klaudia Schachtschneider, Water Stewardship Programme Manager for WWF South Africa.

Supplies of peaches, nectarines, plums and apricots grown in the Breede catchment in South Africa’s Western Cape were identified as being at risk following a supply-chain analysis on WWF’s water risk filter web tool. The water quality from this catchment does not always meet international standards and the water quantity can be unpredictable.

**The Big Issue**

Farmers are the biggest direct users of water – 66% of all South African consumption – and the most widespread custodians of landscapes in our catchments. It is critical that they are supported in managing water and land resources to maximise the benefits for all water users. Water stewardship involves minimising negative water impacts and joining forces with your catchment neighbours to tackle shared risks. This project developed the first online support tool to support farmers in this area implementing the international Alliance for Water Stewardship (AWS) standard. It grew out of an existing partnership between WWF-SA, the Breede-Gouritz Catchment Management Agency (BGCMA), GIZ and the retailers Marks & Spencers and Woolworths, together with their fruit suppliers in the Ceres area.

“In 2014 we started working with farmers in the Ceres fruit-production area who fall under the local catchment management agency to identify their key water risks and to pilot the first Alliance for Water Stewardship standard towards addressing these risks,” Schachtschneider continues.

The three key water risks identified were:

- Pollution from rapidly expanding low-income settlements;
- Rapidly invading alien plant species, which decrease run-off;
- Continued poor practice because of lack of awareness and limited or fragmented access to information.

When it came to discussion about how to go about complying with the AWS standard, what quickly emerged is that farmers are suffering from ‘compliance fatigue’. They have to comply with so many different standards that yet another one was daunting for them. The alliance's methodology is also better suited to larger companies that have a sustainability team to address the requirements.

WWF-SA and the Danish Embassy recognised the need to simplify the process, and contracted DHI South Africa, a global company that specialise in water environments, to develop an easy-to-use, free, water stewardship web-based tool.

The aim of the online tool is to give farmers and businesses the opportunity to begin their water stewardship journey with guidance on the best local information available.
The web tool was officially launched in October 2015. Its approach and design has been well received by test groups. It links water users to relevant water and catchment information from many sources including the Department of Water and Sanitation, the Water Research Commission, and the Breede-Gouritz Catchment Management Agency. The tool is now ready to be expanded into other agricultural sectors such as sugar and sustainable wine.

Guidelines for best practice learned in this project

“The complexity of making something work simply is a difficult but necessary challenge,” says Schachtschneider. “Solid water expertise is the first step, but it has required extensive work with our digital team and communications experts to make sure that our guidance on how to use the standard is accessible to farmers.”

“Your water is my water”

The Alliance for Water Stewardship is an independent, global organisation that takes a ‘whole cycle’ approach to water stewardship – from sound management of wetlands, rivers and catchments, to the social and reputational issues of business management. It addresses the need for collective catchment management, where, whether we are upstream or downstream, we are dependent on each other for the quality and quantity of the water we receive.

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Useful Links

WWF’s water stewardship web tool: www.wwf.org.za/what_we_do/freshwater

WWF’s water risk filter tool: www.waterriskfilter.panda.org

Alliance for Water Stewardship: www.allianceforwaterstewardship.org

66% OF ALL WATER CONSUMPTION IN SOUTH AFRICA IS BY FARMERS WHO ARE THE BIGGEST DIRECT USERS OF WATER

© JOAN ISHAM

Agriculture in the Breede River Valley where the water quality from the Breede catchment does not always meet international standards, and the water quantity can be unpredictable.
SAVING WATER LOSSES IN RURAL SOUTH AFRICA

The summer rains have not yet arrived in early October in the rural village of Lerupurupung in South Africa’s Limpopo province. Situated a stone’s throw from the Botswana border, the parched red earth is a billboard for the necessity to manage water.

“We are still waiting for the rain,” says Lerupurupung resident Paulina Malatji as she fills up her bucket from a communal tap in the street. Her home is right next to the tap, which eases the burden of fetching and carrying water. Half of the houses in the village have taps in their homes, the other half make use of these communal taps.

Lerupurupung’s water is pumped from the nearby Lephalala River, which is running low ahead of the summer rains. From the river, the water is first led to a water treatment reservoir and then to a storage reservoir on a hill above the village, from where it is finally distributed to all the households.

The Big Issue

Preventing, monitoring and repairing water supply leakages in deep rural areas is a significant problem. Leakages are caused by anything from burst or blocked pipes to taps that are left running. As a water scarce country we urgently need to bring down the 37% of water losses that occur in most South African municipalities.

Thirty kilometres from the village in the town of Lephalale, the Lephalale Municipality manages the water for this remote area. It is provided free of charge to approximately 5,000 people, many of whom are unemployed, some work on farms in the district and others are subsistence livestock farmers.

When there are leakages or problems with the water supply, it can take days, even weeks, to locate the problem and have it resolved. Exacerbating the problem is that community members do not always know whom to contact to report leaks and broken taps.

“To demonstrate what can be done to reduce leakages and improve the management of water through accurate technological monitoring, the WWF-Danish partnership is funding a pilot project in Lerupurupung, using Kamstrup’s water meters to monitor water use and track irregularities,” says electronics engineer, Thinus Botha, technical manager for Kamstrup in South Africa. A Danish company, with an office in Pretoria, Kamstrup specialises in the design of water, electricity and heat energy meters. This project will install 40 of the blue, cricket-ball-size water meters on communal taps in Lerupurupung and 48 on taps in individual houses, plus a bulk meter at the reservoir on the hill above the village.

Simple in their sophistication, these meters are hardy and non-mechanical. Each meter has a lifespan of 16 years and they are designed in such a way that the parts are not useful to the general public, which minimises the risk of theft. They are also easy to install and the project will train approximately 12 local people to do this.
“The moment water flows out of the tap, the meter switches on and uses sound waves to measure the flow of the water. Every 16 seconds each meter sends information via a tiny, lithium battery-operated radio to a central ‘concentrator’, which has a miniature computer that can manage the information from a few thousand meters,” Botha explains.

The concentrator will be installed at the top of the ultra-high lamp-pole of a large floodlight in the village. “From the flow readings the concentrator can detect if there are leakages or if the flow is insufficient, indicating a burst or damaged pipe. In addition, if the sum of the usage does not equal the sum of the water coming out of the reservoir it indicates leakage,” Botha continues.

The concentrator has a simcard linked to the internet, and it logs the data for each meter every 16 seconds. Every six hours it then sends the information to the hosting server in Denmark, with an alert message if there is any problem, locating exactly where the problem is. An SMS or email detailing the nature and location of the problem is then immediately sent to the appropriate person in the Lephalale Municipality, as well to the town engineer.

A meeting was held in the local community hall to share with residents how the meters work and to answer any questions. In attendance were community members and delegates of the Lephalale Municipality, as well as representatives from the Johannesburg-based Spatial Planning Agency of Southern Africa (SPASA) who are partnering on the project. SPASA’s senior data and GIS officer, Herman Motshwega, did the on-the-ground and online layout for the project and they are also responsible for the overall quality of the water supply. SPASA assists local government in addressing issues of service delivery, governance, capacity building, integrated development planning and sustainable development.

“It’s an important step towards managing water correctly for South Africa, with significant financial savings,” said SPASA’s financial manager, Ben Loggenberg. At the meeting the local ward councillor, Alpheus Thulare, reassured the community members that the meters did not have anything to do with billing them for water, which was a key concern they raised.

“These meters will help us to find and fix water problems much faster than before,” he explained. “We won’t be sitting without water for days.”

“It will help us to manage our water better throughout the year because sometimes the boreholes inside the river dry up in the non-rainy season,” added assistant technician for water from the Lephalale Municipality, Mathlodi Kgobiwa. This is the first time a project of this nature has been piloted in South Africa. “What is great about this model is that it can work equally well for small and large municipalities, and for urban and rural areas,” Botha adds. “Once we demonstrate how much water it can save, the model will hopefully be extended to many other areas in South Africa.”

Guidelines for best practice learned in this project

Community meetings and ongoing community engagements are key to the successful implementation of the project to ensure that community members understand exactly what water meter measuring is all about, how it can benefit them, and to encourage them to own the project. This way, they will take it upon themselves to ensure the meters are kept in good order. To get the project rolling the WWP-Danish partnership will cover the data hosting costs in Denmark for the first six months. Thereafter, SPASA has shown interest in assisting the Lephalale Municipality in hosting it in South Africa.

The message that the Drakenstein Municipality is conveying to its citizens is that every ‘blue drop’ of water (every freshwater source including rain, rivers, wetlands and dams) – and every ‘green drop’ (the wastewater treatment systems) – needs to be optimally managed because it is essential to human, economic and ecosystem health. In 2013, only 60 out of more than 300 wastewater treatment plants in South Africa achieved green drop status.

“South Africa faces significant challenges in terms of water quality and quantity, now and in the future,” says specialist water engineer and local project manager Chris Swartz who is partnering on this project with Danish water and wastewater company VCS and the Drakenstein Municipality.

“The aim of this partnership is to facilitate successful public-private partnerships by drawing on Danish technology and know-how to enhance South Africa’s water and wastewater sector through a pilot project.” Within the Drakenstein Municipality’s six-town jurisdiction, Paarl and Wellington were selected for this pilot. From October 2014 workshops were held in Paarl, led by VCS’s specialist water engineer Thomas Jørgensen and specialist wastewater engineer Per Henrik Nielsen and attended by a range of supervisors and scientists from the Drakenstein Municipality, as well as from the Stellenbosch and Breedle Valley Municipalities. Based at the Paarl Wastewater Treatment Works the core team consists of Mark-Anthony Watson, senior superintendent: wastewater; Grant Rhoda superintendent: wastewater treatment; and Raymond Swarts, chief chemist: scientific services. They manage the operation and maintenance of six wastewater treatment plants and 12 wastewater reticulation pump stations to ensure the safe return of treated effluent back into the environment as per South African legislation.

“These are exciting times as the Drakenstein Municipality has achieved blue drop status for all drinking water plants, and green drop certification for one wastewater plant, acknowledging our high management standards. The input from Chris and the Danish specialists is now taking us to another level,” says Watson.
“One example is the improvement of our biofilter efficiencies. These biofilters utilise bacteria that feed on solid organic material and require oxygen for the biological oxidation process. Through this collaboration we realised that we needed a more consistent inflow over the stone beds where the bacteria live. When the flow is inconsistent, the bacteria die off, which, in turn, leads to a reduction in efficiency when the flow increases.” Swarts and his team are constantly monitoring the type and quantity of bacteria (biomass) in the treatment system, as well as the ammonia and nutrient levels (nitrites and phosphates) in the wastewater effluent.

“Another issue in terms of operational shortcomings is that not all the operational staff thoroughly understand the biological and chemical processes in the plant,” adds Rhoda. “Training all staff in the basics of these processes would help to more accurately identify and rectify problems.”

The initial water and wastewater process that this project is addressing will:

• Provide guidelines to reduce water leakages in the system;
• Look at opportunities for water saving through water re-use and recycling, including further irrigation and other uses of secondary treated wastewater;  
• Improve the quality of the wastewater plants’ final effluent which flows back into the Berg River;
• Provide specialist inputs into upgrading the Wellington wastewater plant.

The second phase will:

• Provide guidelines and best practices to improve the energy efficiency in the Drakenstein water supply and wastewater treatment systems;
• Generate power by installing micro-hydroturbines in the high-pressure elevated water supply pipelines from the Paarl mountain or other high-lying areas. This would reduce the electricity costs, as the Drakenstein Municipality would be able to use the energy it generates for its own on-site needs.

South Africa’s Water Research Commission has pioneered generating of electricity from our water pipes by placing micro-hydroturbines in municipal infrastructure. This has already worked well in Bloemfontein and VCS are assessing the Drakenstein infrastructure to see where this new technology could be implemented. Micro-hydroturbines help to further reduce leakages by reducing pressure in the pipes and then constructively convert the energy to electricity for use by the municipality.

Initial results
Drakenstein Municipality is already seeing significant improvements in the whole system. They have also increased the number of days when the final, treated effluent flowing into the river is fully compliant with all the specifications set out by the Department of Water and Sanitation. On days when it is not, such as when a pump has broken down or another incident occurs, the problem is far more quickly identified and mitigated.

Guidelines for best practice learned in this project
It’s extremely important that the laboratory staff and operations staff work hand-in-hand to empower the team and achieve optimum results with input from world specialists like the Danish.
CONCLUSION

If we are to meet the enormous challenge of supplying enough water to meet our growing needs, it can no longer be 'business as usual'.

Water management is undertaken by a myriad of institutions, directly in the water sector and indirectly by those who impact water resources. The projects we have supported during this partnership, have engaged a diverse array of organisations to build and strengthen relationships that support new ways of 'doing business' with water.

New technologies, such as the high-tech Kamstrup water meters attached to communal and individual taps, can dramatically improve our understanding and management of our water systems. However, they are not sustainable without the broader support and understanding of the communities they serve. These projects have focussed on building that understanding, not only between the Danish and South African implementers, but also between the government and the broader community of workers, farmers and beneficiaries. Skills development has been a critical component to ensure the innovations are embedded in environments that can make full use of them.

It is important for South Africa to build a thriving water sector with local products and innovations, as well as including appropriate technologies from countries such Denmark. These partnerships have recognised this. Haldor Topsoe, in addition to demonstrating the significant water savings that can be realised by including the water-saving SNOX™ technology in coal-fired power stations, have started discussions with Eskom about how to bring local content – local systems and people – into the application of SNOX™ in South Africa. VCS, as well as recommending design and management improvements to the wastewater plant operation in Drakenstein Municipality, saving on water and energy usage, also advised on how best to implement South African micro-hydropower innovations to generate electricity.

Farmers are a critical part of our water sector in South Africa and manage much of the productive land that makes up our catchments. Helping them to manage their land and water better results in huge water savings and benefits. WWF’s work in Riviersonderend supports farmers to clear damaging, thirsty, invasive alien vegetation and the Linddana wood chipper helps them to make good use of the wood from the plants. By spreading the wood chips over cultivated areas they then create a protective mulch that reduces their irrigation requirements. At the same time these catchment landscapes can start to heal as aliens are removed, the invasion is halted in its tracks, and less water is needed to maintain agricultural production. Similarly, FynStroom were able to reduce their water needs by using better quality water controlled via the Grundfos pump.

South Africa’s water sector is going through a period of transformation. We are shifting from an engineered supply focus to a new era with a focus on demand management in a ‘low-water’ economy. The technologies we have tested will be important stepping stones to new management systems with radically reduced carbon and water footprints. They also support our fledgling water institutions, such as catchment management agencies, who will be the critical defenders of our water resources and negotiate an important part of the interface between water and the broader economy.

DHI’s work with the Inkamati-Usuthu Catchment Management Agency helps us to manage the periodically ferocious power of floodwaters and predict floods better.

A new water stewardship web tool, developed with DHI for South African farmers and water-users in the Breede-Gouritz Catchment Management Agency, helps everyone become a better water manager. Water stewardship is gaining momentum in the private sector around the world, and through this partnership, South Africa has the first online tool to connect farmers to a wealth of local information that exists to support them in managing their own farm water, and in collaborating with their catchment neighbours to address the collective water issues that they cannot tackle alone.

These projects have meaningfully contributed to addressing some of our big water issues. Many small steps, taken in partnership together, move us closer to a water secure future.

"In order to achieve (our) strategic priorities we have realised that there is a need for increased impetus and pace. This calls for a revolution, a water and sanitation revolution to reclaim and better manage our water in order to tackle the triple challenges of inequality, poverty and unemployment.” Nomvula Mokonyane, Minister for Water and Sanitation, 2015 Budget Speech to parliament.
DANISH INVESTMENT INTO SOUTH AFRICA’S WATER MANAGEMENT

8% of South Africa’s land area produces half of our fresh water

66% of all water consumption in South Africa is by farmers who are the biggest direct users of water

2 076 kilolitres of water gained per hectare cleared of invasive alien vegetation

37% water loss occurs in most South African municipalities

Why we are here
To stop the degradation of the planet’s natural environment and to build a future in which humans live in harmony with nature.

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