



**water affairs**

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**WATER RESEARCH COMMISSION**  
**and**  
**DEPARTMENT OF WATER AFFAIRS**

**INTERNATIONAL CONFERENCE ON FRESH WATER  
GOVERNANCE FOR SUSTAINABLE DEVELOPMENT**

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## **SESSION 1: OPENING PLENARY IN CONTEXT**

**Chair: Ms Eiman Karar, Host and Conference Chair, Water Research Commission**

Ms Eiman Karar opened the conference and welcomed everyone on behalf of the Water Research Commission and the organising committee.

Delegates stood for the singing of the national anthem. A minute's silence was observed for the late Mrs Elinor Ostrom, who had passed away earlier in 2012 and would probably have attended the conference if she had still been alive. Mrs Ostrom was awarded the 2009 Nobel Prize in Economics.

### **Welcome and opening address – Ms Barbara Schreiner (Chair of the WRC Board)**

Chair of the Conference, Eiman Karar  
Prof. Mazrui  
Adv. de Lange, Chair of the Portfolio Committee on Environment and Water  
Honourable Guests from far and wide  
Ladies and Gentlemen,  
Friends,  
Colleagues  
All protocol observed

Welcome to this International Conference on Fresh Water Governance for Sustainable Development. And welcome to this exquisitely beautiful venue – with its glorious backdrop of the Drakensberg mountains.

I think that we have three interesting and challenging days ahead of us, and from the discussions that were happening already last night over a couple of glasses of wine, there are plenty of ideas and good minds coming together here. I think, and I hope, that we are in for an interesting couple of days.

Looking around last night, I saw a number of people here that have been part of the South African water project since it began after 1994, as well as a lot of people that are newer to the sector, and to these debates, and I would like to welcome, in particular, the students here with us. It is going to be your task to take this project forward well after a number of us have retired on to our verandas to write our memoirs.

I would like to start this conference with a bit of history. The early 1990s were an interesting period in South Africa, culminating, on 27 April 1994, with the first free and fair elections ever held in South Africa. Minister Kader Asmal was appointed Minister of Water Affairs and Forestry, and led the beginning of the water reform programme that we are still implementing.

The water reform programme saw the revision of the policy and the drafting of new legislation, and the implementation of a major programme to deliver community water supply and sanitation. It also saw the amalgamation of the ex-homeland water functions and infrastructure in the department, which more than quadrupled in size overnight.

At the time, water was rising up on the international agenda, and integrated water resources management (IWRM) was being strongly promoted. South Africa, in writing the new policy and legislation, embraced this concept, and drafted a piece of legislation, the National Water Act ((Act No. 36 of 1998), that was received as world class. Indeed, it was used by several countries as a template from which they drafted their own legislation. It was even translated into Chinese by the Chinese government so that they could use it as a reference document in revising their legislation. It was a remarkable acknowledgement of the advanced state of policy and legislative thinking and capacity in South Africa.

We had come, as you all know, out of a governance system that had robbed the majority of South Africans of access to land and water, and that had provided this same majority with poor, or even no, water supply and sanitation. In 1994 it was estimated that 12 million South Africans had no access to water, and closer to 20 million had no access to decent sanitation facilities. Our recent census reveals the degree to which we have managed to change that picture, and the challenges that still face us in that regard.

The drafting of the policy and legislation was remarkably inclusive, and started from a set of policy principles, which still stand, through to the actual drafting of the legislation. A legal drafting team spent long hours drafting, discussing, arguing, redrafting, arguing again – I am sure there is a book to be written about that process – one of those memoirs to be written in due course. There were some passionate, heated and uncomfortable arguments! But there was also a great deal of agreement on what needed to be in the legislation.

The National Water Act was drafted so that the government could, inter alia, address the inequality in access to water for productive purposes, as well as addressing issues of environmental sustainability, and the efficient use of water. The removal of the majority of South Africans from their land had also deprived them of access to water, and this was one of the critical issues that needed to be addressed. It remains, as the current draft of the National Water Resources Strategy highlights, one of the critical issues to be addressed.

The Water Services Act (Act No. 107 of 1997) looked for the first time at developing a national function for water services, which until then, had been a purely local government function, or a function performed by the then homeland governments. At the same time, the department put in place a national community water supply and sanitation programme that, in a matter of years, delivered water to around 9 million South Africans; a programme that, like our legislation, was held up internationally as an example of best practice.

It is now 14 years since the promulgation of the National Water Act, and 15 years since the promulgation of the Water Services Act, and we must ask ourselves what that new governance paradigm that we developed so passionately over a decade ago has delivered. Are we where we want to be, or not? Are we on the right path? I am reminded of the mountains that surround us – they are exquisitely beautiful in the morning sunshine, clear and tempting, but the wrong path can lead you into dangerous places, the weather can change remarkably fast, and those same mountains can become frightening and indeed life threatening. Are we on the right path, or are we walking into dangerous territory?

If we take a critical look at the water sector, we must admit to ourselves that we have made many mistakes; that we have not got ourselves to the place we hoped we would be; that we have not yet achieved the dream that drove us when we developed the policy and the legislation. There are many reasons for this, and I think it is worth examining some of them briefly.

Firstly, it must be recognised that when we drafted the National Water Act, we were at the leading edge of the curve. We were implementing something that had not really been tried by anyone else. We were turning international rhetoric into practice – in a developing country. We did not have other countries of similar development status or similar hydrology that we could easily learn from. Certainly there were practices in Europe that we could learn from, but the governance and hydrological context were profoundly different. And so we ventured into unknown territory, with all the confidence and enthusiasm of liberation behind us.

Since then, a number of countries have developed similar legislative approaches and have put in place approaches to water management that we can learn from, but at the time, we were at the leading edge and we had to make up a lot of it ourselves.

And we did some remarkable work. South Africa had a remarkable cadre of researchers, scientists and water experts that pulled together to do this work. The Water Research Commission (WRC) must take some credit in having contributed over the years to the development of that cadre and to the work done to support the department. This cadre of people, from inside the department and out, developed methodologies for determining the ecological reserve that have been used across the world. They developed participatory processes for establishing catchment management agencies, ensuring that people who had been excluded from water governance for their entire lives would be part of the process not just of making decisions about water management, but in the process of setting up the institutions. Indeed, catchment management agencies could not be established without proof of a participatory process having been conducted.

They developed methodologies for reallocating water to those who had been historically deprived of such access. They put in place a licensing system and developed the systems for considering licence applications. I could go on.

Why then, did we arrive at this point: in 14 years, two out of 19 catchment management agencies have been established and only had functions delegated to them at the end of last year; while the ecological reserve has been determined for most of our water resources, implementation is still a challenge, and one that we cannot say has been achieved to any great degree; water allocation reform staggers on, but little, if any, water has actually been reallocated in this programme; there are high levels of water theft, and the validation and verification of water use has not been completed and is resource intensive and complex.

At the local government level, we see service delivery protests; we have challenges with water quality as seen recently in Carolina; we have aging infrastructure that is poorly maintained; we have a huge backlog in sanitation that needs to be addressed. In a water scarce country, the average water loss across the country according to recent work done by the WRC is 37%.

So where did we go wrong? And let me be clear, I ask that question as one of the people who was there in the early days, trying to translate excellent policy and legislation into practice. I ask that question as one of the people who contributed to us being where we are today. I ask that question as one of the people who, at the crest of that wave of the mid to late 1990s, thought we could do everything. We were ambitious; we were bold; we were fired up. And that led us to two mistakes – well, two key mistakes – I am sure there were others.

The first is that we developed overly complex systems for implementing the legislation. Our methodologies for determining the reserve, for example, are scientifically rigorous, but they are expensive and resource intensive – or at least, comprehensive reserve determinations are. Validation and verification is equally resource intensive and complex, which is why it has not yet been completed. Our methodologies were designed to be 'the best', but in being the best, they were complex and difficult to implement, and with so many of them needing to be implemented simultaneously, the total demand on skilled resources was too much for the resources of the department.

The second was the focus on implementing so many new approaches simultaneously. Despite the legislation being carefully drafted so that we could choose to phase in actions according to need in different geographic regions and times, we ended up doing most things all at once. This meant that limited human resources were pulled this way and that, without many critical processes being seen through to completion.

These challenges were exacerbated by the high turnover of staff in the department and in local government, and by the difficulties of recruiting experienced and qualified staff.

There were other challenges, which I will not go into at the moment. What we must accept, however, is that there have been failures of governance that have brought us to this point; failures that we are all too aware of. We need to step back and reflect on these failures, and on the successes, to look at what has, and what has not worked, and to learn from both. We also need to learn from other countries, particularly those of similar hydrology and development status; and to think cleverly about our capacity and how best to deploy it to achieve effective water management that supports the development objectives of government.

This conference gives us that opportunity: to think, to share, to argue, to be innovative, to rethink, to find new paths forward; to avoid getting lost in the mountains.

This conference is looking at a wide range of governance issues. Many of the issues that I have raised will be addressed on the programme, as well as a host of other issues. Over the next few days, there will be sessions on multi-level water governance, on implementation, on water regulation and accountability, on water allocation reform, on adaptive management, on gender and governance, on groundwater governance, on the role of water in development, and more. There are a fascinating range of papers to be presented.

It is my hope that these papers will spur further debate on how we can improve our governance systems; how we can make our governance systems truly excellent. Where 'excellent' means that they enable effective management of water resources and water services within the human, financial, technical and natural systems capacity of the country. Where 'excellent' means that we can identify and focus on the key priorities and address those effectively. Where 'excellent' means that we see the difference we are making in the field, or in the river, rather than on paper. And above all, where 'excellent' means that our water governance supports, rather than hinders, equitable development in South Africa. Where 'excellent' means appropriate to and practically implementable in the South African context, with all its challenges and opportunities. Where 'excellent' might mean using a donkey to explore difficult terrain, rather than a Ferrari.

As an aside, it would be interesting to know what the economic impact of the delays in issuing of licences has actually been since 1998. For every water use licence delayed by a month, that means the people who might have been employed as a result of that water use have had to wait a month for an income. And that is ignoring the multiplier effects of a new business or water-based enterprise. Considering that some licences have been delayed for years, one can see how the social and economic impacts pile up.

Stepping aside from that issue, let me take this opportunity to put in a commercial break for the Water Research Commission. The WRC was established in 1971 and has had 40 years of producing excellent research for the water sector. It is a unique model – a research-commissioning organisation funded by water users, and one which many countries envy us.

The establishment of the WRC shows the recognition, 40 years ago, of the importance of research and the importance of effective water management in South Africa – even if that research was largely intended to benefit the white water-use community. Forty years later, the importance of good research has only got bigger. It is important that our policy, strategy and implementation are based on sound research, whether it be social or biophysical. And the WRC is the central player in the water research field.

Currently, the WRC is moving forward from the solid base of the past 41 years, into a phase guided by four key streams.

The first of these is investment in the multiplier effect, aiming to increase the impact of the research done through the WRC.

This will be achieved using two mechanisms. The first is the WRC Knowledge Tree which, in addition to the knowledge products and publications from the WRC research portfolio, aims to:

- Inform policy and decision-making,
- Contribute to sustainable development solutions,
- Develop products and services for the real economy,
- Actively contribute to human capital development,
- Directly empower communities, and
- Enable the national transformation project.

The second mechanism is to adopt a programmatic approach to choose a significant proportion of new projects in each funding cycle that builds on the knowledge base of existing and previous funding cycles.

The second stream is 'Research concentration for accelerated knowledge and solutions development'. This will be done through the development of WRC Lighthouses, which are transdisciplinary, inter-institutional mega-projects that address multiple key strategic areas and will examine priority water issues across the innovation value chain.

The third stream is a further diversification of the research philosophy to expand the number of projects in the portfolio that moves from the classical independent, observer scientific approach to an action research paradigm. This entails the broadening of our scope to one that actively involves communities in the research design and project participation as key partners to upscale and maintain the interventions post-project.

The final stream is that of partnership.

To stretch the impact of the Water Research Fund, the fund that is built on a levy on water use, the WRC is looking to increase the WRC's partnerships in various domains. These include research partnerships, implementation partnerships and innovation value chain partnerships. This partnership approach, both locally and internationally, is an important way of increasing the body of knowledge on water matters and getting synergy between the needs and capabilities of various partner bodies.

In addition, the WRC has launched a dialogue programme, with three types of dialogue intended to enhance the water debates across the country – the first dialogue type is public sessions, the second is seminars on particular topics, and the third is closed sessions, operating on Chatham House rules, where an issue can be thoroughly worked through without participants fearing reprisals for their views.

A critical aim of the WRC is to improve the dissemination of the knowledge generated through its programmes, so that research uptake improves, and that the new knowledge generated is implemented in the field according to need. One of the big challenges of research is how to get it to the decision-makers in a form that they can easily access and use. I am, in this regard, delighted to see that we not only have the research community here at this conference, but a number of key decision-makers and implementers, who will, I hope, take the knowledge from this conference back into improving governance practice within their organisations.

I started this conference with some history, and now I would like to end it with some future gazing. We meet here at an interesting time. The challenges facing us are immense, and are not going to decrease.

At the Conference of the Parties (COP), 18 countries will gather to discuss, once again, how to manage the challenges of climate change. We cannot predict with certainty what the future is going to bring us in terms of climate change, but we can be pretty sure that it is going to change. This means that we have to be able to manage in a context of increasing uncertainty. Our governance systems have to be resilient in the face of that change and uncertainty. And our governance systems have to protect the poor and the marginalised in particular, who will bear the hardest brunt of climate change.

In addition, according to the latest census, our population is still growing, and will continue to grow. This poses us the challenge of human population growth against a background of limited resource availability and increasing biodiversity loss.

Equally, the inequality in this country remains one of the highest in the world, and the levels of poverty are unacceptably high. These are challenges that we have to address, and address with passion and commitment. This happens within the context of a continued global economic challenge, where even the relatively rapid growth rates of Africa and the Asian giants still struggle to catalyse a significant global economic recovery.

It also happens as the important marker of 2015 looms closer, with the failure to achieve the Millennium Development Goals (MDGs) becoming more evident.

I raise these issues not to depress you, but to sketch the picture of the challenges we have to rise to meet. I raise these challenges knowing that we have, both here at this conference, and in the water sector in South Africa nationally and internationally, some remarkable and creative minds, people of great commitment and passion, and that, if we pool our resources, share our ideas, bash our heads together, we can find a way forward that will enable us to rise to these challenges and deal with them.

Let me make one last statement before I end – we cannot save the world as water managers, researchers and specialists alone – we have to work out of the box, engage with the other sectors, drive water into the centre of the development debate and development plans. Water is a critical component of the development scenario in this country, and we need to ensure that it is integrated into the governance systems of the country as a whole, the mind-set of all decision-makers: we need to place water at the centre of the development agenda of the country. Our governance systems need to support that approach.

In conclusion, ladies and gentlemen, we have our work cut out for us. There is so much to do, and so little time to do it in. It is my sincere hope that these three days will bring a fresh view on water governance, will assist us in sharing knowledge and ideas, as part of the process of developing better and more effective water governance systems in South Africa, and in other developing countries, in particular. I really look forward to being able to be part of these debates and to learn from the experiences of people locally and internationally in this critical area of work. It is a great privilege for all of us to be here and to have this time to share ideas – I hope it is fruitful, fascinating, and fun, and I look forward to being part of it.

### **Welcome – Mr Dhesigen Naidoo (CEO: Water Research Commission)**

Mr Naidoo welcomed everyone to the conference.

Ms Schreiner set out part of the challenge that the conference aimed to engage. Although the conference is examining the South African context in particular, we are facing a global challenge with respect to water, in the context of a difficult economic paradigm that has been pursued internationally for the last 150 years. Climate change has been one of the results. There is no sustainable paradigm of development in either the developed or the developing world. We cannot name a single example anywhere in the world where water is an active part of the planning process of development. Water tends to be an 'end-of-pipe' discussion around constraint, or a problem to be solved. If the water parameters were addressed up front, a very different solution would emanate.

We are looking forward to vibrant discussions over the next two and a half days. It will be a huge challenge tying the various streams together, because the conference has expanded dramatically.

In the conference sessions, we need to start conversations that we can take further outside the conference so that the real work can happen.

### **Greetings – Mr Phera Ramoeli (SADC Water Division)**

Greetings from the SADC (Southern African Development Community) secretariat on behalf of the SADC Executive Secretary, Dr Tomaz Augusto Salomão and the Director of Infrastructure and Services (within which water falls), particularly to the Chair of the Portfolio Committee on Water and Environmental Affairs, the Deputy Director-General of the Department of Water Affairs and the chair of the WRC board.

Water is the most shared resource in the southern African sub-region, with about 15 shared water courses transcending national borders or abiding between the boundaries of two countries as a shared resource. This makes it imperative to have good governance if we are to sustain the utilisation of water as a shared resource at a reasonable and sustainable level. In realisation of this, one of the main objectives of the forerunner of SADC, the Southern African Development Coordination Conference (SADCC), when it was established in 1980 was to fight against apartheid South Africa and to make sure that the countries of the sub-region sustain their development, including in the water sector. When SADC was established, there was already a feeling that good governance structures should be built, and therefore robust policy and legal instruments were adopted by SADC, one of which is the main SADC policy document, the Treaty. The treaty was adopted by heads of state and government of the southern African region in Windhoek, Namibia in August 1992 when SADC came into being. On the basis of the treaty, a number of protocols were negotiated and subsequently adopted after signing by the heads of state. These protocols are instruments that govern the various sectors in order to ensure that good governance of the various sectors of the economy is engendered. The SADC Protocol on Shared Watercourse Systems was the first protocol to be adopted in the SADC region in 1995, and was revised in 2000.

Through the influence and leadership of the Minister of Water of South Africa at the time, Minister Kader Asmal, the water sector became recognised as a dedicated sector in SADC when he called the ministers responsible for water in the region together in 1995 to start working to elevate water to the highest level in SADC. This was achieved, and in 1996, the SADC Summit adopted water as a dedicated sector of development in the region.

In order to support these legal instruments, policies and strategic documents have been adopted by SADC member states, including the Regional Water Policy and its strategy, within which there is a strong governance component that ensures that we cannot go wrong in whatever we do if we have good governance.

Among the strategies that have been adopted in SADC is the Strategic Action Plan, which is now in its third phase. It focuses strongly on infrastructure development and activity that we all need to embark upon. For South Africa, which has more developed infrastructure than other member states, the issue is to maintain that infrastructure and to operate it efficiently. SADC has recently adopted the Regional Infrastructure Development Master Plan, in which there is a dedicated chapter on water infrastructure. Therefore at the level of Summit, the governments of the region have committed themselves to doing what is required to ensure access to safe water and sanitation for the people of the region so that their livelihoods are improved.

There has been much work to establish the required governance structures, including river basin organisations and joint water commissions for shared water courses in the region.

The most important structure in the water sector is the committee of ministers responsible for water that guides all policy and strategic development in the sector to ensure governance that is important for all development. This committee is supported by senior officials responsible for water.

At the technical level, we have a technical committee that clears all technical aspects of activities.

Research is vital to the water sector, given the challenges we face, especially the issue of sustainable development, which will require innovative approaches in order to remove inherent inefficiencies, particularly in the agricultural sector that is served by the water sector. It is important to ensure that the requisite institutions are in place. The Water Research Commission is one such institution. At the regional level, we have the Global Water Partnership, WaterNet and the Water Research Fund for Southern Africa (WAFSA), which must be resuscitated.

Water infrastructure is coordinated and promoted at regional level through good governance and implementation at the river basin or member state level.

Greetings from SADC, and may there be good deliberations at the conference over the next few days.

**Opening address – Adv. Johnny de Lange (Chair: Portfolio Committee on Water and Environmental Affairs)**

Chair of the WRC, Barbara Schreiner  
Chair of the Conference, Eiman Karar  
Honoured guest and keynote speaker, the eminent Prof Ali Mazrui  
Distinguished guests from SADC  
Representatives from different governments and institutions from far and wide  
Respected scientists within the water and related sectors  
Honourable guests  
Ladies and gentlemen

It is a great pleasure and honour for me to be here today at this International Conference on Freshwater Governance for Sustainable Development.

May I commence by apologising on behalf of the Minister, Mrs Edna Molewa, for not being able to attend and deliver this speech. The National Council of Provinces meets from time to time in different parts of the country, and is currently meeting in the Northern Cape; the Minister has been deployed on behalf of Cabinet to attend.

I appreciate that you have travelled long distances to participate in this important think-tank event, where we will discuss the pressures on the scarce resource upon which all life depends, namely water. Judging by the number of people here, the topic of freshwater governance for sustainable development must be important, and the venue has been well chosen, situated as it is in one of South Africa's most important water sheds and one of the most beautiful and scenic areas of the country.

We are here to understand what we mean by 'water governance', why it matters and how we can do it better, hopefully not just in South Africa, but perhaps even more broadly. The United Nations Development Programme (UNDP) and the Global Water Partnership define 'water governance' as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society". It seems to me that there are four pillars to this definition that support the final objective, namely, political, social, economic and administrative systems. Perhaps there should be a fifth pillar, that of natural systems that support and are supported by our water resources. What is interesting, however, is that the final objective of this definition seems to be the development and management of water resources and the delivery of water services. However, it seems to me that these are merely tools towards a greater objective – the building of a society in which all people can live with, and in, dignity, can develop and exercise their own potential as human beings, as individuals and as members of society, which respects their humanity and includes them within its warm and caring embrace. Taking that as our ultimate aim, let me spend a little time unpacking each of these five pillars and what I broadly think is important for us to recognise in each of them.

The first pillar is the political system that underpins how water governance functions in this country. The South African government is very clear that we are striving towards achieving a developmental state for our society, in particular a democratic developmental state based on the concepts of participatory democracy. We see the democratic developmental state as the driver of job creation, of equitable economic growth, development of an inclusive economy and eradicator of poverty. What then is the role of this democratic developmental state in the water sector? It is the role of the state in this context to ensure that we have participatory processes in which the state, the private sector and civil society can engage to determine how best to utilise, protect and develop our water resources; to engage on how best to ensure that everyone living in this country, particularly the poor and the marginalised, have access to the water services that so many of us take for granted, namely safe drinking water and decent sanitation facilities. It is the role of the state to lead this process, to give direction and to ensure above all that water plays a role in helping us achieve our national developmental priorities.

I would like you to look at the National Development Plan of the National Planning Commission. I would have thought that the issue of water would have been dealt with very differently in that plan. To tuck the issue of water away under infrastructure development seems to be a great misunderstanding of the role and impact of water. I would have imagined that there should have been a central chapter on water and how it ensures the creation of the developmental state for the next thirty to forty years. I would like this conference to consider and address this issue, because if we do not get the issue of water right in the National Planning Commission project, which is projecting the course for the country over the next forty years, we have little chance of dealing with all the issues that Ms Schreiner has mentioned. We started with good intentions. There are clearly flaws in the systems; and we need to fix these, but if we do not have the right vision, these matters will not be a priority.

The political systems operate within a social and economic context, within which, despite being a middle-income country, South Africa is a country of great income disparity; a country within which, according to the latest census figures, there is a great deal that we still need to address. Globally, South Africa is said to be the country with almost the highest gap between the rich and the poor. Despite the fact that the proportion of households living in informal dwellings has gone up 12.5% since 1996, only 8.8% of households do not have access to piped water, and 31% of households do not have acceptable sanitation facilities. While this is an impressive improvement on the previous census, it is still not good enough. We have sufficient resources in this country to make sure that all of our people have access to sufficient safe drinking water and adequate sanitation facilities. We should also not forget that we live in a country with a huge range of cultures, religions and languages. The social and economic systems that operate in this country are therefore different for, and are experienced very differently by, our different people and different groups in society. There are those that are fully integrated into the mainstream economy, who operate inside the space and world of the internet, Twitter and social networking, but there is also unfortunately too large a group that are on the margins of the economy, struggling for their place in the sun (or their place at the tap, so to speak); most are living on less than US\$1 per day.

Our country is divided by race, class and gender. While examining the governance of water, we must

remember these differences, and that good governance, in such a context of disparity and differences, is governance that consciously and proactively addresses these differences in the form of positive discrimination or affirmative action, and through affirming and empowering actions and programmes. It is the administrative systems that we put in place in the area of water governance that must ensure that these affirming and empowering actions are implemented so that Mrs Mkwanazi, just down the road from here, is able to access water for productive and domestic purposes, that she has access to sustainable sanitation services, that she has access to road and transport services to get her produce to the market, and that she can make a living that enables her to feed and educate her family and to live with dignity.

Equally, the administrative systems must serve the needs of big business, the mines and farmers, so that we can enable them to create decent jobs and drive rapid progress with a minimum of delay and bureaucracy. We must look at the water administrative systems not in isolation, but within the context of the social, economic and political imperatives. We must look at the water administrative systems in the context of other administrative systems so that, where possible, we can provide integrated and efficient services to meet the needs of our people.

Here I would like to mention again a bad example, namely the interface between mining, the environment and water. Mining in South Africa has always had a very protected and special place, above the environment and water. It is the legacy of this country to have built upon its resources. However, the problem at present is that mining licences are being given all over the country. There is not a square centimetre in Mpumalanga, for example, that does not have some mining licence given over it. In some instances, the mining starts without proper environmental impact assessments or water licences. The latest figures are that there are between 30 and 40 mines in this country that are mining without proper water licences. There is no integration whatsoever between those cross-cutting issues. We as the Portfolio Committee have very strongly engaged with our department, and they are now engaging with the Department of Mineral Resources, to work out a protocol for integrating these processes. There must be a number of steps to be completed before mining can be allowed, otherwise we have the chaos that we see at present. I use the word 'chaos' in a very deliberate way, because if there are 30 to 40 mines mining without proper water licences, that can only be described as chaos; at the very least, it is anarchy. These are the kinds of examples where we need to be much stronger, and ensure that integrated processes take place; if not, the environment or the water sector will always be the losers. We will be surprised and ask why we do not have enough water to be able to provide for the functioning of our economy and for the needs of our people. The reason is that we are allowing things to take place illegally in this country. I have not even mentioned yet the illegal use of water by farmers all along the Vaal river. The Department of Water Affairs has tomes of reports and knows exactly who the illegal water users are, but years down the line, we have not fixed these issues. These are the kinds of administrative tools that we have to pull much closer and ensure that we use them far more efficiently and effectively.

Administrative systems are not merely neutral tools of government. They are immensely powerful tools that can serve to empower the poor and the marginalised, but they can also be used to exclude them from proper integration into the system. In 1994, we put a final end to the administrative system that was specifically designed to exclude the majority of South Africans from access to water, proper sanitation, justice and their human rights in the area of water governance. It is up to us now to ensure that our administration systems work the other way, to ensure that the weakest and most marginalised people in our society have access to everything the state offers in terms of safe drinking water, as well as proper sanitation.

The National Water Act provides some powerful administrative tools, which I believe can be used effectively in this regard. As an example, I am told that the general authorisations, an administrative tool not available to many countries, can be designed not only to reduce the administrative burden on the state, but as importantly as a tool for redress and poverty eradication, allocating water to small users without the need of licences. This, however, requires that those driving the administrative system are truly focused on how best to achieve both equity and development in the country. Our civil service must be value driven, responding to the political, social and economic imperatives of our country.

Finally, we must look at the natural systems, because looking after our ecosystems is an important element of sustainable development, not least because ecosystems provide a range of goods and

services to local communities and to the society at large. In doing so, however, we must ensure that we are not further entrenching inequity and inequality in our society, trapping the poor in on-going poverty in order to protect our ecosystems.

I would like to emphasise this point, particularly to our foreign visitors. It is important to realise that there are sometimes good principles, for example, decentralisation, leading to effective administration. However, we need to be careful in South Africa, because the legacy of apartheid is at the lowest level. South African cities are multicultural and multiracial. When one starts breaking the city down, however, to the townships and suburbs, the legacy of apartheid becomes starkly visible, because all people with dark skins live in one area, and all people with white skins live in another. When we deal with principles such as decentralisation and subsidiarity, which are good principles that are important, we must always be careful in the South African context how we apply them, to avoid applying them in an area that cannot perform. One of the reasons why there are huge problems in the water sector is that one of the most important functions in water provisioning and water services was assigned to local government, but there is no capacity or funding in local government in the former Bantustans.

When considering applying good principles in South Africa, one must always ask whether they will work in our situation. If we do decide to implement the principles, we may want to put in certain checks and balances to make sure that they work. We must be careful not to trap the poor in on-going poverty.

The water boards are another example. We often say that the infrastructure that water boards provide is funded 'off budget'. If we expect the people of the former Bantustans to fund the infrastructure of water boards for themselves off budget, it means that they have to pay for it. In our new society, we are placing the burden again on the poor and marginalised that suffered under apartheid. We have to be careful that the mechanisms we use are not to the detriment of our people.

We therefore need a balance between ecosystem protection and sustainable economic and social development, and above all we need to use our water to create lives of dignity and wellbeing for all our people.

This conference therefore has an important task to look at how water governance can contribute to what the latest draft of our National Water Resource Strategy has termed "developmental water management" – water management that contributes directly and appropriately to developmental requirements of the country, including the development of water infrastructure, large and small. Developmental water management needs innovative, high-calibre water managers, with a clear understanding of equitable development, how the state must intervene, and how to build partnerships with the private sector and civil society that make equitable development happen in actual reality. We need African solutions for African problems, taking from the best practices in the rest of the world and making it work for us and our priorities and needs.

The foundation on which these five pillars are based is what stands between a water-stressed country like South Africa and a water crisis. The formula for success for a solid foundation lies in a mixture of very important ingredients. The primary ingredient is a sound knowledge derived from good science and technology. The second factor is good accessible infrastructure that is well maintained. All our performance indicators in this country deal with infrastructure provisioning and not with the functionality of that infrastructure. We do not have any performance indicators in the water sector in this country on the functioning, and therefore the maintenance, of the systems, and therefore we do not budget for it. The third factor is a critical mass of skilled talent at all levels of the system, from the paraprofessional on the ground to the system operators, water engineers, system managers and research scientists that generate new knowledge and technology for better solutions. The fourth factor is good, or if we want to avert a potential crisis, exemplary water behaviour from all of us, from the big industrial users to small, medium and micro enterprises (SMMEs), from large commercial farmers to those that manage small business subsistence plots, from big business to each of us as individual users in our own homes, we all need to 'come to this party'.

The UNDP and the United Nations Economic Commission for Africa (UNECA) report of 1990 predicted that on the usage patterns observed at that time, no African country would not be water vulnerable into the future, and that South Africa in particular would move further down the ladder from

water stressed to water scarce. The report also says that the power to change that trajectory is in our own hands. The Water Research Commission of South Africa was established in 1971 to address exactly this issue. It currently has a very good record of providing knowledge-based water solutions to help us better develop and manage our country's water resources with a view to improving the quality of life for all South Africans, while maintaining the integrity of our water ecosystems. We are in a moment where the Water Research Commission and its partners, both locally and internationally, now have to be even more creative to produce more innovative solutions as we develop our society and economy further in the wake of a whole variety of challenges, not least of which is global climate change. One of the issues that our Portfolio Committee has recently raised with the Water Research Commission is that we have to start getting indicators by the Commission to more clearly see how the research they are doing impacts particularly on government and its priorities, and on society more broadly. The Water Research Commission is producing a whole lot of good work, but it is not very clear to us the extent to which this is driving certain processes for the better in our society. The Water Research Commission is working closely with the Portfolio Committee, and will be meeting again in January 2013 to take this process forward.

The international community of practice gathered here, in one of our most important watersheds, does so at a very opportune time. We are in the home straight of the finalisation of the second edition of the National Water Resource Strategy (NWRS 2), and the Portfolio Committee is holding public hearings on this. The successful finalisation and implementation is heavily dependent on the new wisdom that you will be able to inject into this process through your deliberations at this conference. We are also looking to revise the Water Services Act, to improve the delivery of water and sanitation to our people. There is also a process under way to revise the White Paper on Sanitation. I would like this conference to comment on this matter. Sanitation was moved from the Department of Water Affairs to the Department of Human Settlements. I am not going to debate whether this is a good or bad thing, but the question is, when we move an issue such as sanitation from a department that has policies, legislation, regulations and staff to do the work, to a department that has none of those things, what are we doing to ourselves? We are setting ourselves up for failure. In the last budget cycle, we had to give R1.6 billion back to National Treasury because we were not able to produce rural sanitation. We did not have the tools to do so, because we had moved the function for sanitation from Water Affairs to Human Settlements. I do not mind where the function is located, but wherever it is located, there has to be capacity. At present, the situation is that another department's staff is having to implement the Department of Water Affairs' legislation. A comment on this matter from this conference would not be out of place.

All these matters need to be informed by the wisdom and minds gathered here for the next three days, and of course in other similar interventions planned for the near future. We are hopeful that we are not only developing solutions for South Africa, but also for Africa, the developing world and the world at large. While you develop these solutions, remember the homesteads you drove past on your way here – the ones that do not have the facilities that we have here and in our own homes, the ones who live on subsistence agriculture, remittances from urban areas and government pensions and grants. Ask yourself how water governance can change the badge of dishonour that we carry as one of the most inequitable societies in the world. We need hard questions to be asked and innovative answers to be given.

I have only been in the water sector for a year. I am a lawyer and I have always been involved in justice. The one thing that has struck me about the water sector, when one asks questions to the Department of Water Affairs, is the basis on which we take decisions if we want to create a great developmental state, that actually looks after the needs of society and is a leader in terms of where we want to take society, and not a babysitter. How do we do this, and how does the department make its decisions? I look, for example, at where we build dams and ask why we are building a particular dam. I get responses such as that the water is needed to supply water to a power station that Eskom is building. After repeated questions, it is clear that we always provide water because another party expects the department to do so. At no stage does the department sit down and ask what it means to be the leader in the water sector. What criteria are we going to use as a department to take decisions about provisioning. We have had almost 20 years of democracy. Why has the department not thought about water provisioning in the Transkei, a poverty-stricken former Bantustan. Why does a developmental state, whose role is to capacitate people so that they can take control of their lives, not consider that the Transkei is a place where a dam should be built, for example? No-one can answer this question. I am happy that the President, in his last State of the Nation Address, declared that a

dam would be built in the Transkei.

My forefathers, the Afrikaners, in the Clanwilliam valley, built dams and canals and empowered communities to become commercial farmers. We are not doing this in areas such as the Transkei. We have been caught in the trap of our legacy of apartheid, and the priorities that were set then, in the decisions we take about most things in society, including the water sector.

To what extent do we capacitate the ordinary people in South Africa to take control of their lives? I would suggest that the provisioning of water to those communities would be one of the major measures. Bringing water to subsistence farmers in rural areas, who already know how to farm, and allowing them to do the kinds of things that the Afrikaner did at the beginning of the last century, would empower those people.

I have it on good authority from the organisers of this conference that we have some of the finest minds on water governance in the world here. I think you have your work cut out for you, and we eagerly await your outcomes.

At the last meeting of the Portfolio Committee with the Water Research Commission, I instructed the CEO of the Commission to provide a full report of this conference to the South African Portfolio Committee on Water and Environmental Affairs, which we will in turn engage with and discuss with the Commission and other roleplayers.

I wish you the best of luck with your deliberations, and a warm welcome to beautiful South Africa, especially this very special corner of our country. I thank you very much for listening so attentively.

**Keynote address: Water in a triple heritage perspective: indigenous, Islamic and western legacies – Prof. Ali Mazrui (Director: Institute of Global Cultural Studies, Binghamton State University of New York, USA)**

This paper has borrowed from some of the earlier writings of the author, including his television contributions to the British Broadcasting Corporation.

I address this international conference on water not as a specialist on water-management, but as a student of human society and of comparative culture. I feel more comfortable discussing people than recommending how best to protect water supplies.

But there would be no *people* if there were no *water*. I am therefore humbled to have been given this role of keynote address at such a conference.

But let me begin by emphasising that although water is a pre-condition for life itself, it can also be a destructive force. Climate change not only threatens us with drought in some parts of the world. Such change also threatens us with floods in other areas. We are at risk not only with too little water, but also with too much.

The paradox of water in the human condition is indeed a paradox of life itself. Water is the supreme element without which life is impossible. But from time to time there is a tsunami or hurricane which kills thousands. Water becomes a killer.

My state of New York has just witnessed a devastation which killed over a hundred people and devastated the lives of millions of others in water-related catastrophes.

Water has nurtured civilisations along the Nile and the Ganges, but water has also washed away whole villages and cultures.

We must try and sustain the creative functions of water — and safeguard humanity against the ferocity of water and its destructive aggression.

Noah's ark was probably based on fact. If so, Noah's tsunami and flood was probably an earlier case of climate change.

Water makes history time and time again. Unfortunately water also destroys history, when it washes away massive historical evidence. When water kills history, we witness the phenomenon of historicide.

In my almost 80 years of life I have been a witness to history. I had accumulated documents and photographs of African history — including my correspondence with African heads of state over the decades. It took one major storm in New York state about a year ago to destroy all this documentation of the first 50 years of independent Africa. Water perpetrated historicide and destroyed my archives.

It is partly for such reasons that water is both worshipped as mother of life and cursed as a deadly force. But let us begin with the small scale of experience.

Everyday life in Africa is affected by a convergence of three systems of values — indigenous, Islamic and Western. These three normative systems approach the issue of water in divergent ways. On the whole, indigenous culture is conservationist in its use of water, partly because fetching water in rural Africa is a labour-intensive process.

Western culture is extravagant in its use of water, partly because of complex domestic needs and love of gardening and flowers. Western culture also came with industrialisation and its water-consuming consequences.

Islam was born in the desert of Arabia, but surprisingly became water-intensive in many of its central rituals. Since Planet Earth is inhabited by a billion-and-a-half Muslims, millions of gallons of water are used every single day for the five prayers alone.

Policy-makers have understandably focused on the positive aspects of water and how to protect the supply of clean water. But policy-makers also need to address the destructive consequences of hurricanes, floods and future rise of the global sea level, as the ice of the North Pole continues to melt.

On a smaller scale there is also the effect of annual rains on village homes. Modest huts are flattened, and villages are reduced to new levels of poverty every year. As rural families build new homes to accommodate their expanding populations, these mud constructions are flattened out, thus perpetuating certain forms of poverty. Farmers are blessed when rain is on modest scale. Farmers are impoverished when the rain floods out cultivation and destroys their homes.

The eastern United States has recently experienced the fury of water. The casualties include over 100 dead. The Caribbean experiences the ferocity almost every other year. In Africa, water kills silently without ferocity.

### **Infant mortality and parental immortality**

Food aid is a familiar enough concept. Water aid may be 'the wave of the future'. Singing (Band Aid) or running (Sport Aid) in order to feed those who are hungry makes good humanitarian sense. Performing for those who are short of clean water is at least as compelling a cause. In reality, far more African children die because of lack of clean water than because of famine — though the silent famine is disastrous enough. The lack of clean water is the cause of a variety of diseases, which include cholera, bilharzias, different forms of diarrhoea and typhoid — all of them ruthless killers of children and sometimes of adults. Malaria's relationship with stagnant water is more complex, but still relevant to infant mortality. Two to three million children in Africa die every year because of diarrhoea alone. Malaria claims the lives of an additional million.

A new hazard has entered the scene with increased Westernisation: bottle-feeding. I took my English wife to Kenya for the first time in 1963. She was startled to see a woman relative of mine pouring sand into her baby's feeding-bottle. Molly asked the relative in astonishment: "What are you doing?" The relative answered in puzzlement: "Well, I am cleaning my baby's bottle, of course!" "*Cleaning* with dirty sand?" exclaimed Molly. The idea of using sand from the pathway as a kind of "scrubbing soap" for a baby's bottle was one of Molly's first culture shocks in Africa. Of course the sand is then washed out and the bottle appears to be 'scrubbed clean'. But if the water in turn is already contaminated, the risk of polluting the baby's milk increases at every stage.

Contaminated water is not only a threat to the mortality of children. It is also a threat to the immortality of parents.

The risk multiplies further when an African mother goes even more 'modern' and uses powdered milk instead of fresh cow's milk. The powder is, of course, mixed with water. If the water is not clean, the infant's health is in danger, perhaps the infant's life.

Curiously enough, the problem of contaminated water in Africa is part of the population explosion. Precisely because many children are dying, many more children are being born. Birth, death and clean water are interlocked in the demography of Africa. Well-meaning foreigners have often asked me why we permit a population explosion in our continent when we have so many economic problems and a lot of starvation. The answer lies in this convergence of forces. African values do indeed favour the birth of many children; Western skills try to ensure their survival. African traditions promote a high birth rate while Western medicine controls the death rate. Water is indispensable for survival, but it is sometimes destructive in tropical storms and tsunamis.

According to African tradition, a person's immortality after being buried depends upon being remembered among the living. To become an ancestor beyond the grave requires having descendants who are still alive. To put it in modern terms, I can never be completely dead for as long as my genes are part of the living, part of my children and grandchildren. Some parents are buried at sea, willingly or by enemies – as in the case of Usama bin Laden after being killed by American troops. Usama bin Laden left behind enough progeny to constitute a legacy.

*O joy! That in our embers  
Is something that doth live,  
That nature yet remembers  
What was so fugitive!*

And so having children is not only an insurance to protect the parents in old age – it is also a way for them to safeguard their immortality. Clean water is a precondition not only for the mortality of children, but for the immortality of parents.

But parents can be as effectively remembered by two children as by seven, provided the two survive. Although international effort to save Africa's children has intensified recently, the toll of young casualties every year is still in millions. A number of African countries have undertaken nationwide inoculation of children and the casualty rate in the villages is declining, but the annual carnage is still devastating. The quest for clean water is not always successful. The poignancy of small coffins among the luggage on public transportation in Africa is one of the meeting points between bereavement and deprivation; between personal pathos and poverty. If immortality depends upon one's blood flowing in the veins of the living, bereaved parents suffer a double blow. The funeral of their child is partly a funeral of themselves. The funeral is partly of their own claim to an afterlife, as they bury their loved one today. Death in Africa is a many-sided experience: it links the living, the dead and those yet to be born. The issue of water affects the farmer praying for rain, affects a villager in fear of a hurricane, affects a mother terrified of river blindness, and affects the whole of society in quest of hygiene in water usage.

In the long run, African couples have to be assured that their first babies will survive before they can take the risk of not having any more. The fear of infant mortality continues to affect the dream of parental immortality. Only when African parents begin to bury fewer children will they learn to bear fewer babies. When all is said and done, African mothers do not need sermons about the prevention of further births – they need the confidence that when they leave the clinical reassurance of the hospital, and take their babies home, death will not be lurking in the village, waiting for their little ones.

The two minimal conditions for survival are hygiene and clean water. The first, hygiene, is a matter of knowledge and understanding. African mothers need to understand what is at stake when they cook near a lavatory, or when they feed a baby from a bottle which has not been sterilised. If African women are traditionally custodians of fire and water for the home, they need to know how to mobilise fire in order to make water safe, and learn about boiling water as a method of disinfecting.

## On worship and water

Hygiene is sometimes part of the wider culture, and can even be linked to religion. Muslim Africa has a complicated relationship with the concept of 'clean water'. Islam is ritually water intensive. What defines water as clean is not 'fit to drink' but 'fit for ablutions'. The devout Muslim prays five times a day, and each prayer is usually preceded by the use of water for ablutions. The African continent may have 450 million Muslims. The ablution tradition involves wetting hands, arms, feet, head and having a mouthwash before every prayer. At least traditionally, water is 'clean' when it is suitable for such preparation for worship. Clearly, the standards of water suitable for sacred purposes are not the same as the standards of water suitable for human consumption. In the modern age, many Muslim families have indeed recognised a dual standard of cleanliness – but in much of Muslim Africa in the rural areas, there is a belief that if water is good enough for communication with God, it is good enough for consumption by human beings. Water for ablutions does not have to be boiled. It simply requires careful assessment as to whether it has been ritually polluted. Bird-droppings falling in the water can be ritual pollution; but the diseased hand of a believer is not. In terms of human dignity, this scale of values is correct; but in terms of human health more generally, it is not necessarily so.

Then there is the Muslim use of water after personal excretion. More millions of gallons are at stake. Islam does not encourage the use of toilet paper, and it normally prescribes the use of water itself. Muslims believe that toilet paper does not clear everything from the relevant part of the body after excretion or urination. Only a thorough wash of that part of the body can restore the believer's ritual cleanliness. This is very hygienic in principle, but it does require that the believer subsequently clean his left hand thoroughly after it has cleaned the anus or genitalia. Normally this works all right, especially since orthodox Islam discourages believers from having long fingernails. Residual excreta in the nails of the fingers of the left hand are normally cleared away with additional washing and soap (if soap can be afforded). But when water generally is in short supply, these standards of thoroughness may become more lax. The risk of spreading infection from one believer to another suddenly becomes more severe. The fingernails of the left hand can become major carriers of contagion.

There are one and a half billion Muslims on Planet Earth. The religion was born in a region of the world which is relatively short of water. The Prophet Muhammad was born in Mecca and died in Medina. He unfolded a whole new universe of values concerning water. In Africa there are at least 450 million Muslims, praying and washing.

Perhaps the most hygienic use of water prescribed by Islam concerns sex. Between copulation and the believer's next prayer, a thorough wash of the body (a thorough shower) is needed. Here again Islam is water-intensive. Every inch of the body needs washing, including the hair. Those who need to have sex every night are therefore enjoined to have a shower every night, after sex, for by the time of the dawn prayer, the next morning, the believer should have got rid of his *janaba*: his unholy condition of sexual hedonism. Only a thorough shower can get rid of *janaba*, and it is a major sin to enter a mosque before one has had his or her post-sex shower.

It is one of the ironies of history that a religion born in the grandeur of the Arabian desert, in all its barrenness, should have prescribed so many ritual uses of water. Christianity seems to have the concept of a once-and-for-all baptism for each individual. In Islam, baptism is, in a sense, a daily affair – covering five prayers and following every act of sexuality. When available, water in Islam is a continual ritual necessity.

In itself, all this is a contribution to hygiene. The problem arises when water is in short supply, and short cuts are made to make the same amount of water serve too many purposes. A little pond near the village may be used by too many believers to get rid of their post-sex *janaba*. If one of the believers is diseased, the danger of infection occurs. Islam is, indeed, a religion of cleanliness; but it also recognises that ritual cleanliness is no substitute for real hygienic understanding.

Even the understanding of hygiene is not enough if it is not accompanied by actual availability of clean water. Contaminated water is often a killer. They say that in much of Africa it is easier to get a bottle of good beer than a glass of clean water. Things are not made easier by Western companies dumping on Africa powdered milk which is then mixed with unclean water. Rural mothers are being

diverted away from the healthier tradition of breast-feeding. Africa needs *birth* control far less than it needs *death* control. We need family planning far less than family survival.

And yet, in spite of all this death and devastation, Africa is the fastest-growing continent in the world, in terms of population. Droughts come and go, famine hits and retreats, disease is ever-present in our midst, civil disorder takes its toll—and yet a new and larger generation of Africans is in the making all the time. There is enough clean water to keep the population growing.

I am a citizen of a country (Kenya) which at times has led the world in population growth. I am a native of a continent which is the vanguard of human fertility. And yet the world is staging spectacular singing and sporting events to save us from starvation and death. Why is the land of fertility also the land of famine? Why is a people of fecundity endowed with a continent of barrenness? It does not seem to be fair. It does not even make sense. Yet all is not lost if we are capable of such astonishing growth rates and if we can replace our dead so convincingly. Perhaps part of the explanation lies in the continuing resilience of the African family, in the mutual support it fosters among its members, and in that incredible love for children which is the hallmark of this remarkable continent. After all, the first human child ever was born here, a million years ago. You could say we invented the family. The tradition continues.

But we continue to need the protection of clean water if the family is to be strengthened, and more young ones be served. Next time we run on behalf of Africa, and are ready for a nice, cool drink of clean water at the end of the 'race', let us spare a thought for those to whom such a healthy drink is still a mere dream, a luxury for the future.

### **Water and identity**

This is also a continent in which a quarter of the population belongs to nationalities whose names are shared with rivers and coastlines. The largest African country in population is of course, Nigeria – sharing its name with the river Niger. So does the Republic of Niger. The largest francophone African country shares its name with the River Congo – the Democratic Republic of the Congo (Kinshasa). Its neighbour is also called the Congo (Brazzaville).

No other continent has as many nationalities based on not only on a *fatherland* but also a *mother river*.

Other African countries which share names with rivers and coastlines include Senegal, Gambia, Zambia, Upper Volta (now Burkina Faso), the Ivory Coast and the Gold Coast (now Ghana).

### **Between petroleum and hydroleum**

Oil and water have been adversarial liquids for centuries. It is a common adage that water and oil do not mix. In earlier centuries water played a more energy-intensive role than oil. When fossil oil was discovered in the seventeenth century, a new era was inaugurated in which water supplies were increasingly at risk from petroleum. By the late twentieth century rivers and lakes were increasingly polluted by the neighbouring petroleum industry.

Barack Obama has had policies to govern fossil fuels but no comprehensive strategy specifically about the utilisation of water. There has been Congressional legislation to protect clean water for human consumption, but no promotion of water as a source of energy.

As fossil fuel became economically more and more valuable, there was less and less protection of water in places like the Niger Delta in Nigeria, or the Gulf of Mexico on the shores of the United States.

The Obama administration has shown commitment to alternative and cleaner forms of energy. American investment has gone into solar, wind, and even nuclear sources of power. Surprisingly the Obama administration seems to have shown far less interest in imaginative ways of using water as a source of electricity. Water policy in the United States is often in the hands of states rather than the Federal Government. California's water needs have often involved elaborate negotiations with other

states like Colorado. But there is a role for the Federal Government in water policy. The Federal Government could be more involved in the politics of water.

The Obama years in power coincided with expanding production of petroleum within the United States, and the discovery of petroleum in more African states. There has also been expanding fracking and production of natural gas in both the United States and Africa. The United States is expected to rival Saudi Arabia in oil production by 2020.

In contrast, the Obama years have also coincided with fluctuations in supplies of water, partly because of trends in climate change. The range is from unexpected floods in one part of Africa (such as southern Nigeria in 2012) to drought and drying rivers in East Africa. There have also been increased frequencies of hurricanes in the Americas.

Since 2008 when Obama was elected United States president, several African countries have become new oil producers or have expanded their production. These countries include Ghana, Uganda, Tanzania, Liberia and the Republic of South Sudan.

Obama's expansion of oil and natural gas within the United States would not have helped these new sources of energy in Africa – except for the competition of the People's Republic of China. The Chinese are becoming major customers for Africa's resources, especially petroleum. China, as the second largest economic power in the world, has developed a great appetite for fossil fuels from Africa and the Middle East. The Obama administration could not ignore the rising economic power of China, especially its access to vital perishable resources across the world.

The political economy of Africa's petroleum is externally determined by the global market, including such major consumers as China, Europe and the United States. But the political economy of Africa's water supplies is primarily domestic rather than international.

The international phase of Africa's rivers and lakes was when Europeans were either exploring or conquering Africa. The struggle by John Hanning Speke to find the source of the Nile was historic. In 1858 Speke finally discovered the source near today's town of Jinja in Uganda. The Nile as Africa's largest river emerged out of Africa's largest lake. The British explorer called this lake Lake Victoria.

Eventually Uganda and Kenya tapped Lake Victoria for hydroelectric power. By the twenty-first century, about a dozen countries were recognised as part of the Nile basin — either as beneficiaries of the Nile or as contributors to the waters of the Nile.

Competition for the waters of the Nile has intensified in the Nile basin as associated countries needed more irrigation and more electricity. Egypt's privileged position in the old Nile treaty, which went back to British imperial days, was unfair to Ethiopia. Unless a long-term agreement is reached about sharing the waters of the Nile, the situation could escalate into a war between Egypt and Ethiopia in the years ahead. Postcolonial Africa cannot afford such potential military rivalries over water.

The shores of Lake Victoria have not only produced electric power and irrigation. Those shores have also produced generations of Nilotic peoples. One son of Victoria Nyanza on the Kenyan side of the Lake was called Barack Hussein Obama, Senior. This son of the lake went to America, got a degree and a wife. A child was born in 1961. He was named after his Nilotic Dad – Barack Hussein Obama (Junior). This child was destined to become the first Black President of the United States of America.

At the northern end of the Nile near the shores of the Mediterranean, Africa produced Ramses II of ancient Egypt. At the southern end of the Nile near the shores of Lake Victoria, Africa produced the father of the most powerful man of colour in world history — the younger Barack Hussein Obama.

Young Barack is already a great African American, but not yet a great President. Indeed, Barack Obama is a remarkable man for having broken the glass ceiling — and became the first black head of state of any white majority country.

The great lake which produced this Nilotic progeny is still ridiculously named after a British Queen – Lake Victoria. The different countries bordering the lake may not easily agree on an alternative name

drawn from their own heroes. But would they consider the name of this most illustrious grandson of Victoria Nyanza? Will Lake Victoria one day become Lake Barack Obama?

But Barack would have to earn such an honour in his years *after the presidency*. His name would be more relevant for the lake than that of Queen Victoria – who never even saw Africa's largest lake. Here is a great man who needed a second term to try and become a great president.

Let us now conclude with a poem by another great African American (a Diaspora African). During the Harlem Renaissance in the early twentieth century, Langston Hughes celebrated *Rivers* and the blood of ancestors:

*I've known rivers:  
I've known rivers ancient as the world  
And older than the flow of human blood in human veins.  
My soul has grown deep like rivers.  
I've bathed in the Euphrates when dawns were young.  
I built my hut near the Congo and it lulled me to sleep.  
I looked upon the Nile and raised pyramids above it.  
I heard the singing of the Mississippi  
when Abe Lincoln went down to  
New Orleans, and I've seen its muddy bosom turn  
all golden at sunset.  
I've known rivers ancient as the world  
and older than the flow of human blood  
in human veins.  
My soul has grown deep like the rivers.*  
Langston Hughes, *The Negro Speaks of Rivers* (1920)

Yes, water is a necessity and a threat. It is also the oldest of our ancestors. It made life possible on Planet Earth.

## **SESSION 2: WATER LEGISLATION AND PUBLIC SECTOR ACCOUNTABILITY**

**Chair: Prof. Ola Busari (Trans-Caledon Tunnel Authority, TCTA)**

Prof. Ola Busari (Trans-Caledon Tunnel Authority) opened the session and introduced the panellists.

Mr Dhesigen Naidoo thanked the Trans-Caledon Tunnel Authority for being a platinum sponsor for this event.

### **Panel discussion: Why is the South African water law a difficult draught to swallow?**

**Convenor/facilitator: Mr Dhesigen Naidoo, Water Research Commission**

The title of the panel discussion (Why is the South African water law a difficult draught to swallow?) is from an article in *The Economist* about two years ago that examined water law in India, how it affected rural villages and why it was failing dismally despite technically being a good law. This seemed a good platform for the kind of debate we need to have in South Africa. South Africa is probably at a fork in the road at present. We have a good law and legislative environment that has not found the meaning intended when it was first drafted. Now is the chance to unpack the challenges and, as part of the National Water Resource Strategy, to design a way to reorganise in order to move in the desired direction.

**Ms Olivia Rumble (Edward Nathan Sonnenberg Inc, ENS), on behalf of Robyn Steyn (ENS) who was one of the primary architects of the National Water Act**

The legal firm for which I work, Edward Nathan Sonnenberg Inc, has done considerable work with mining companies and seen how the National Water Act (NWA) (Act No. 36 of 1998) has played out over time, how it has been difficult to enforce, and the misperceptions and misunderstandings around the Act. I have personally had considerable involvement with constitutional law, working at the court before joining a law force. From a general socioeconomic rights perspective, I have had some

experience of seeing what needs to happen in South Africa for these rights to become enforceable, take effect and be implemented.

After the end of apartheid, there was discussion on what it means to have access to sufficient water. South Africa had been operating on the basis of a system of riparian ownership of land, in which access to water was tied to riparian ownership. Part of the reform process involved not only people's right of access to land, but also breaking the link between ownership of land and the entitlement that came with it.

Access to water has a huge impact on vulnerable groups. In South Africa, this issue is also related to HIV/AIDS, poverty and breaking the poverty cycle. The thinking at the time was influenced by a constitutional review process related to the existing Water Act of 1956. In this process, the environmental impacts were also considered. The 1956 Water Act had taken environmental considerations into account, but there was a feeling that this should be done more holistically, and in light of the environmental right in the Constitution.

In 1994, the Minister of Environmental Affairs and Forestry appointed a policy and strategy team, which was an advisory team made up of people from different racial, political, gender and cultural backgrounds to address water law reform. Through the Minister, the policy and strategy team gave direction to the drafting team, which was constituted by the Minister and made up of legal and technical specialists. This led to a detailed review of existing water law. The review process led to the creation of a document entitled 'You and your water rights', which was published by the Department of Water Affairs and Forestry in March 1995. This document aimed to assist the public to make meaningful contributions to policy and development; it contained the main principles and provisions of the existing structure; contextualised these against their origin and historical development, and made a general comparison with other water law frameworks across the world. Arising from the call for a public response to the review process, the fundamental principles and objectives for new water law in South Africa were published for comment. The principles aimed to direct attention to the primary areas of water resource management, requiring urgent reform and transformation. In turn, this would provide a new basis for water law policy. These principles are fundamental to a comparison between the real objectives at the time and where we are now.

The principles were as follows:

- All water is a common resource, the use of which should be subject to national control and held in the public trust.
- There is no ownership of water any more, but only the right for environmental and basic human needs for authorisation for its use. There shall be no authorisation in perpetuity.
- The objective of managing the quantity, quality and reliability of the nation's water resources is to achieve optimum long-term environmentally sustainable social and economic benefit for society from the use.
- The quantity, quality and reliability of water required to maintain the ecological functions depended on by humans shall be reserved, as will the water for basic human needs.

These principles went through a huge consultative process, and addressed existing shortcomings in the law and the areas for urgent reform. After undergoing a number of revisions, and following widespread formal consultative meetings, these principles were finally finalised and approved by Cabinet in November 1996. The principles then informed the White Paper process, and in turn the White Paper became the National Water Act.

Some 36 workshops were held throughout the country for drafting the National Water Act, and the draft bill was released for further public comment prior to being approved by Parliament in 1998.

There have been some suggestions that there was not enough public sentiment at the time; that the idea of owning a natural resource was not fully entrenched in South Africa; that the principles and the NWA itself were perhaps too ambitious; and that that the skewed apartheid view of natural resources meant that there was insufficient uptake of the principles at the time.

The NWA is one of the most highly regarded water acts across the world. It has been used as a precedent for many other countries. My view is that the drafting of the NWA could not have been left any later. There is a tendency among academics to divide certain rights between first-, second- and

third-generational rights. The first-generational rights are often seen as the civil-political rights that are the cornerstone of democracies, which should therefore be prioritised. However, it has become increasingly accepted that without addressing the second and third generational rights, such as water rights and socio-economic rights, the first-generation rights would not be sustainable. The period 1996 to 1998 was the right time for reform; there was an urgent need for reform, without which the rights to dignity and life could not be achieved. It is hoped that this introduction provides a sense of the thinking at the time and the need for urgent reform.

We still face a number of challenges today. The issues do not relate only to implementation, but to access to justice, access to dispute-resolution mechanisms, access to information; whether the amendments needed for the NWA have allowed it to keep up to pace; and whether we have allowed the NWA to become a living law, sensitive to changes, new thinking and new understanding about our resources.

**Dr Jamie Pittock (Australian National University)**

I work for the United Nations Educational, Scientific and Cultural (UNESCO) Chair on Water at the Australian National University, and have had the pleasure of working with South Africans on water-related issues for a number of years. Australia and South Africa share many biophysical similarities, so there are perhaps some useful comparisons to be drawn. Nonetheless, as an Australian, I comment on South African law with a degree of trepidation.

A few years ago, I was in the Western Cape, and a South African water official said to me, “You Aussies are part of the problem; you are like the English cricket team. Whenever we get people with the requisite experience, you come and poach them.”

I see South Africans looking at their National Water Act some 14 years later and asking whether it is too complicated and whether it should be changed. Like many Australians, when South Africa adopted the NWA, I was inspired by its breadth, but the limited implementation is dismaying. I do not see serious problems with the Act that necessitate its being changed. The Act is not the problem in my view, but South Africa's will to implement it thoroughly.

I would like to comment on several areas where there are lessons to be learnt in relation to Australia, starting with leadership. One of the desires we all have is a policy and Act that is so powerful that whoever is the Minister of the day or senior officials of the department should not matter in terms of the implementation of the Act. But sadly it does.

South Africa was blessed with determined leaders, such as Ministers Asmal and Kasrils, who were toughened in the struggle and demonstrated real drive in introducing this legislation. However, a country cannot be serious about implementing such a far-reaching national programme if it changes its ministers four times in a short number of years and has four directors-general of a water department over the same period. That is not the way to see a major programme being implemented. In Australia, we have a similar challenge in terms of frequent changes of senior leaders, and we too have some mediocre ministers from time to time. The question is how to have a system that can perform adequately even when some of the senior leaders are ‘not hitting their straps’.

Australia has tried some measures that have helped us through some periods of mediocrity. One is having some parallel institutions that stiffen the spine of reform. An important such institution in Australia has been the establishment of catchment management authorities. I see South Africa agonising over its current proposed nine catchment management agencies (CMAs), and having established only two in 14 years is rather poor performance. Australia has 56; I cannot report that they are performing as well as we would like, but they have provided a focal point for water stakeholders to coalesce, often form a common vision, and be a proponent for the national and state governments to make serious investments in water reform. I wonder in the South African case where the meso-scale institutions are that will back up the national reform effort. A deliberate decision was made in South Africa not to include a major role in water for provincial governments. In Australia, our state governments are often a major barrier to reform, but they are also a place where experimentation happens, where best practices are demonstrated, and that bring together stakeholders that demand that the national government remain on track. I would say to South African decision-makers that getting catchment management agencies established is critical.

We in Australia have suffered the same problem that South Africa has, where existing institutions are frightened by the potential for catchment management authorities to detract from their power and mandate. Certainly, our catchment management authorities in Australia have had their 'chain yanked' by state governments that are scared about the mandate they are developing and the resources they are taking from state water management agencies. For those reasons, it is important that South Africa's CMAs do have a strong legal mandate and, importantly, have a degree of self-funding. In my research around the world, the most powerful meso-scale institutions I have seen have been in countries such as Brazil, where such institutions raise a modest portion of their own money from their residents. This gives those institutions a core capacity independent of national government funding, that sustains a common vision, and the capacity of the people to argue for reform.

The second lesson from the Australian situation is that the establishment of tradable water entitlement as a share of the available resource has been a powerful back up to the national reform effort. I was a reluctant convert to the idea of letting market forces loose in the water realm, but I must say that on reflection, it has been largely a force for good. In particular, it has meant that given that the water portfolio in most national governments is in practice a second-tier priority after ministries of finance, economic affairs and foreign affairs, this has been a powerful way of raising water up the political priority stakes, having genuine dialogue with some of the first-tier and keeping some of the water reform agenda on track in Australia. I do not see this in South Africa yet, and I wonder why the South African licensing system seems to be so stalled.

Lastly, I would like to comment on the contestability of ideas and policy, because in a water act that is to be implemented by one primary department, there is always a danger that if 'one string in the bow is a bit limp, the arrow will not fire properly'. Unless there are some parallel institutions that back up the reform effort, there is a risk that at times, the reforms will not proceed. By accident in Australia, we have created a few institutions that have added great value. One of these accidental institutions is the Commonwealth Environmental Water Holder. This is a statutory officer who owns the environmental reserve water that the federal government has purchased. I do not think that the architects of Australia's laws thought that this body would be important, but having a Commonwealth officer owning the water, and having a very focused mandate on delivering that in terms of an environmental reserve, in parallel with the institutions that manage water allocations and day-to-day tap-turning on dams, has been a very important way of keeping the system on track and honest. Similarly, I would say that the establishment of the water market, and bringing in economic agencies like the Australian Competition and Consumer Commission as an enforcer of the water market, have kept the water agencies honest in terms of things like water accounting, issuing new licences and undermining the cap-and-trade water systems.

Let me conclude my comments by saying that South Africa has an inspirational Act. Many of us around the world look to South Africa to demonstrate that such inspiring policy can work, but it is time for South Africa 'to get its mojo back' and show leadership in implementing it.

**Ms Barbara Schreiner (Chair: Water Research Commission)**

Fifteen years is not a long time to implement complex and profoundly changed legislation, but it is a long time in terms of the aspirations of the people of South Africa. We face a tension in that regard. When new legislation is introduced after a revolution, or a moment of liberation as South Africa had, one does not start from a clean slate, and layer over that and try to change it with the new. We have carried forward the structural inequity of apartheid; this is enormously difficult to change and cannot be changed just by addressing water alone. What we do need to recognise is that the ownership of the economy of South Africa is a contested terrain; and access to water is contested. We are not operating on a playing field on which everyone wants the same outcome. Water is a scarce commodity, and there is enormous contestation around it. We have to recognise that, as it plays into what we manage to achieve or not achieve.

We are sitting in a context in which we have, as Adv. de Lange made very clear, structural inequity. The former homelands remain the areas of deepest poverty in South Africa, and it is a massive challenge for us to change that and to see how water plays into that. This also means that we have huge differences in capacity and capability in the country.

The two previous presentations have focused much on the National Water Act and water resource management. I would also like to highlight briefly that we have particular challenges in terms of water services; that we have a Constitution that defines three spheres of government. Local government has the constitutional responsibility for water supply and sanitation; provincial government has the intervention function; and national government has the authority to set national norms and standards. At the provincial level, however, there is no water function in provincial government. There is a local government function with respect to water. Because of the absence of a water function in provincial government, there is a disconnect in the way we have drafted our Constitution. Added to that is that we have provided the equitable share as an unconditional grant, which makes it extremely difficult to understand where that money is going to and what it is providing. There are thus structural issues that we need to take into account when looking at how we have tried to implement the legislation and what has held us back over the past 15 years.

I also think we need to recognise that it was not only the water legislation that was changing over the past 15 years. We have been through a period of enormous change. At the local government level, there were huge changes over powers and functions, boundaries, amalgamation of previous municipalities, and bringing in of areas that were previously excluded under municipalities. This massive change meant that local government really only settled into its current form and functions about ten years ago.

Added to that, in 1994 the Department of Water Affairs quadrupled in size overnight. That imposes incredible challenges on an organisation about how to structure and function, and how to take itself forward. At the time, we were also quite correctly facing the challenges of affirmative action, and those challenges continue. What that meant was that on top all the changes in legislation, policy, institutional arrangements, boundaries and functions, we were also changing staff at national, provincial and local government levels. Institutional memory was thus changing; people were coming in with different sets of skills and experience. This in itself posed enormous challenges, both within organisations and in terms of implementation.

There have been significant challenges in our planning processes, in making sure that those planning processes are translated into implementation, and that there is accountability for the implementation. The issue of accountability is critical for us to look at. Let us look at water services development plans, for example. For many years, water services development plans were developed by consultants and put on a shelf. They were required by the Department of Water Affairs and were therefore developed. However, this does not mean that they were necessarily the tools by which water services authorities and water services providers managed on a day-to-day basis. The same can be said of other plans as well. The whole notion of having clear targets, that can be measured through a clear performance management system, and against which people can be held accountable for non-delivery, is something that we need to look at.

This raises the issue of who holds government accountable, particularly who holds national government accountable. The National Water Resource Strategy, which is a legislative requirement that is required to be revised every five years, is currently about two and a half years late. Who holds the Department of Water Affairs accountable for having failed in its legislative mandate in that regard?

We have also faced enormous challenges within the Department of Water Affairs. We are trying to implement extremely complex pieces of legislation, in an organisation that has not had much organisational maturity. Because of the complexity, the department has been managed under a matrix management system. Anyone that knows anything about organisational development and management will know that matrix management systems can be the polite term for chaos management. They are extremely difficult to get right. In a mature system, they can work quite well. In a system that is not mature, they can work against the ultimate objectives. I therefore think that there have been internal challenges in how to get the department to function efficiently and effectively. The delays in implementing things such as the catchment management agencies have added to the pressures, as there has been a stop-start approach to establishing these agencies. People whose posts are supposed to be moved to a catchment management agency do not where they stand over a period of years.

These have been some of the challenges we have faced in translating our fantastic legislation into implementation. Having said that, I believe that we do have the capacity to do so. We keep talking

about capacity challenges in the country, but I believe that we have enormous capacity and capability, although it might not always be in the right place at the right time.

### **Discussion**

**Dr Barbara van Koppen (International Water Management Institute/WRC Board):** I have worked on water law. I am rather surprised that in 2012 we are still repeating ideologies from Australia that we heard 15 to 20 years ago. A lot of research has been done to show that water markets have not worked, even in Australia. Huge debates have already started on the issue of catchment management agencies and the role of line agencies in local government as democratic accountable institutions. I would like to get to the real issues on water law, namely that licence or permit systems are not new; they are as old as Roman water law, with Caesar essentially declaring the water as public water and hence owned by Caesar. There has been a huge issue of dispossession of conquered tribes since early times on permit systems. That kind of system has travelled to Australia by declaring Australian water public and vesting it in the name of the British monarch, thus dispossessing all indigenous Australians and then developing water control dams and canals with some 300 000 vested registered users who could manage the water resources. Permits were then made tradable to solve the issue of huge water scarcity in Australia.

In Africa, the permit system has been used by most civil law countries to declare African water as public and vested in the colonial rulers, with the exception of countries such as South Africa and Ghana. At independence, the only thing that changed was that the colonial rulers were exchanged for newly independent governments without any debates on the usefulness of that type of law for an area where more than 80% of the people are primary water-takers, especially in rural areas. Small-scale farmers often invest themselves without much state support. The legacy of dispossession has not been addressed.

South Africa added to its legal pluralism a licence system; we therefore have existing water use and many different laws. Ownership of the state was added, not through the right to sell water rights for an income, but as in terms of custodianship. This is no longer challenged.

South Africa is the first country in the world, and certainly in Africa, for which it is so important to discuss how to recognise customary water use by small-scale water users as a priority right. The tool of general authorisation could be a solution. We need to ensure that people that have general authorisation (up to 30 hectares) still get access to loans, and that the value of their water is equivalent to that of water users with licences, which raises the whole issue of the tradability of water in a country such as South Africa.

**Dr Mark Dent (University of KwaZulu-Natal):** I am delighted to hear the concluding comment by Ms Schreiner that South Africans do have enormous ability to make a plan. I have held that view since the National Water Act was promulgated in 1998, and I am delighted that the conversation has come back to that positive note.

**Prof. Larry Swatuk (University of Waterloo, Canada):** I would like to mention an idea from a three-year project that I worked on with Lewis Jonker (University of the Western Cape). Ms Schreiner referred to the absence of a water function for provincial government. There has been a decision to reduce the number of catchment management agencies from 19 to nine. Could South Africa not decide to abandon catchment management agencies and vest the authority for water resource management in an existing recognised political authority such as the province, and let people work in terms of an ecosystem or watershed sensibility? One of the problems seems to have been to try to create new institutions, which caused those with existing power to strive to retain it. Why not work through existing institutions and give them the help they need?

**Mr Andrew Muir (DHI):** I am an environmental attorney. From the Australian perspective, the catchment management agencies (CMAs) do not seem to have been the success it was hoped they would be. South Africa has only two of the nine CMAs in place. What can we do to streamline the implementation of future CMAs to address some of the concerns that have been identified from the Australian perspective?

**Mr Mike Muller (University of the Witwatersrand):** Last week, I asked Advocate de Lange in parliament what the Portfolio Committee on Water and Environmental Affairs was doing about departments and ministers who did not obey the laws passed by that committee. He did not answer that question. I would like to suggest that the revision of the National Water Resource Strategy (NWRS) offers the opportunity to do the right thing, if there is leadership and discipline. I would suggest that a strategy that contains 23 strategies and 78 strategic actions is unlikely to be implemented and is probably in need of some prioritisation.

If there are challenges of people looking for access to water for equity, or looking for water for the reserve, perhaps compulsory licensing would be the key strategic initiative that needs to be taken. I am concerned that if we read the NWRS, we discover that the compulsory licensing action that is proposed is to continue in the same three small catchment that were started in 2003. We are thus making absolutely no progress on the most important strategic issue.

I agree with Dr Pittock that we need a few more institutions, largely the CMAs – because there is talk of closing down provincial governments, rather than of expanding their functions – to ‘pick up the ball and run with it’. Some of the CMAs are already in place, and the users are waiting for the CMAs to be established. However, there is a problem of leadership. Somehow, in the current draft of the NWRS, the key priorities and key actions that are required are avoided.

**Mr John Harrison (eThekweni Municipality Water and Sanitation):** I would like to pick up on something that Dr Dent mentioned and Dr Pittock spoke of, namely capturing leadership and the ability that we have as South Africans to make a plan and get things going at grassroots. There is enough in the laws to lead us in the direction in which we should be going. Our problem lies with all the obstructions that stand in our way, such as environmental impact assessments and supply chain management problems that prevent professional leadership from getting the job done. I would like to suggest, as a way forward, respect for professionalism. Contrary to what labour unions think, professionalism is not job reservation. Professionalism is for people who are prepared to take risks beyond normal business risk and to be accountable for those risks. We have to train people to become accountable for those risks. Our senior leadership needs to realise that there is a huge resource available that can take that risk and actually deliver on the ground.

**Prof. Ray Ison (Monash University, Australia and Open University, UK):** I would like to reflect on experiences that I had of working with South Africans in 1994, just after the first democratic elections. This was around a collaborative consultancy concerned with land reform, agricultural extension and rural development. From that experience, I was inspired for the rest of my life by the commitment and aspiration that South Africans had at that time to ensure that they invented institutions in civil society that always created a powerful dialectic with the state. I have come to characterise this as an investment in what might be called vertical governance and horizontal governance. The point that Dr Pittock was trying to make when he said that catchment management authorities ought to have some separate funding was to underpin an innovation in horizontal governance that gives a dialectic between horizontal and vertical governance. We lack those institutions of horizontal governance to create the dialectic and accountability to the state in terms of vertical governance. If I have desire for both Australia, the UK and South Africa, it is to give some consideration to how to invent those institutions. Please do not be seduced in your implementation of CMAs as merely the continuance of vertical governance mechanisms.

**Unknown speaker (University of Pretoria):** South African water legislation is considered world class. Now we should realise that policy and legislation can only go so far. Even though we have world-class legislation, we still face many challenges. We should therefore place more emphasis on the issue of political will and the ability to transform South Africa’s world-class legislation into action and integrated planning. I do not believe that registration of water use is the problem.

**Prof. John Williams (Australian National University):** I would like to comment on the ordering role and trying to get action in the national account. Dr Pittock did not mention the Australian National Water Commission or the assessment of progress on the national water initiative, which is a very positive role. As regards CMA establishment, having audit as a function, delivering the product and reporting to the state premier is a very powerful role.

With reference to the comment on giving more power to provinces, one of the difficulties we have in Australia is that water rights reside with the states, and the Commonwealth struggles. We thus have a constitutional problem because of that. South Africa does not have this problem, so go carefully.

**Mr Derek Hazelton (TSE Water Services):** In response to the comment that the water law is too complex, I do not believe that it is complex, but we must move away from traditional legal language and simplify the language used in all our legislation.

I agree with most of what Dr Pittock said, but as regards water trading, it would be necessary to be very careful in relation to the power structures in South Africa. Water trading could be an utter disaster in this country.

Ms Rumble mentioned the case of *Masibuko and others v City of Johannesburg and others* (CCT 39/09) [2009] ZACC 28; 2010 (3) BCLR 239 (CC) ; 2010 (4) SA 1 (CC) (8 October 2009). I feel very passionately about this case. I believe that all three judges were very imperfect. The High Court judge said that local authorities could do nothing right, but the Constitutional Court seemed to say that the ordinary people can do no right and that the municipalities are perfection. To me, that was not access to justice. Ms Schreiner was also involved in that case. I would like both Ms Rumble and Ms Schreiner to pass some comment about the three judgements. My overall comment is that, despite all its faults, the High Court was pointing in the right direction at least.

**Mr Dhesigen Naidoo (Facilitator):** There are some parallel cases in the rest of the world that we should look at very carefully.

**Ms Noxolo Ncapayi (DWA):** Tradable licences are not the right way to go in South Africa, because this would perpetuate the status quo. The policy talks of water trading, but the National Water Act does not; instead the Act talks of about the transfer of water. There is a difference. The policy needs to be reviewed even though it may have been written with good intentions.

**Mr Bongani Khumalo (Financial and Fiscal Commission):** In a recent report presented in parliament, the Public Service Commission reported one of its findings being that South Africa has a heavy load of legislation, and that the implementation of legislation is therefore an onerous and very difficult exercise for public servants. We see the results in the under-spending of government departments and the continuous shifting of functions between departments when there is policy implementation failure.

**Prof. Jennifer McKay (Centre for Comparative Water Policies and Laws, University of South Australia):** Dr Pittock's comments are very relevant. Australia has 56 macro regions. Within those, only 114 water natural resource management plans have been produced. New South Wales has been tardy for many reasons. This brings us back to the subsidiarity principle. There is an essential difficulty in giving local people in any country, even Australia where we are not beset by the same social history as South Africa, autonomy over a public good, because they will always act in their own interests and only think of the small region, whereas water is a common pool and needs to be managed in a larger context.

In South Africa, local government supplies water. In Australia, this is also the case. We have 14 different legal forms of water supply businesses. Their single most important characteristic is that they do not communicate with the one next door unless they are forced to. This is a human problem; in South Africa, the situation is beset by the problems of the past, which lead to structural inequality that we do not have in Australia. There is a solution, and the government of Queensland may have come up with it to some extent, namely to leave the water supply with the local authority but make sure that the water supply institution is a separate part of the relevant local government. Queensland, ironically, has set up a local government with a corporations law company as a subsidiary. In law, that is a very peculiar relationship. It is then necessary to get people on to the water authority who represent the stakeholders in the local region, but who also represent broader public interests, such as the national and provincial government. There should be an uneven number of people (about 11), and both local and non-local interests must be represented. The local interests should include the people that will pay for the water as well as longer-term interests such as the environment. My Centre has produced a model for this, which has received considerable academic and other interest. However, there are always problems of politics and the need to keep power in a local region. There is some merit in

keeping things at the local level, but having people with a broader perspective from the non-local area being involved in water decision-making. Some of them could well be from the national government. That might help the vertical and horizontal issues that have been mentioned. This is essentially a human problem, which is seen across the world with water associations. The biggest users and toughest people get more water than the poor. We have to manage the human problem by putting in people whose views are not going to be biased by how much they can achieve for themselves. Australia has done well with 114 catchment management authorities, and have taken 50% of water from farmers in some regions, but this has been very sporadic and patchy, and has not been a uniform approach.

**Prof. Bimo Nkhata (Monash South Africa):** Ms Schreiner commented that 15 years is not enough for the implementation of the legislation currently in place. What sort of mechanisms would address the implementation of legislation as well as societal expectations?

There is a tendency in South Africa to look beyond Africa for lessons in the water sector. However, much has been done elsewhere in Africa that South Africa could learn from, for example, from Uganda's water and sanitation sector.

**Dr Mercy Dikito-Wachtmeister (Global Water Partnership):** The presentations have provided a useful critical analysis, not just by outsiders but by South Africans themselves. How does South Africa intend to move forward through the issues that have been raised? How are you going to make use of these contributions? What is your plan for the way forward?

**Ms Barbara Schreiner:** I agree that the legislation is good and not too complex. I believe that we have complicated it in how we have decided to implement it. The major challenges are in implementation. I do not believe that we need to rewrite the National Water Act in a profound way. The Water Services Act needs more rewriting, as the framework of local government has changed profoundly over the last ten years with respect to local government's powers and functions, and the Act needs to be updated to take account of the contemporary governance framework of South Africa.

As regards the issue of provincial government and CMAs, we should rather give more powers to CMAs than to provinces, and manage the country on the basis of watershed boundaries.

A comment was made about the challenge of giving autonomy over a public good to subsidiary organisations. It is important to stress that there is no intention to make CMAs autonomous bodies. They are an organ of state, accountable to the Minister, and they fall, and always will do so, under the National Water Resource Strategy, which is one of the reasons why it is so important to get the NWRS right. The NWRS sets the boundaries and parameters, and the guidelines and the framework, for managing water resources in this country. CMAs will have to develop catchment management strategies, which go to the Minister for ratification and have to be in accordance with the NWRS. We do not intend to give up the national overview of water resource management to the basin level. CMAs operate within the framework for water resources, with the Minister retaining the custodianship role over water resources in the country. It is critical that the Minister should continue to play that role. This is the intention, but this does not mean that there are no challenges in planning and implementation.

As regards the comments on the heavy legal burden and how one manages this, a very positive feature of the National Water Act is that it allows decisions on what to implement where. Not everything has to be done across the whole country at the same time. This allows the ability to prioritise, although prioritisation is a challenge.

With respect to the question of how we should move forward, we need to prioritise and recognise that different things will be done in different parts of the country; the capabilities are not the same, and the priorities of different areas need to be addressed in different ways. We need to be able to focus on what we want to do in particular areas.

In South Africa, we critically need to make decisions and act on them. We have suffered from the 'paralysis of analysis' for far too long. We tend to agonise over decisions. A number of our neighbouring states have taken decisions and acted upon them. It did not take Zimbabwe, for

example, long to put catchment management agencies in place, although they may be very different and function differently from ours. We are still thinking about the process of establishing CMAs.

The intention is to set up nine CMAs within the next three to five years, and hopefully everyone in the country will hold the Department of Water Affairs accountable to make that happen.

**Ms Olivia Rumble:** Many of the implementation frustrations stem back to the failure to amend the National Water Act. I agree with Ms Schreiner that the Act is very sound in its fundamentals, and that it creates a good system. It is quite a complex Act, but we should not undermine it by saying that it is too onerous and complicated, and that we cannot implement it in time. The legislative amendment process has fallen far behind. The last amendment to the NWA was in about 1999. Its fines, for example, are completely out of date. Fines in the National Environmental Management: Waste Act (Act No. 59 of 2008) or the National Environmental Management Act (NEMA) (Act No. 107 of 1998) can be up to R10 million, whereas the maximum fines related to transgressions of the NWA are R60 000 or R300 000, depending which court the case is heard in. This is a major flaw with respect to the NWA. It is not clear why it has not been amended. A legislative review process is to be tabled in 2013.

Other important revisions would include the powers of the enforcement agencies. The Green Scorpions, for example, are doing exceptionally good work in terms of the powers that they derive from NEMA, and the NWA needs to legislate equivalent powers for its enforcement agencies. The NWA was based on very good intentions at the time, but it has not benefitted from the learning, understanding and experience since the Act was promulgated. The Blue Scorpions are being trained as the enforcement agency within DWA, but under the NEMA laws that capacitate the Green Scorpions. This leaves a hanging provision in the NWA, which is supposed to capacitate the Blue Scorpions.

Another issue that requires attention is to clear up timelines. There have been some good amendments to other laws where clear timelines are stipulated for processing licences. Quite an effective policy of the Department of Environmental Affairs has been to provide clear timelines on when to accept certain applications, acknowledge receipt and process documents. It might be useful to try and incorporate that approach in the NWA, and provide clear timeframes and goals and things to hold people accountable to. There have been some good suggestions for amending the Water Services Act dating back as far as 2007, but we are still waiting for those. There are issues of political will, and we do have good legislation, but without proper enforcement, the NWA lacks the political teeth to do what it promises it could do.

On the issue of water trading, the NWA does make a distinction, as was pointed out, between transferring and trading. The Act does speak of trading, mentioning that the Ministry should put in place regulations to bring that into effect and to regulate trading. Allowing for trading haphazardly could give rise to equity issues. Unfortunately, we are still waiting for the water trading regulations. The NWRS is correct in saying that water trading should be explored; it does require regulation and oversight, but I would not dismiss it entirely. Water trading has worked in other parts of the world quite successfully, but equity issues, as well as inter-catchment transfer and pollution issues, would need to be taken into account.

With respect to compulsory licensing, there have been some good attempts by DWA to clear the delays, for instance, project Letsema. The department may still be thinking long and hard about compulsory licensing, but it is very slow to come into effect. Difficult choices have to be made. Compulsory licensing would affect planning for business and investing infrastructure, but at the same time the vision of the NWA was that this was how equity would be addressed, and the two-year transitional period was intended as a compromise for those with existing lawful use. In my view, it is very unfortunate that compulsory licensing has not been addressed with the urgency that it requires.

With respect to the Water Tribunal, this is an issue that the intervarsity students will be debating during the conference lunch sessions. Without access to courts, people lack opportunities to resolve their issues. One of the strengths of the NWA was therefore to create a Water Tribunal, so that issues could be decided expeditiously without legal representation, and without the heavy delays that most people experience in accessing South African courts. There have been issues of insufficient seatings, questions about the legality of the tribunal, the appointment process and rules. This is to be reviewed

in the legislative amendment process in 2013. It is a pity that the matter of the tribunal has been allowed to get to this stage.

The Mazibuko issue was a very sensitive case. It concerned the water metering policy in Phiri in Gauteng. The dispute started in about 2003/04 and concerned the installation of prepaid water meters and the policy at the time, which fell into development regulations about the free basic water allowance of 6 kilolitres per household per month, or 25 litres per person per day. The issue was how to give content and meaning to the right of access to sufficient water in the Constitution. There were two prongs to the case. The first was about the metering and whether the prepaid meters were lawful; this was an administrative justice issue. The other issue, which was more political, was whether there is a minimum core to the right to sufficient water, and whether it could be quantified in terms of numbers of litres. The High Court and Supreme Court ruled that the amount should be specified, and what that amount should be. The Constitutional Court, in a majority judgement by O'Reagan, ruled that there is no minimum core to socio-political rights, such as access to water, housing and health care. 'Access' will have different meanings for different people. In the case of housing, for example, access to housing might not necessarily be a house, but could take the form of access to bricks and mortar to make a house. In the case of water, a minimum core for water could not be quantified. An important issue was that government was continually readdressing this matter.

**Mr Dhesigen Naidoo:** In summary, the Constitutional Court offered the constitutional interpretation of the right; it did not say what was right and what was wrong. This is an issue that we need to engage. A constitutional court that ruled the other way was the New Delhi High Court, which interpreted and ruled an opposite judgement with respect to the Indian Constitution.

**Dr Jamie Pittock:** Thanks for the many excellent comments, and particularly to Prof. Ray Ivson for his academically erudite case for knitting together the institutions that provide good vertical and horizontal governance to back up water legislation.

On the issue of lessons from the Australian catchment management authorities, which is a key part of vertical and horizontal governance, we did not always provide a rigorous overarching framework in Australia. Ms Schreiner has emphasised that that is in place in South Africa. Another issue is that, in Australia, we have tended to try to set up such institutions in one 'big bang', which is not always successful. Ms Schreiner has emphasised the opportunity in South Africa to do that in a staged way, and to build capacity region by region.

I would emphasise the importance of self-funding for the CMAs to have a degree of independence from the year-to-year budgets of the national or provincial governments. The WRC is an example of why this is so important; the continuity and professionalism that we see in the WRC today is in part because it has an independent source of revenue from the water-user fees. A key issue I have found from engaging with CMAs in some of the most poor and far-flung regions of Australia is that they provide a key platform for different stakeholders with very different visions of how to manage water to come together and, if not to reach consensus, at least to understand where the other stakeholders are coming from, and to come together around some form of common identity and reach agreement on the way forward. This is a powerful institution.

With respect to the questions on the licensing system, concerns have been raised that a licensing system would discriminate against the poor. There is no doubt that a badly implemented licensing system could reinforce inequities. In Australia, smallholders do have access to water despite the licensing system. Licensing systems can be a tool for redressing the inequities of the past. In Australia, there are early efforts to redress the dispossession of indigenous Australians in part by using the licence system to transfer water entitlements back to those traditional owners. I do not see why that could not be adapted in other circumstances. Importantly, however, some of the benefits of such a system are less appreciated by those that worked on water in the past. One issue is how to reallocate water in over-allocated catchments. Does one take years trying to do this by administrative fiat, or does one set up tradable licences and pay for those transfers to happen in a way that overcomes some of the resistance from powerful interests? Tradable licences are a quick way of facilitating change, and an important way of managing variability. South Africa and Australia share some of the most variable climate in terms of droughts in the world. In Australia's Murray-Darling basin in the last ten years of drought, the irrigation farmers received only 30% of their erstwhile annual licensed water, but the value of their irrigation production was 99% of what it would otherwise

be. One key reason was that farmers who had only a portion of their licence in this drought could choose to sell it to higher-value farming producers, who were able to produce high-value crops and maintain employment. This is a powerful socio-economic benefit for managing variability in the sorts of climates that we share that is worth considering.

I started my career as an environmental advocate, and frankly, if environmental water is only the water that is left after entitlement-holders have taken their share, then the environment will lose out. When the environmental water has the same legal status in a licence or entitlement, then there is a much more powerful legal basis to ensure that the environment is not always the loser.

This licensing system does create the need for auditing and water accounting in a much more rigorous way than is otherwise the case. As Prof. John Williams suggested, it has driven the establishment of some institutions in Australia such as the National Water Commission that reports regularly to the top political leaders, and has led to expanding the mandate of the Bureau of Meteorology to have a water accounting function that has been a serious boon to the water agencies in reinforcing their agenda and backing up the importance of water reform.

**Mr Dhesigen Naidoo (WRC):** We are in a very important space and time. We have a wound that is festering a little, and an opportunity to open it up. This may be painful, and several of the comments were raised quite emotionally, but we have to go through that, because beyond that is the opportunity to have a much better system implemented than we currently have. Our contribution as South Africa to the global community is that we are a living laboratory that is engaging these very difficult issues. We have an opportunity for some of this thinking to be embedded in the immediate term in the National Water Resource Strategy. Some of the thinking has to be dealt with in the much longer term. We have to come to grips with some very important questions, one of which is why we place the equity and economic development parameters on a see-saw when they should actually be part of the same vector. We also have to examine vested interests in the system. Everyone benefits regardless of what happens, but some benefit more than others. There are huge beneficiaries to South Africa's not moving along with water allocation reform. Have we come to a point where those forces have become so powerful that we cannot turn the tide? Have we bought into the anarchy in such a way that our reallocation process will be stymied?

Thanks to the panel for their inputs and responses, and to delegates for their participation.

### **SESSION 3: MARKERS OF GOOD GOVERNANCE**

**Chair: Dr Andrew Achou Enow (National Research Foundation, NRF)**

**Mr Mike Muller (University of the Witwatersrand) – Keynote address: Why government should lead stakeholder involvement in water resources management: Theory meets practice in South Africa**

The presentation was based on the outcome of the study done in 2010/2011 called, 'Prospects and processes for the establishment of stakeholder-initiated catchment management agencies'.

Water management is a difficult and complex business requiring appropriate institutional arrangements as well as guidance and support from government, which is often unable to act effectively to address day-to-day water resource management (WRM) issues. Theoretically, water as a 'common pool resource' is best managed by users self-organised at a local level and within a basin framework. Water users and other stakeholders have detailed and up-to-date local knowledge as well as an interest in ensuring effective management to share water equitably between different users and to control pollution. This approach is supported by South Africa's National Water Act (NWA), which provides for the establishment of Catchment Management Agencies (CMAs) to perform a range of WRM activities within the framework of a National Water Resource Strategy (NWRS). However, since the NWA was passed in 1998, only two of the proposed nineteen CMAs have been established.

The main objective of the study was to understand water users' perceptions of, attitudes to and concerns about the benefits and disadvantages in respect of the process of establishing CMAs using the following provision of the NWA, '...a CMA may be established for a specific Water Management Area (WMA) after public consultation, on the initiative of the community and stakeholders concerned. In the absence of such a proposal the Minister may establish a CMA on the Minister's own initiative.'

At the start of the study it was considered that the reasons for stakeholders not taking the initiative to establish CMAs might include:

- Ignorance of the enabling provisions of the NWA (knowledge)
- A lack of compelling incentives to establish a CMA (satisfaction with status quo)
- Concern of stakeholders' ability to defend their interests in a CMA (capacity and uncertainty)
- Fear that a CMA might be detrimental to their interests (negative evaluation of the management concept)
- Fear that a CMA would be ineffective in achieving its goals (lack of confidence in the management model).

Two WMAs (Olifants and Upper Vaal) were selected for the study and different types of users were identified to ensure a diversity of interests and experience. A series of open-ended interviews was conducted to identify water resource issues of concern, previous involvement in WRM, knowledge, perceptions and opinions about WRM in general and the establishment of CMAs in particular.

Although it was apparent from the interviews and other evidence that a number of users had taken the opportunity offered by the NWA to engage and promote the establishment of CMAs, the initiatives had not progressed. Numerous concerns were raised by respondents, including:

- The current state of water administration and The DWA's failure to enforce the NWA
- Unsuccessful efforts by commercial and small farmers to ensure that water use was compliant with legislation and the uncertainty about the relevance of compliance in times of drought
- The lack of clarity with regard to the overall contents of the NWA
- Municipalities' general disregard for WRM, yet awareness of their liability in relation to DWA's Blue Drop and Green Drop process
- The ineffectiveness and lack of statutory recognition of informal forums
- The need to understand the purpose, functions and funding of the CMA
- The lack of incentives for water user associations to initiate or lobby for CMA formation and the absence of champions to promote CMAs.
- The unfavourable social, political and economic environment to intra sub-sectoral cooperation.
- Politicisation of the water sector necessitated the involvement of a neutral and unbiased facilitator, other than DWA, in the CMA establishment process.
- Stakeholder-led establishment of a CMA would not necessarily be supported by local and provincial governments.
- Problems with addressing water resource interests relating to marginalised groups and dissatisfaction about the lack of mobilisation of small farmers and poor communities concerning water resource issues in the context of CMA proposals.
- The establishment of CMAs was marred by suspicion. Resourced respondents perceived the CMAs as a mechanism to take away resources and non-resourced respondents felt that CMAs that would not ensure equitable WRM arrangements.
- Limited capacity and financial resources for the establishment of CMAs and complex institutional structures.

Although the establishment of CMAs received some support, most respondents thought that any initiative would have to be led by government, specifically DWA, as the only organisation that could bring together and ensure balance between the very different groups of stakeholders. This position reflected the findings of the research on the principal question of whether stakeholders could initiate the establishment of CMAs in the two pilot WMAs.

Numerous insights were gained into broader WRM problems faced by respondents as well as their views on the efforts to improve water management in their areas. Many believed that the task of establishing a CMA was simply too onerous and time consuming, and expressed concern about the inevitable domination of CMAs by more powerful interests. Environmental organisations were generally supportive of the establishment of CMAs, but could be seen as using the CMA process as a vehicle to promote their interests. The study also concluded that mechanisms must be put in place to engage with disadvantaged and marginalised communities to ensure that the interests of these groups are adequately addressed. The performance of national government was perceived to be weak and leadership absent.

The main reason for stakeholders not taking the initiative to establish CMAs was not their ignorance of the provisions of the NWA. Stakeholders were dissatisfied with the status quo and many were frustrated by government's weak administration of water matters and its failure to deal with serious water management issues. Many sought ways to become more involved in the management of water resources and were concerned about whether a CMA would protect their interests and support their objectives, or undermine them. Some stakeholders felt that the CMA model was too complex and would not solve the underlying lack of capacity and leadership that were at the root of WRM problems. The majority of respondents looked to national government to lead the establishment of effective WRM arrangements but were pessimistic about its capacity to do this.

Recommendations based on the outcomes of the study highlight the importance of recognising that action must be taken to strengthen local WRM. Although there is no impediment to the basic construct of the CMA, they must reflect local capacity and have sufficient resources to take on the main tasks, and require a considerable element of self-organisation. The design of CMAs must make efficient use of available resources and should not merely duplicate the DWA regional offices. The underlying functions to be performed by CMAs should be evaluated and analysed, and roles and responsibilities clarified. Although the Olifants and Upper Vaal WMAs experienced many pressures, the absence of an immediate crisis deterred organisation and action. Precautionary WRM interventions would ensure that a crisis does not occur. The development of municipal water services development plans, which identify both water supply and wastewater treatment requirements, could provide a helpful focal point for initial discussions and actions.

## Discussion

**Unknown person:** Have the recommendations of the study been addressed?

**Mr Mike Muller (University of the Witwatersrand, Wits):** The recommendations have been taken up in the review of the NWRS and there has been progress as there is a consciousness that movement is necessary.

**Mr Mbangi Nepfumbada (DWA):** To what extent have the power dynamics been considered in setting up CMAs and sustained WRM? Perhaps we could learn lessons from the developing world, particularly the African continent, on how to ensure that local capacity is used in setting up and managing CMAs.

**Unknown person (DWA):** It would be important for the water sector including DWA regional offices to begin to develop knowledge and understanding of the NWA. This would boost internal capacity. Knowledge, Attitude, Practice (KAP) is an important principle. Knowledge must be built in order to change the attitudes of stakeholders and to help them understand their role in WRM.

**Ms Ndileka Mohape (DWA):** Research is always subjective, according to the sampling and interpretations of interviews with respondents. This study has not produced any new information. My main concern is that DWA continues to be attacked without providing solutions to the problems or acknowledging the skills and capacity limitations. This point has also been raised by the Parliament Portfolio Committee. Research that is helpful and that assists South African citizens to move beyond the challenges would be more helpful. Disunity of the water sector cannot continue.

**Mr Mike Muller (Wits):** The question of power dynamics is very fundamental and the research is subjective. The perception that there is a lack of unity between the water users and DWA is also subjective. This perception should be dispelled. It is interesting that water users look to DWA to be the agency that takes the initiative to establish CMAs. This presents a challenge and an opportunity that should be taken by DWA.

In terms of lessons to be learnt from the region, Mozambique has a regional water administration system that is self-funded from water users and is very concerned about the lack of progress made in South Africa. Kenya has successfully implemented the South African NWA in a very short timeframe. Unlike South Africa, our neighbours have not agonised over making the necessary decisions to move forward, and have learnt by doing. The limitations of capacity are theoretical. The quicker and more extensively real issues are dealt with, in terms of governance as well as research, the quicker progress will be made.

KAP is very important and should be implemented across the water sector agencies as well as the water users. We will be able to move forward when we reach a common base of knowledge. There is a real danger that DWA perceives the outcomes of the study as an attack. One of the stronger conclusions of the study was the view that water users depend on government and expect government to take the initiative in establishing CMAs. DWA should view this as an opportunity rather than a challenge.

**Dr Guy Pegram, Pegasys – Governance observations and lessons from the establishment of Catchment Management Agencies (GC Pegram and D Weston)**

There are several key observations concerning the establishment of CMAs. Policy and legislation regarding CMAs were originally based on the concept of stakeholder boards managing CMAs. This, balanced with the fact that CMAs are public entities that act in the public interest, has created tension in respect of corporate governance and fiduciary responsibility of CMAs. A further key element in establishing CMAs is the concept of institutional development and legitimacy of the CMAs. It is only through legitimacy that stakeholders and water users are able to engage effectively with CMAs. The issue of financial viability and self-sufficiency of the CMAs is of substantial relevance both in Africa and internationally. The role that CMAs can play in terms of supporting water for growth and development is distinct from DWA's role in this regard.

At the time that the NWA was promulgated in 1998 much of the debate on WRM was being framed by the experiences of Europe, Australia and the USA, while WRM processes had not yet developed in the developing world. In the early days the discussion concerning the democratisation of water in South Africa led to the concept of stakeholder involvement in WRM, which was supported in the NWA, within the context of the NWRS. Procedures in Schedule 4 of the NWA focussed on CMA board process and neglected governance.

Nineteen WMAs were defined, but because stakeholder boards were neither willing nor able to drive the complex construction of the proposal process, DWA took the lead in the stakeholder consultation processes. The promulgation of the Public Finance Management Act (PFMA) changed the governance requirements of CMAs. In addition, overall pressure on the resources was mounting. Over a period of about five years, substantial planning, consulting and developing of proposals took place, National Treasury refined the governance framework, the mandates of institutions were clarified and DWA underwent a restructuring exercise to reflect the NWA. Progress was limited until the Inkomati CMA (ICMA) was set up, followed by the Breede-Overberg CMA (BOCMA). Discussions in Advisory Committees centred on the structure and composition of the CMA boards of up to fourteen members representing a wide range of sectors, balancing current and future users, needs of local and provincial government and environmental interests. However, the process of setting up the organisations and staffing the CMAs was driven by only a few board members and took precedence over the deliberations on WRM. The delegation of functions from DWA to the CMAs was delayed, constraining the legitimacy and eroding the confidence and the credibility of the organisations.

The CMAs are positioned between stakeholders and the Minister of Water Affairs and their dual role enables them be more effective than DWA in responding to local WRM requirements. The development of Catchment Management Strategies (CMS) was an opportunity for CMAs to build stakeholder legitimacy. However, the necessary information to support strong action was not available, which led to a further delay in the process and further erosion of the CMAs' credibility. As evidenced in the international experience, the financing of CMAs requires a balance between user charges and self-sufficiency of the organisation. The delay in the delegation of revenue collection to the CMAs remains a challenge and the uncertainty of collection has led to unrealistic budget estimates.

The recent review of the NWRS and the CMA governance issue has seen the original nineteen CMAs being reduced to nine CMAs and nine WMAs. National Treasury viewed CMAs as part of the proliferation of public entities and resisted their establishment. Challenges in relation to governance, legitimacy and financing of the CMAs should be faced courageously and guided by the experience of the past decade as well as international lessons during the current acceleration of the establishment the nine CMAs. Additional governance observations with regard to the establishment of CMAs are:

- The board composition reflects the mandate of the CMA in terms of balancing commercial, environmental and developmental interests. Commercial interests have been addressed but it is also necessary to address interested of water for development and work towards emerging groups being able to use water productively through a process of empowerment and support from DWA and the CMA. In addition to revenue from existing water users, the CMA should also make provision for developmental interests to become part of the revenue base.
- As a means to overcome the potential to become distant from stakeholders, a more effective organisation structure involving three levels is proposed:
  - Governance: An expertise-based CMA board runs the organisation and accounts to government for the expenditure of public funds through board committees.
  - Stakeholders: Catchment committees and catchment forums represent stakeholders.
  - Executive: Includes the CEO, management and staff of the CMA.
- Empowering the CMA with accountability is an essential aspect of effective CMAs. The delegation of functions, development of service level agreements as well as responsiveness from the Minister of Water Affairs and DWA would lead to financial autonomy of the CMAs within two years.

### **Discussion**

**Dr Sharon Pollard (Association for Water and Rural Development, AWARD):** There are real lessons to be learnt in terms of the representative CMA boards. We should remind ourselves that many of the unintended consequences of these representative boards have worked against the spirit of the NWA, particularly relevant in the ICMA. Until very recently, the ICMA did not have delegated functions yet has shown true leadership in a number of areas and has done a lot of innovative thinking. Many lessons can be learnt from the role of leadership, self-organisation and self-regulation of the ICMA.

**Dr Kevin Winter (University of Cape Town):** What can be suggested as a way to improve the organisation and the accountability of the organisation to ensure that stakeholder committees do not become autonomous and lose their representation and their mandate from their stakeholders?

**Dr Guy Pegram (Pegasys):** The ICMA's representative board members experienced a conflict between their role as representative of the sector and their fiduciary duty to the organisation that is above the stakeholder representation. National Treasury's governance framework requires an environment where the board has a responsibility, not to stakeholders, but primarily to the organisation. Stakeholder committees will not have to be purely representative of the organisation and can represent sectors. Members of these committees should possibly be recalled if they do not fulfil their obligations to the sectors.

I agree fully that the CMAs have found ways, through good leadership, to optimise the space not filled by DWA in many of the WMAs.

### **Ms Sabine Stuart-Hill, University of KwaZulu-Natal – A snapshot of South Africa's water resource management status and what this indicates for overall water governance (SI Stuart-Hill and RE Schulze**

The following key messages have begun emerging from the on-going research on the status of South Africa's WRM:

- South Africa's governance system shows a diverse set of emerging issues within its water sector
- The policy management cycle is fragmented and not closed
- The South African narrative of 'lack of capacity and skills' could not be confirmed.

Water governance refers to the 'whole range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society'. It includes capacity to implement effective water arrangements through effective institutions. South Africa's promising water legislation tackles challenges of societal transformation, growth and development, as well as future uncertainties. It offers the flexibility to tailor regulations and water management to each catchment area.

The two main research questions concerned the legal framework that offers a unique and flexible set-up to understand vulnerabilities (existing as well as emerging) and proactively adapt to climate change, and the realities of decision-making within the water management system and the implications of these decisions for overall water management and governance.

The policy management cycle involves three levels of status (past, present and future) that move from one level to the next through adaptive response. The main elements of the cycle are implementation of policies and regulations, learning and feeding back into the governance system, and initiating an adaptive response to address issues in the system.

Semi-structured interviews were held with 34 experts, decision-makers and stakeholders in the water sector, both inside and outside the government system, with the aim of understanding the functioning of the governmental set-up as well as interactions with society and other sectors.

Interviewees rated the implementation of the NWA at between 2 and 3 on a scale of 1 to 5, with 1 being very bad and 5 being excellent. The Water Services Act was generally rated 1 to 2 points higher, mainly due to clearer roles and responsibilities defined in the Act. The NWA was rated between 4 and 5 in terms of the incorporation of Integrated Water Resource Management (IWRM). Decision-making was rated at least 1 to 2 points lower, with the exception of 3 interviewees from the Western Cape who rated the decision-making environment, incorporating integration and a holistic view, much higher than the other interviewees. It was evident from the interviews that even though the legal framework is in place, there is a lack of an integrated and holistic approach, as well as adaptation to responses. Interviewees mentioned too much change, the lack of finance and the misalignment of tools, laws and organisations as barriers to the implementation of the NWA. Interviewees indicated very limited learning for individuals and no organisational learning within the system. Furthermore, interviewees mentioned a strong focus on constraints within government and the government system, activity focussed in silos of government, the lack of appropriate skills, illiteracy in the system and a lack of leadership.

Although the analysis of the feedback phase of the study was not yet finalised, interviewees reported some opportunities to receive feedback within departmental structures and the lack of uptake of opportunities to give feedback to society and other sectors. Indications are that there is hardly any adaptive management taking place. The overall picture shows a disconnect between adaptive response and implementation, implying that movement to the next level is restricted and the learning cannot be implemented to allow a new management approach and paradigm to emerge. It is also clear that the links between implementation and adaptive response are weakening, and that there is communication and discussion taking place concerning this issue.

The study considered the capacity narrative in terms of the emerging challenge relating to political, professional, implementation and compliance capacity issues within the system. Only 4 of 32 interviewees indicated a lack of capacity on all levels, 3 indicated good capacities on all levels and 6 indicated acceptable capacity on all levels. The majority of the remaining 19 interviewees indicated weak or no capacity in either professional or implementation levels and many rated political or compliance capacity as low.

Preliminary conclusions that can be made are:

- The management cycle within government is not well established, with weaknesses especially on the higher levels of complexity (in the feedback and adaptive response phases).
- Communication with stakeholders and other areas of the governance dimension is limited and cooperation is lacking.
- Overall, South Africa's water governance system shows opportunities but is not maturing in the manner required for integrative and adaptive management.

## **Discussion**

**Dr Andrew Achou Enow (NRF):** What actions would you recommend, taking into account your observations of the water sector and the cycle that is not closed? The missing link between high implementation and low adaptation could be filled by the concept of co-design.

**Ms Sabine Stuart-Hill (University of KwaZulu-Natal, UKZN):** The main issues, also emerging from other research that I have done, relate to the culture of learning lessons from experience and from others, and the necessity to collaborate. There is a lack of trust within organisations and outside organisations within the governance system. Some of the illiteracy issues around the NWA, policies, procedures and regulation should be addressed. Leadership is essential in order to initiate functioning of the decentralised system. The gap could be closed if all the actors within the water sector were prepared to learn from and teach each other.

**Dr Everisto Mapedza, International Water Management Institute – Governance lessons from the Flag Boschielo Irrigation Based Joint Venture Schemes in South Africa (E Mapedza and P Sithole)**

The presentation, a brief overview of a study carried out in Limpopo Province, was given by Dr Mapedza.

In South Africa, as in most countries of the developing world, irrigation is justified as contributing to food security and as addressing the past injustices in terms of disproportionate access to water. It is necessary to invest resources in irrigation in order to empower disadvantaged, smallholder farmers. The Limpopo Department of Agriculture (LDA) has spent over R400 million over the past ten years to promote commercial production by smallholder farmers.

The study focussed on two irrigation schemes sponsored by the LDA, covering an area of about 200 hectares. A decentralisation framework was used in the research, which attempted to identify the actors in joint venture schemes (JVSs) and assess their decision-making powers, and identify the accountability mechanisms that are in place. JVSs involve partnerships between commercial farmers and smallholder farmers concerning production from irrigated land that was previously owned by numerous individual smallholder farmers and consolidated into one large piece of land. Local communities become shareholders in the JVS even though the majority of the production activities are carried out by white commercial farmers.

Some of the findings of the study were:

- According to the contracts signed between the partners in the JVSs, drafted by the LDA, the smallholder farmers are not entitled to make decisions concerning crops to be grown and marketing of the produce. These decisions are made by the commercial farmers and the LDA.
- In terms of Black Economic Empowerment (BEE) the smallholder farmers are entitled to 50% of the profit of the JVS, but for several years the other partners claimed that no profit had been made due to high operational costs. The smallholder farmers were unable to access financial records and began to doubt their partners. In 2010, the smallholder farmers took one of the JVS irrigation schemes to court.
- The partnerships under JVSs were intended to encourage the transfer of technology and skills from commercial farmers to smallholder farmers, but to date, have not been successful in this regard.
- Employment opportunities had been limited by technological progress.
- The exclusion of smallholder farmers from access to financial records has resulted in a lack of financial accountability and transparency of the JVS. The LDA has failed to support the interests of the smallholder farmers.

The International Water Management Institute (IWMI) was working with the LDA to clarify some of the matters that came to light in the study and to restructure the JVS to ensure that smallholder farmers benefit from the partnerships in future. It is suggested that the other joint venture partners should pay a land-use fee to the communities whose land they use and a compulsory capacity building process is put in place to ensure that the farmers are capacitated.

When the JVS partnerships are dissolved after a certain number of years and production from the irrigated land becomes the sole responsibility of the smallholder farmers, they are left with vandalised and malfunctioning irrigation systems that require repair and maintenance. It is recommended that the cost of replacing capital investment should be built into the JVSs from the onset. There is a need for farmer ownership of the land that is used for production by commercial farmers as part of the JVS.

## **Discussion**

**Dr Aidan Senzanje (UKZN):** What farmer ownership is being proposed, and is there sufficient land and farming equipment to satisfy all the smallholder farmers? It is necessary to minimise vandalism and bring a sense of responsibility for the farming land.

**Mr Mike Muller (Wits):** Is there a gap between subsistence farmers and the commercial farmers? Is there any regional experience where the best performance seems to come from the medium-sized farmers with some capital resources for production? Would this be a solution?

**Unknown person:** I represent an initiative in the Limpopo river basin that is sponsored by USAID and that looks at the basin's resilience from a biodiversity and climate change perspective. I observed that you did not unpack the capacity building required at a community level, but I suggest that there is a lack of institutional capacity, rather than farming skills. I also observed synergy with the biodiversity and eco-tourism sector where there are partnerships with the private sector. Government (and other bodies) has supported many efforts to build capacity to engage effectively with private sector investment. It would be useful to look at National Treasury's framework for public-private-partnerships, as well as initiatives of other stakeholders in the biodiversity sector. There are various areas where there is an overlap between the agriculture sector and the biodiversity conservation sector. Parallels can be drawn from these cases.

**Dr Everisto Mapedza (IWMI):** In terms of my proposal concerning farmer ownership, I think that irrigation systems have been destroyed because people realise that the irrigation is on their land. Each farmer used to own a small piece of land and they used a simple form of irrigation. Then the LDA introduced new technology as they wanted to improve the lives of farmers, but this did not happen. Farmers feel that they have lost their land and do not produce food for their own consumption. They have been dispossessed of their land and are not part of the JVSs. Is it in this context the ownership is important.

It is true that the middle-sized farming model works well, but smallholder farmers can also be successful if they receive appropriate support. Resources do not seem to be a problem in the Limpopo JVSs that were studied.

It is correct that institutional capacity is lacking but technology transfer is also necessary.

I agree that lessons can be learnt from JVSs in respect of biodiversity, conservation and eco-tourism.

### **Prof. Jacqueline Goldin, University of the Western Cape – Hope as an indicator of good governance: A case study in rain water harvesting and food security**

The presentation is in the context of a project titled, 'An institutional adequacy index using a multidimensional poverty framework'. Hope is proposed as an indicator for inclusion when considering good governance or performance of water management institutions.

Three characters are introduced:

- A character from Samuel Beckett's play
- A farmer called Gogo from a district of Mpumalanga
- The legendary Greek god, Prometheus.

In Samuel Beckett's play, 'Act without Words', the lone central character is flung onto a bare stage under merciless harsh light from which there is no escape. He is flung back onto the stage each time he tries to leave. He is systematically offered a number of items which are withdrawn the moment he reaches for them. The audience sees that among his many sufferings he is excruciatingly thirsty and tries to take the jug of water lowered to him, but it is withdrawn. In the final moments when the water is once again withdrawn from him, he sits still, in despair and in silence. This character is an archetype of un-freedom and a metaphor for power and control. The character is completely un-free and feels disempowered and hopeless. The image from Beckett's play is universal and has no locality. The central character is every man and every woman.

This image is used to hone into a real character, Gogo. On a dusty road at sunrise, Gogo treads slowly up towards her food garden, carrying a hoe and humming to herself. She eventually reaches the place where she will spend the whole day working in the field in the hot sun, to return home late in the afternoon. Gogo's feet are cracked and engrained with dirt. There is not enough water to wash, but just enough to cook and drink. She has followed this routine for many years. She has multiple deprivations and is poor.

Emotions are used to consider disconnects in the context of these deprivations, looking at the role of hope in development in general and in water management in particular. It can be argued that emotions can be used as a proxy to measure the success of a WRM project. In the case of Gogo, the project has to do with rainwater harvesting.

In terms of the theoretical framework for the project, the capability approach has been helpful as an entry point to ideas behind emotions and hope. It is a framework that gives primacy to ideas of freedom and opportunity rather than the distribution of material goods. Development economists working within the capability approach framework have identified what they call 'missing dimensions' when they evaluate poverty and development. Five missing dimensions are included in their standard poverty assessments: empowerment, physical safety, ability to go without shame, psychological well-being and the quality of work. Human emotion is implicit in all five of the missing dimensions. Hope is proposed as a further missing dimension and is possibly a clue for measuring success in implementing IWRM projects. Manifestations of the effective lives of people have been largely sidelined in development discourses.

Pro-poor policy and ideals of social justice are not only about the distribution of material goods and water. It is necessary to be vigilant of the emotional context that might be corrosive to social justice and even reinstate disadvantage. More attention is being paid to being inclusive, although in technical discourses there is a tendency towards isomorphism in constructing our water resource institutions at multiple scales and very little attention is paid to the emotional life of water users. Technical discourses do not focus on hope as a proxy for success. It is not easy to fit in human emotion into a quintessential technological world where development and aid is usually limited to materiality. However, the study of emotions has mainly been materialist. Emotions have been seen as constituted as biological phenomena or psychological facts that are not systematically linked to power and social structure, advantage and disadvantage. They are usually seen to be private and personal rather than fitting into public space, and are preferably invisible as they might cause embarrassment.

In the conversation with Gogo we see individuals who come together regularly in public spaces where they feel comfortable. These are not controlled, formal spaces of water committees and WRM organisations. As a farmer, Gogo is invited to participate in water committees but does not have time to sit and talk. Meetings are for men and those who like to talk. The assumption is made that these public places are desirable, but perhaps they are a space where people have feelings of disempowerment of hopelessness and where no attention is paid to how people feel. Certainly within the formal institutional spaces about the control, management and use of water, intangible goods (emotions) are framed as unsuitable topics.

As Gogo talks, there is a sense of pride, self-esteem and hope despite suffering and multiple deprivations. The presence of resourcefulness prompts a reassessment of poverty. When intangible goods such as hope are brought into the equation, the poverty assessment might change. If one is not deprived in terms of tangible goods one might still have multiple deprivations. Unlike taps, water pumps and dams, intangible goods cannot be distributed as they are a function of social relations and processes. Emotion is defined as a statement about a person's relationship with the world and problems in that relationship. The most commonly occurring emotions can be seen as markers of tension or fulfilment.

'When they look at us they think we are playing. But when they see the results they will be motivated to get involved, just like now, we have 60 children working in our garden. They come and help us with the work that we do. The only thing that will stop us is to be sick or die. .... They taught us to water the plot with the grass on top so that the water doesn't evaporate quickly.... We are not finished yet, we used to plough in one line but now we have a way that helps you reap more. We are going to sell a lot. You are going to see cars coming to buy. If this water arrives, you should come back and see what we are doing. The crates will be filled with vegetables'. This extract from the conversation with

Gogo reflects the idea of opportunity and freedom linked to hope. Theoretically, it is not easy to take on emotions such as hope.

A programme on water and food is looking at rain-fed agriculture and small scale water infrastructure (SWI) and several presentations in the session on water and society at the 13<sup>th</sup> WaterNet Symposium in November 2012 were on SWIs, dysfunctional boreholes and wetlands. Many reasons were given for the boreholes being dysfunctional, but no reference was made to emotions or hope in particular. If hope was used as a measure of the success of SWIs the results would be interesting. The hypothesis is that there will be linkages between hope and success in WRM. A current WRC project is looking at this topic.

With hope, water users who use boreholes will not allow them to break and the many disconnects in WRM institutions, the struggle to narrow the gap between policy and its manifestation on the ground will become part of the struggle for success. For this reason it is worth circumscribing this attribute and many others that are part of the dashboard of emotions.

The ideal of hope is not naïve. Philosophers through the ages have used hope to show that man struggles for something better. Looking at people's emotions may answer the question about what makes people do what they do.

### Discussion

**Mr Mbangi Nephumbada (DWA):** Scientists, technocrats and bureaucrats should take heed of this important aspect. How much of this project applies to indigenous knowledge systems (not culture) (IKS) in WRM?

**Ms Phoebe Luwum (African Ministers' Council on Water, AMCOW):** This presentation is about hope as an indicator of good governance, but what about changing the instruments and tools used to design and implement programmes to include emotions?

**Mr Jeremiah Mutamba (Trans Caledon Tunnel Authority (TCTA):** The current approach uses tangible goods to measure progress. Are you suggesting that intangible goods should also be an instrument to measure progress or success? I believe that interventions will bring hope.

**Prof. Jacqueline Goldin (University of the Western Cape, UWC):** The question on IKS was thought provoking but difficult to answer.

Once performance indicators are in place then system can be put in place to ensure that goals are achieved. If emotions are viewed as performance indicators and given equal importance with tangible indicators then the emotions of people in institutions would be measured.

The point with Gogo's story was to show that although rainwater harvesting dams were built that provided water for vegetables, Gogo and the other women involved in the project had high manifestations of hope. The success of the rainwater harvesting projects should be measured not only by the provision of water but also by the emotional manifestations of those who use the water from the dams.

**Ms Sabine Stuart-Hill (UKZN):** Referring to the implementation cycle in my presentation earlier, perhaps it is the feedback phase that is important. Making space for feedback in the government and governance system will motivate people to act and have hope that things will change for the better.

**Prof. Jacqueline Goldin (UWC):** Prometheus is the symbol of struggle as well as the symbol of emancipation. In the struggle to establish water institutions, if the struggle itself is recognised and becomes a positive experience, it would contribute to the emancipatory journey. People need to have hope in order to struggle.

#### **SESSION 4: MULTI-LEVEL WATER GOVERNANCE AND ADAPTIVE MANAGEMENT / THE ROLE OF INTERNATIONAL PRESCRIPTION OF WATER GOVERNANCE**

**Chair: Dr H Biggs (SANParks)**

**Mr Andrew Tanner, Aurecon SA – Keynote address: Foundations for cooperative governance of shared river basins and the contribution of the PRIMA IWRM Strategies and Plans project in the Incomati and Maputo Shared River Basins (A Tanner and J Beumer)**

Mr Tanner, a professional engineer involved with several trans-boundary projects, presented the Progressive Realisation of Inco-Maputo Agreement (PRIMA), focusing on:

- Foundations for co-operative governance in shared river basins
- The PRIMA programme and the Implementation activities and action plans (IAAP) 3 Integrated Water Resource Management (IWRM) project
- PRIMA achievements in providing foundations for effective cooperative governance.

The question was posed of what was required for effective cooperative governance of shared river basins, what the legislative environment would allow, and whether a highly regulated directive was needed, such as the European Union (EU) water framework directive. He provided Southern African Development Community (SADC) examples from the Orange-Senqu River Commission (ORASECOM), Limpopo Water Course Commission (LIMCOM) and Tripartite Permanent Technical Committee (TPTC).

The key building blocks for the foundation of cooperative governance of shared river basins include:

- Basic information about the water resources, natural environment and water-using activities in the basin that is shared, agreed and trusted by the parties.
- Trust, mutual understanding and acceptance of each country's objectives for socio-economic development.
- A vision and objectives for the river basin that is shared by the governments and populations of the riparian states. The objectives must be measurable and achievable. Strategies must be in place for achieving the objectives, as well as plans for implementing the strategies.
- Agreed water resource development and management interventions and economic development scenarios, supported by IWRM strategies and plans for each river basin

Political level support in all the riparian countries is essential, including recognition of the importance of cooperative governance in shared river basins and of the agreed role of the coordinating bodies (TPTC, commissions, river basin organisations), which must be adequately resourced and proactive; recognition that it requires a different approach from national water management; commitment to cooperative governance through appropriate national decisions; commitment of adequate resources within each country, at various levels, to the TPTC, RBOs and commissions; continuity at official and political levels; and objectives that drive water demand, namely, water for quality of life, and water for economic development.

The PRIMA programme is financed by the government of the Netherlands and addresses the Incomati and Maputo river basins, both of which are shared by South Africa, Swaziland and Mozambique. The Umbeluzi basin (also shared by the same three countries) is not directly included in the PRIMA effort. The primary objective of the PRIMA is to create one or more comprehensive agreements to replace the interim IncoMaputo Agreement that dates from 2002.

The PRIMA programme has two phases, with the following objectives:

- Phase 1: Provide a sound baseline of policy, legal and technical information, agreed by the three countries, to support drafting the Comprehensive Agreement.
- Phase 2: Fill gaps identified in Phase 1 and move to implementation.

Phase 1 is made up of the following implementation activities and action plans:

- IAAP 1: Shared watercourse institutions
- IAAP 2: National water policies and legislation
- IAAP 3: Integrated water resource management (IWRM)
- IAAP 4: Water supply to Maputo City and environs

- IAAP 5: Disaster/Risk management
- IAAP 6: Trans-boundary water quality impacts
- IAAP 7: Exchange of and access to information
- IAAP 8: Capacity and confidence building
- IAAP 9: Stakeholder participation and communication
- IAAP 10: System operating rules
- IAAP 11: Preparation of the comprehensive agreements
- IAAP 12: Management of the PRIMA programme.

The overall objective of the IAAP 3: IWRM is to provide the technical information required for IWRM to enable Mozambique, Swaziland and South Africa to improve their joint management of the river basins, and to complete and implement the envisaged comprehensive agreement for the protection and sustainable utilisation of the water resources of the Incomati and Maputo water courses.

The specific objective of the IAAP 3: IWRM is to develop IWRM strategies and plans for the Incomati and Maputo river basins to enable the three countries to improve the joint management of the basins.

IAAP 3 studied and provided plans for the protection of ecosystems and the environment; the sustainable utilisation of the basin's water resources; meeting future water requirements; and managing and developing the resource.

The recently completed project to develop IWRM strategies and plans made the following contributions to the effective governance of the river basins:

- The baseline information from each basin was integrated information to give agreed data sets and maps, including hydrology, land use, water use, demographics, environmental status, economic development and water resource infrastructure developments and plans.
- The baseline and scoping reports led officials of the three countries to a shared understanding of the present status and the challenges and limitations that the available resource places on future developments.
- The integrated development scenarios, covering current and future environmental, socio-economic and water resources requirements provided an agreed and shared view and achievable plans for the future of the three countries.

The programme has succeeded in compiling basic information that is shared, agreed and trusted by the parties on topics including water resource quantity and quality; surface water and groundwater; the natural environment; and water use.

### **IAAP 3: IWRM**

It is important to ensure effective alignment between national water resources planning, national and sub-national economic development plans, national poverty alleviation plans and other objectives and programmes of the basin states.

The goal is to develop IWRM strategies and plans for each basin as homogeneous management units, now and for the future, to enable the countries to manage and develop the water resources of basins, and to strike a balance between the use of resources for economic and social development; conservation of the resource to sustain its functions; and the promotion of social equity, environmental sustainability and economic efficiency.

### **Maputo basin**

Mr Tanner outlined the processes for developing IWRM plans for phases 1 and 2, and presented a map detailing the proposed water management sub-catchments for the Maputo Basin. IAAP 3 IWRM planning for sustainable utilisation entails the development of management options and development options. The management options involve the improvement of water conservation and demand management, the removal of alien vegetation, the management of water quality and prevention of pollution - water quality status and management (IAAP 6).

## **Incomati basin**

Mr Tanner presented a map showing the proposed water management sub-catchments for the Incomati Basin. The overall objectives for the IAAP 3: IWRM project include IWRM strategies for environmental assessment, social assessment, and the consideration of economic benefits with respect to alternatives for the basin; IWRM plans; an evaluation of institutional responsibilities (IAAP 1) followed by institutional development; and training (IAAP 8).

The achievements of the programme include agreement at official level on the environmental water requirements (which presupposes agreed environmental status), economic development scenarios, management interventions and water resource development interventions. It is less clear how much has been agreed at a political level.

Another achievement has been a vision and objectives for the river basin that is shared by the governments and populations of the riparian countries, involving strategies for achieving the objectives, plans for implementing the strategies and agreed IWRM strategies and plans for each river basin.

Foundations have been laid for effective cooperative governance of shared river basins through the commitment of the parties to cooperative governance; appropriate national decisions; and the commitment of resources within each country at various levels, and to the TPTC, RBOs and the Commission.

Mr Tanner acknowledged the members of the TPTC, the task group of the TPTC, the project steering committee, PRIMA management, the sponsors from the Netherlands, the water institutions in the three countries and staff who participated, stakeholders from all three countries and the consultants who worked on PRIMA.

Mr Tanner concluded by saying that the PRIMA IAAP 3 project for the development of IWRM strategies and plans for the Incomati and Maputo river basins has been an important step towards effective governance of the water resources of the basins, but substantial additional work is required.

## **Dr Samantha Adey, Breede-Overberg CMA – The role of water user associations in viable decentralisation for adaptive management: Lessons learned from the Breede water management area**

Dr Adey's presentation focused on the Central Breede River and its associated catchments.

The Breede-Overberg Catchment Management Agency (BOCMA) is located in the Western Cape Province, and the Breede Water Management Area lies to the East of Cape Town. The boundary of the BOCMA stretches from North of Ceres, to beyond Gordon's Bay in the South West, and East along the coast, including Cape Agulhas to Witsand in the West.

South Africa's adoption of a revolutionary National Water Act (NWA) in 1998 (Act 36) formed the basis of Dr Adey's presentation. The Act makes provision for two rights to water: basic human needs and the environment. It also makes provision for the decentralisation of water management through the establishment of catchment management agencies (CMAs). CMAs in turn establish water user associations (WUAs) in the smaller catchment areas to facilitate the localised management of the water resource.

WUAs are the fourth tier in the water management structure, and functions are delegated down to the local level of the WUA from DWA at both national and regional levels and CMAs.

WUAs are public law bodies that undertake functions of a public interest nature. WUAs are free within the law to make their own decisions. Within a WUA, functions are delegated to the local/catchment level and decentralisation does occur.

The roles and responsibilities of WUAs include water resource protection, pollution prevention and conservation; self-regulation of local water use activities; monitoring of water resource status and use; mechanism whereby water users are directly involved in management and decision-making;

responsibility for government water schemes; and billing agent services to water users. WUAs are ideally positioned for decentralised management of water resources, and are therefore, in theory, also structured to facilitate adaptive management.

Decentralisation is viable on condition that DWA functions have been delegated to WUAs through CMAs, and that WUAs operate at a local level and include all sectors of water users in a given catchment.

Water management institutions face a number of technical and economic challenges. For the Breede Water Management Association (WMA), these include challenges in the marketing of local produce (mainly wine, table grapes and stone fruit); adaptation to climate change, the potential prospect of less water being available over time and the increasing severity of flood events in the region; the repair and maintenance of infrastructure (much of which was established in the 1950s); economic sustainability.

Key questions to be addressed with respect to the role of WUAs are whether decentralisation is effective, and what should be done to ensure that it becomes more effective.

The core to the effectiveness of decentralisation is adaptive management. The key institutional factors related to adaptive management are voluntary compliance, tradition and mental models, administrative responsibility and overcoming bureaucratic inertia, conflict resolution mechanisms, socio-political economy, and the acquisition of information.

In terms of the ability of the WUAs to respond to challenges, there are a number of institutional factors that need to be considered. Voluntary compliance is a major factor in the Breede River region, which falls into the desert Karoo biome, so the allocation of additional water is a contentious issue, particularly as the environment also needs to be considered.

Tradition in the area is very strong as many families have farmed in the region since the 1700s and this is in turn linked to mental models, where there has always been sufficient water and riparian rights to water. This has changed with the new water act, where riparian rights have fallen away, and the environmental requirements must now be met before any additional water is allocated.

Although the WUAs are considered to be largely independent water management institutions, they are still largely bound by administrative requirements from the 'parent' agencies, these being the CMA and the DWA. Unfortunately bureaucratic inertia remains a problem within these institutions, where an application for water use authorisation can take between two and seven years. This has a severe impact on the ability of the WUA to effectively manage the water resource.

With any scarce resource, conflict management is key to issue resolution, and this can be a challenge in WUAs where the management has historically been concerned with the physical supply of water and not the accompanying social issues.

The acquisition of information by the WUA from parent organisations is time-consuming and not always effective.

The NWA requires that 50% of the management committee of the WUA be composed of women or other previously disadvantaged groups. In some areas this poses a problem for WUAs and there is insufficient land reform in the area to fulfil this obligation.

The situation with respect to water resource management in the Breede-Overberg water management area can be summarised as follows:

- Management of the resource is effective.
- Regulation and control processes are well-established and well understood.
- Collective decision-making is not as effective; processes that enable a supportive environment are not established or well understood.
- Institutional processes have been decentralised with the delegated functions.

Key institutional challenges facing WUAs include:

- Structures and processes within the CMA do not readily support effective decentralisation and adaptive management.
- The CMA currently practices only regulatory control of the WUA.
- The CMA acts largely in isolation regarding the planning and management of the water resource.

The following steps are proposed for the way forward:

- The CMA should adopt participatory and adaptive management processes in addition to regulatory processes.
- The CMA must drive and engage in inter-sectoral planning and management of the water resource.

### **Discussion**

**Mr Matomi Mahasha (DWA):** (1) What is the role of the BOCMA in terms of participatory management, for example, how does the BOCMA assist historically disadvantaged communities to understand how the water sector operates? (2) Many water associations are struggling to involve women. Does BOCMA help to bring women into the water sector?

**Dr Samantha Adey (BOCMA):** (1) BOCMA considers raising awareness amongst communities to be critical. There are water forums and awareness weeks held at schools, for the general public, municipalities and other organisations. (2) Yes, BOCMA works towards raising awareness and increasing capacity for women. Several projects in Breede area involve women. One project group won the award 'Women and Water 2011'. BOCMA is definitely making inroads with regard to the involvement of women.

**Mr Brian Jackson (Inkomati CMA):** Capacity awareness, gender and equity issues should be included in the constitutions of WUAs. It is the responsibility of the WUAs as well as the CMAs to address those issues. CMA budgets are small; the redress initiative will require substantial support and funding.

**Dr Samantha Adey:** BOCMA has a capacity building programme in its constitution and business plan.

**Mr Balarabe Bello (Lake Chad Basin Committee):** What is the difference between WUAs and water boards?

**Dr Samantha Adey:** WUAs operate on a much smaller scale (a local catchment level) than water boards.

**Mr Musa Masilela (Swaziland Water and Agricultural Development Enterprise):** (1) What is your experience with regard to billing users? Do you have any challenges and success stories to share with us? (2) In the future, will the development of WUAs be successful and will the establishment process be faster than it is currently?

**Dr Samantha Adey:** (1) For the central Breede WUA, billing is not an issue; we have a good relationship with them. In terms of establishing WUAs, most of ours were quick processes. Where there are no irrigation boards, motivating people can be difficult.

**Prof. Kevin Rogers, University of the Witwatersrand Centre for Water in the Environment (CWE) – Re-thinking decision-making across the policy/action interface: fostering complexity thinking in action research for change in complex social-ecological systems (Kevin Rogers, Rebecca Luton, Harry Biggs, Reinette (Oonsie) Biggs, Sonja Blignaut, Aiden Choles, Carolyn Palmer and Pius Tangwe)**

The presentation was given by Prof. Rogers and was subtitled: 'Choosing your reality'. Prof. Rogers reflected that Advocate de Lange (Chair of the Portfolio Committee on Water and Environmental Affairs) had a different perception of reality than that of the National Planning Commission. He encouraged attendees to give some thought as to which reality they operated under at the moment.

Prof. Rogers explained that policy planning and policy implementation had too often been seen as separate processes, and should at least be treated as overlapping. In reality the transition from policy to implementation was interlinked and iterative.

Our understanding of the world is changing fast, fundamentally and with major consequences for our approaches to turning IWRM (integrated water resource management) policy into action. The most important change is the emergence of complexity thinking into a global society dominated by a socially constructed habit of reductionist/determinist thinking. The two paradigms present entirely different pictures of reality, especially at the interdisciplinary and systems levels of decision-making. The reductionist or determinist searches 'objectively' for single knowable and linear cause/effect relationships, which supports the notion that we can get decisions and policy right. The reductionist habit may be summarised as follows:

- Cause and effect are linear and traceable.
- The system is divisible into parts that can be studied or solved independently.
- The parts can be categorised into like types to reduce complexity through generalisation.
- The parts and system are ultimately knowable if we have the right information.
- Individual tasks, decisions and solutions can be isolated and completed.

Current thinking predominantly reflects a 'top-down' reality where representative governance determines the instruments, regulation and implementation for the stakeholder. The desired future scenario is one that is driven by stakeholder needs (bottom-up).

A complexity view, however, emphasises that one is working with imperfect knowledge in a perception and value-laden environment where non-linear, context-dependent interactions lead to interactions lead to highly uncertain outcomes that are not ultimately knowable in space or time. Reality is complex, and many factors affect the trajectory to the desired 'state', including values, and social, technical, economic, environmental and political factors. These factors are highly variable and/or uncertain. The emerging complexity perspective has the following characteristics:

- Non-linear feedback in a causal thicket, in which it is difficult to trace a sequence.
- The interactions between the parts are more important than the parts themselves.
- The variability between parts is valued above the average and generalisation.
- Neither the parts nor the system are ultimately knowable, and the world is full of surprises.
- The outcome of any one task affects the others. There is no definitive end to decisions or solutions.

Conversely, in terms of the 'complexity reality', there are multiple legitimate ways of framing each question or problem. There are no universally 'right' answers, but there are multiple legitimate solutions to any one problem.

Table 1 illustrates the continuum from complete certainty to complete uncertainty.

**Table 1: The continuum from complete certainty to complete uncertainty**

<b>Complete certainty</b>				<b>Complete uncertainty</b>
	Simple risks	Uncertain risks	Complex risks	Systemic risks
<b>Reductionism</b>	<b>Known knowns</b>	<b>Unknown knowns</b>	<b>Known unknowns</b>	<b>Unknown unknowns</b>
Objective expert scientists	Directives	Classic adaptive management	Causal thickets Stakeholder values	
Frequentist statistics		Models	<b>Socially robust decision-making</b>	

The vast majority of actors in IWRM have very little understanding of complexity and its implications for decision-making. A major challenge is to help people to unlearn the long imposed and habitual use of reductionist/determinist problem solving. Only once this is achieved can the actors begin to adopt a

new complexity style of thinking and decision-making that could better lead to the social-ecological transformation in the water sector that is demanded by policy. We develop an integrated model of how learning by stakeholders, including scientists and managers, can lead to a transformation in the world view to include the use of complexity thinking in decision-making. Critical to this learning process is the acquisition of new complexity orientated habits-of-mind that must complement, or even replace, entrenched reductionist/determinist ideas.

The new approach requires participative governance, characterised by networking, empowerment, collective action and integrated learning, and acting in service to society. Typically there is management of a common pool of resources and the goal of reaching a shared future. A shared rationality about what is 'real' is imperative for decision-making.

**Dr Maud Orne-Gliemann, University of Pretoria – Water user associations in South Africa: evolving interpretations and consequences on newly established associations**

Chapter 8 of the NWA contains the following pieces of text:

- "Water user associations [...] are in effect co-operative associations of individual water users who wish to undertake water-related activities for their mutual benefit."
- "The Minister establishes and disestablishes water user associations."
- "The Minister may exercise control over them by giving them directives or by temporarily taking over their functions under particular circumstances."

Dr Orne-Gliemann explained that two perceptions were at odds in the NWA. On the one hand, 'cooperative associations' was a term with a long tradition, pertaining to users' control and users' interests; in the first-generation WUAs, a scheme was equivalent to a WUA. On the other hand, 'third tier institution' referred to a top-down creation with control from the top, both for the common good and in the state's interests. Second- and third-generation WUAs involve multiple users, and semi-regional WUAs may be established.

There was an unresolved tension embedded in integrated water resource management. From 2000, there had been a shift in favour of a top-down approach, which was becoming more noticeable in official documents, apparent in such phrases as 'common good', and 'interest of the general public even those that are not participants in the WUA'.

While official discourse still referred to 'cooperative associations', in practice the NWA proposed wall-to-wall coverage and compulsory WUA membership. The ideological reasons for this approach include national redemption. In this context, WUAs are considered as mediums of equity, solidarity and social cohesion; and resource poor farmers, commercial farmers and farm workers work together for the benefit of all. Another reason for this approach is national sacrifice, and the notion of the necessary involvement and effort of all to fulfil development and reconstruction objectives. Since 1994, the task at hand should not only be the responsibility of the state.

The structural reasons for this approach included delays in the creation of CMAs, which have left an institutional void. In terms of the NWA, a CMA should be a water management institution par excellence.

WUAs are at the bottom of the hierarchy made up of the Ministry of Water Affairs, Department of Water Affairs, DWA regional offices, catchment management agencies and WUAs.

The consequences of a top-down definition of WUAs have been to make WUA membership compulsory and to expect wall-to-wall coverage plans for WUA-projects. In this context, the creative of the WUA becomes a passive act; participation in the WUA tends to become merely instrumental and to be characterised by consultation rather than action.

Dr Orne-Gliemann cited some examples to illustrate her argument of the that the present approach tends to make WUAs passive. The chairperson of the Sekhukhune WUA is on record as a saying: 'I am the Chairperson. I just don't know what I am the Chairperson of.' The Nzhelele WUA, which was gazetted in 2005, had not developed a business plan or held new elections by 2011. Issues of control as opposed to the desire for independence have come to the fore in the example of the Mpumalanga former irrigation board.

Dr Orne-Gliemann concluded by considering some of the needs identified by small-scale users themselves. The importance of a choice was emphasised. It was noted that state institutions and cooperative associations have different logics and conditions of creation, as well as different logics of legitimacy. The end goal is to balance the department's needs, public good and water users' sense of control. However, the feeling of control over water management is strongly lacking in small irrigation schemes.

### **Discussion**

**Prof Larry Swatuk (University of Waterloo, Canada):** (1) The presentation contained much that was negative. Is there anything positive that we can build on? (2) If I were to say that the disestablishment of the irrigation boards is to blame, what would your response be?

**Dr Maud Orne-Gliemann (University of Pretoria):** (1) Water associations are for small-scale irrigation schemes. As to whether water associations have a wider political existence, my answer is no. In the new forest in Mpumalanga, there are groups that call themselves water associations, manage their water resources and have management committees. That is positive, but those groups don't appear on the departmental statistics. In Nzhelele, management happens at a scheme level; the concept of water associations does not exist. (2) I have little experience with regard to the transformation of the irrigation boards, but my impression was that most were doing well, and had sufficient previous experience to meet and build on the requirements of the department. My experience is limited though and pertains to the Western Cape.

**Mr Sibongaye Mkhathwa (KOBWA):** (1) I feel that your study is superficial; the research does not touch on equity and how it can be addressed. People do not have the capacity to participate in WUAs, and thought needs to be given as to how to provide that capacity. (2) Your view of water associations is not balanced. Most of the participants have been farmers all their lives and have a high degree of control over the associations. The emerging farmers own less land and don't own the means of production. Even Hulleths is controlled by established farmers. For people to participate, empowerment is essential.

**Dr Maud Orne-Gliemann:** (1) My study was specifically on small-scale farmers, but I recognise that there are other issues. (2) In terms of empowerment, I disagree - you cannot force people to participate. I believe that water associations should be small cooperative institutions; not state institutions.

**Dr Barbara Tapela, Institute for Poverty, Land and Agrarian Studies (PLAAS), University of the Western Cape – Water governance and traditional leadership in South Africa: decentralisation options**

The presentation included a video showing women carrying heavy water drums over rough ground for long distances to illustrate the difficulties experienced by many South Africans accessing water.

For many vulnerable women and men in rural and urban settings, water insecurity is a social construct of 'resource management', which is determined by political, economic and social power dynamics underpinning the institutions that provide structure to social relations, access to the bases of social power and productive wealth, and stability to the organisation of human societies.

The political and economic contexts are therefore critical.

The socio-institutional landscape where water governance reforms are implemented "is in fact the result of a constantly evolving political game, which reflects the current distribution of power between local actors and their struggle to control the natural, institutional, financial and political resources...In this political battle for power, the poorest and most marginalised are often the losers" (Bene et al 2009).

Efforts to improve water governance in 'traditional communities' need to be based on "clear understandings of the range and complexity of existing institutions that shape water use in rural communities and households" (Meinzen-Dick & Nkoya 2005).

There are many issues to be taken into account, including protracted failure by formal institutions to enhance water security and livelihoods in marginalised rural communities; concerns about possible resilience failure; the search for effective linkages between the micro-levels of water use and the meso and macro levels of water governance; and traditional leadership roles in water governance.

Kooiman (2008) emphasises the importance of governance systems (state, markets and civil society); the systems to be governed (social, cultural, political, economic, ecological) and governing interactions (policy, participation, impacts, pressures.)

Decentralisation involves the recognition of traditional leadership, custodianship and responsibility over cultures, indigenous knowledge and customary rules pertaining to land and related resources. Decentralisation calls for the actualisation of legal pluralism and for devolution to the 'lowest possible level'.

The calls for decentralisation resonate with the South African government's commitment to ensuring that traditional leadership plays a developmental role in society as a 'partner'. The calls also resonate with the developmental logic of decentralisation, which assumes that local representation is most effective since it is closest and most aware of issues at the grassroots level.

The precedence of Roman-Dutch law over African customary law has led to water reforms that enshrine Euro-centrist notions of 'property rights' associated with European traditions on land (Meinzen-Dick & Nkoya 2005). However, there is evidence that in many African rural community contexts, water rights can derive from many sources besides government.

While gaps in South African institutional arrangements for cooperative governance and democracy have contributed to water insecurity in rural communities, questions have been raised about the prospects of a decentralised and democratised water governance framework that includes traditional leadership as a key role player.

Visions of a significant role for traditional leadership in South Africa need to be tempered with the realisation that the hereditary basis of traditional rule, as well as the historical co-option of much of traditional leaders into the oppressive apartheid system, renders such leadership irreconcilable with democratic values of the South African Constitution (Ntsebeza 2002a, b). On the other hand, emerging evidence shows that in some rural contexts, traditional leadership enjoys a relatively higher degree of legitimacy and/or influence with regard to natural resources governance than newer elected local leadership, and is, to an extent, able to fill the void created by inefficient and ineffective governance structures (e.g. Makuleke).

In many 'traditional communities', local people often devise their own strategies for coping with water insecurity independent of traditional leadership. On a day-to-day basis, traditional leadership is often more concerned with land issues rather than water services issues. However, traditional leadership plays key roles in water-related dispute resolution, cultural rituals and disaster management.

The challenges to traditional leadership include capacity constraints, the lack of clear access rights and appropriation rules at the hand-over of water infrastructure developed by the state and other agencies, the open access scenario, and the emergence of common pool resources.

The reconciliation of customary law with the Constitutional Bill of Rights (e.g. Tete case) presents dilemmas. There is a tension between the custodianship responsibilities of traditional leadership and local economic development objectives (e.g. Mutshindudi river sand abstraction).

Gender disempowerment within WUAs mainly affects vulnerable rural women (e.g. Pongola dam).

The demands of water resource management require the upscaling of the traditional leadership focus on local the traditional community to a broader catchment-wide focus, including transboundary.

Traditional leadership and governance need to remain resilient against the onslaught of aggressive penetration of capital into rural communities (e.g. Revitalisation of Smallholder Irrigation Schemes [RESIS] in Limpopo province).

There is a need to genuinely overcome established attitudes, embrace democratic principles and re-build trust.

Ultimately, the justification of traditional leadership roles in decentralised and democratised water institutions will be reckoned according to their 'legitimacy', 'accountability', 'effectiveness', 'preparedness' and 'robustness'.

Legitimacy, in resource management, derives more strongly from the extent to which water services institutions pursue the interests of local constituencies than from mere accession into governance structures by democratically-elected representatives and traditional leaders.

Robustness refers to institutional capacity to adapt to changing contexts by timeously adopting innovative mechanisms to strengthen the 'alignment' between water services demand and supply.

It is not necessarily a supply-side relationship whereby municipalities and national and provincial government perpetually strive to meet demand, while rural water users continually expect their demands to be met, even as water availability decreases.

Alignment implies a dual-sided relationship whereby *both* supply-side and demand-side options are reconciled, through constructive 'engagement' between, on the one hand, local communities and households and, on the other hand, planning institutions.

## **SESSION 5: APPLICABLE WATER REGULATION FOR ENHANCED ACCOUNTABILITY**

**Chair: Ms Deborah Mochotlhi (DWA Chief Director: Policy and Regulation)**

Ms Deborah Mochotlhi (DWA Chief Director: Policy and Regulation) opened the session and welcomed everyone. She expressed the hope that the deliberations would inform the way forward. The inputs would inform the legislative review of the water sector, the review of the pricing strategy and economic regulation, and help shape the chapter on regulation in the National Water Resource Strategy.

**Mr Martin Ginster, North-West University and Sasol Shared Services – Keynote address: Putting an end to what is 'not a crime': observations on unlawful water abstraction in the Vaal River system (Martin Ginster and Johann Tempelhoff)**

The presentation was given by Martin Ginster. He opened with quotations demonstrating the contestation over the unlawful use of water. There is a broadly held view among water users that stealing water is not a serious crime. The farming sector tends to emphasise that water that was unlawfully used has nevertheless contributed to food production, job creation and economic welfare in rural areas; however, DWA points out that water used unlawfully is theft, as the water has already been paid for by other users:

Although the unlawful usage of surplus water should not be condoned, it should be noted that it was used productively, contributing to food production, job creation and economic welfare in rural areas. (J Moller AgriSA)

The issue is quite simple: the water that is being used unlawfully has already been paid for by other users, which makes it plain theft. (S Rademeyer, DWA)

The Vaal river is a transboundary system. The Vaal system is home to about 45% of the South African population and generates approximately 60% of gross domestic product (GDP). It is not located on a river, and water is assured to the region through the introduction of storage dams and interbasin transfer schemes, in order to move water from where it is available to where it is needed.

The total annual water demand in the Vaal system is 2 900 million m<sup>3</sup>. The usage is broken down as follows between sectors:

- Lawful irrigation: 35%
- Domestic use: 25%
- Domestic losses: 17%

- Eskom electricity utility: 13%
- Unlawful irrigation: 6%
- Sasol fuel and chemical producer: 4%.

Sasol supports research aimed at water security in the catchment. There is a general view that it would be in the best interests of the catchment to deal with the 6% unlawful use and as well as the significant domestic losses. Sasol has three water conservation partnerships with municipalities to free up water to the benefit of the catchment.

Mr Ginster commended DWA for the studies they had commissioned on the Vaal river system as well as the discipline to continue with the six-monthly Vaal River Strategy Steering Committee meetings.

The Vaal river system can supply a total yield of 2 900 m<sup>3</sup> per annum. Figure 1 shows that the demand for water is projected to exceed the supply capability within the next few years due to population growth (the most recent census confirmed that the population of Gauteng had grown by about a third in the last decade). The figure shows the projected demand in terms of two different scenarios, namely with and without efforts at water conservation and water demand management. Above average rainfall experienced over the last few years has masked the supply imbalance in the Vaal river system.

The Vaal River Strategy intends to reduce the demand for water through efforts at water conservation and water demand management, address unlawful water use, and introduce new water to the system through the second phase of the Lesotho Highlands Water Scheme.

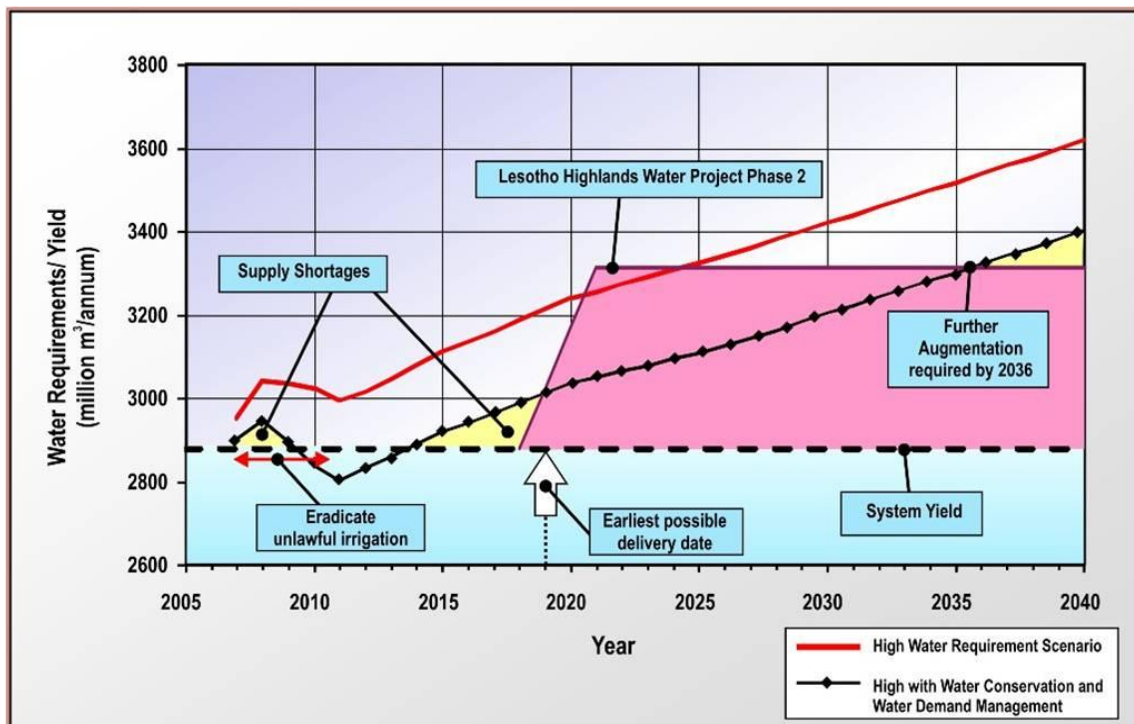


Figure 1: Yield graph for the Vaal river system

The problem of addressing the unlawful use of water is compounded by the complex administrative process governed by the National Water Act that is used to determine the lawfulness (or otherwise) of a water use activity. The transitional arrangements in place in order to move from the previous Water Act (1956) to the new National Water Act (1998) have been a key factor. All lawful entitlements under the old act were transferred on the understanding that a process of registration, validation and verification of water use would be undertaken to determine the lawfulness of water use. The first phase was the registration of water use, which was done through notice in the *Government Gazette*, in which DWA asked farmers to indicate how much water they were using. This phase did not attempt to determine the lawfulness of water use. During this process, farmers tended to over-estimate the

amount of water they were using through fear of losing the entitlement if DWA were to enforce lower water-use volumes. The registration process therefore indicated a far greater area to be under irrigation than could be served by the available water. In the Axle and Liebenbergsvlei catchment, a survey in 2002 showed the hectares under irrigation and the water abstraction to be less than half what farmers had declared during the initial registration process in 2001. In the initial registration, farmers had declared 7 562 hectares under irrigation, compared with 3 434 found in the survey; and farmers had declared water abstraction on 43 306 876 m<sup>3</sup>, compared with 19 254 137 m<sup>3</sup> found in the survey.

The process of applying for the verification of water use was based on pre-validated volumes. The onus was on the department to estimate the volumes of water that farmer were using. Verification followed a process in which DWA informed the farmer of the department's best estimate of the volumes of water used, and asked the farmer to demonstrate how much of this amount was being used lawfully. The desired outcome was to confirm the lawful entitlement to water, which was the first step in the formal licensing process.

The verification of water use is a formal process described in Section 35 of the National Water Act. The complexity of confirming the lawfulness of water use has delayed the process. The process offers an opportunity for the water user to make recommendations regarding the validation findings, but there are several loopholes that can be used by water users to significantly delay the finalisation of the process.

A multidisciplinary research group conducted research in the Axle and Liebenbergsvlei catchment during 2009. The approach entailed semi-structured (qualitative) group and individual interviews with farmers (14), authorities (5) and others (5). An electronic archive was constructed with various checks and balances to guide the early phases of reporting. The sources were protected using a coded system to protect the identity of respondents. Feedback sessions were arranged to communicate the findings to the respondents.

What the research group heard the irrigation farmers say can be summarised as follows:

- Communication with DWA is virtually impossible.
- The only way to get any answer from DWA is to make use of a lawyer, and that is expensive.
- The department does not inform the farmers what exactly is needed.
- Lack of clarity on the part of DWA about water rights causes confusion.
- DWA does not seem to know what the problem really is.

What the research group heard the authorities say can be summarised as follows:

- Water security to Gauteng is being compromised, and unlawful irrigation has to be stopped.
- What they are doing is simply stealing water.
- These farmers also now have the advantage of a constant flow of water, which gives them the advantage over other dry-land farmers, who get pushed out of the market as a result of this unlawful practice.
- This water has already been paid for by urban and industrial users.

Since the research in 2009, there seems to have been an improvement in taking the issue of unlawful water use forward. Awareness and communication have received greater prominence. There has been progress with the process of validation and verification: as at October 2012, 30% of verification was complete, 50% was in process, and 20% had not yet started. Regulation is under development as a prerequisite for action against partially unlawful water users. The initial focus of compliance monitoring and enforcement has been on blatant unlawful users.

Over the 14-year period since the promulgation of the National Water Act in 1998, an estimated 50% of the lawfulness of water use has been determined. This process needs to be accelerated. The successes achieved to date deserve to be celebrated. The approach should be to look beyond measurements; focus and prioritise; support inclusive, participatory action; consider all views; and manage water for an equitable and sustainable future, which is the aim of the second National Water Resource Strategy.

### **Ms Samantha Braid, Aurecon SA – The need to ensure accountability of water resource regulators**

The enforced regulation of environmental legislation, both the National Environmental Management Act (NEMA) (Act 107 of 1998) and the National Water Act (NWA) (Act 36 of 1998), has become a reality in recent years. It is therefore pertinent to ask how accountable enforcement officials are in conducting their duties and functions.

The Promotion of Administrative Justice Act (Act 3 of 2000) provides the context for accountability in enforcing water regulations. The Act determines that “administrative action is to be lawful, reasonable and procedurally fair and the right to written reasons for administrative action, as provided for in section 33 of the Constitution of South Africa 1996”.

Administrative action includes giving a certificate, direction, approval, consent or permission; issuing, suspending, revoking or refusing to issue a licence, authority or other instrument; imposing a condition or restriction; or making a declaration, demand or requirement. Enforcement officials have to be accountable in their decision-making by being able to validate, if required in a court of law, what their decision-making process was.

The key to reasonable decision-making, and therefore to ensuring accountability, is located in three key areas of regulation, namely, the requirements of enforcement officials, the enforcement process and the legislation.

As regards the requirements of enforcement officials, DWA and the Department of Environmental Affairs require that their officials have a knowledge of environmental policies, legislation, international instruments, civil procedure, criminal procedure, constitutional law and administrative law. However, they are not required to have knowledge of aquatic science. In this context, according to Nonet and Selznick (1978), enforcement is not viewed as the mechanical task of finding and penalising violators of unequivocal rules, but rather as the necessary elaboration, correction and detailed specification of regulations required to achieve the intended public purpose (in other words, compliance and enforcement action are not intended merely to punish an offender, but also to bring the activity into compliance with the legislation and rehabilitate the resultant impacts of the transgression).

The Constitution provides the mandate for environmental protection. In terms of Section 24, everyone has the right:

- (a) To an environment not harmful to their health or well-being; and
- (b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that inter alia—
  - (a) Prevent pollution and ecological degradation

Officials receive training in law enforcement. The question was posed whether they do not also need training in terms of understanding detailed specialist reports, or in the fields of basic aquatic ecology, cumulative impacts, environmental management and economies of scale.

The enforcement process follows these steps:

- Site inspection in response to a complaint, or for the purposes of compliance monitoring with respect to an existing permit.
- Issuing a written warning (either a pre-compliance notice or a pre-directive) in the event of contravention of the conditions of a permit or illegal activity. The written warning may require the transgressor to submit a rehabilitation plan or to conduct specialist studies.
- Issuing a directive or compliance notice, with the same set of instructions as in the pre-compliance notice or pre-directive). If new information indicates that any of the instructions need to be changed, a new process needs to be initiated through a new warning letter.
- Monitor the implementation of the instructions. Non-compliance with a rehabilitation plan is a criminal offence.

“River recovery is not simply the reverse of river degradation; rather riparian rehabilitation suggests river recovery, which would be the post-human disturbance trajectory of change towards an improved condition” (Brierley & Fryirs 2005).

The requirements in NEMA and the NWA to apply for a permit or authorisation for certain activities are very cumbersome. Conversely, the requirements of the Acts with respect to enforcement are very brief. NEMA section 31L (2)(b) stipulates that a compliance notice is only required to set out any steps the person must take and the period within which those steps must be taken. According to NWA section 53(1), a directive only directs a person to take any action specified in the notice to rectify the contravention. In terms of these sections of the Acts, decision-making with respect to the requirements rests solely with the official.

Moreover, there is too much legislation, and too many overlapping mandates of the various institutions involved. The responsibilities related to a removing the soil in the event of a collapsed river bank were cited as an example. In this case, the following legislation would be invoked: NEMA (Activity 11, 18 GN R544 of 2010), Sections 21 (c) and (i) of the NWA, the Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983), the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002), the National Heritage Resources Act (Act No. 25 of 1999), as well as various municipal by-laws. A number of different government departments and entities would be involved.

Based on the problems identified, there are two critical evils that emerge:

- The resultant impacts and ecological degradation of contraventions are not identified or mitigated, and the rehabilitation of pollution or ecological degradation does not actually occur; and
- People, in various sectors, will willingly choose to be illegal, as fewer impacts and mitigation activities are identified and required to be addressed, fewer studies are necessary, and therefore costs are lower.

The R10 million fines provided for in NEMA are starting to have an effect, but the R5 000 fines in the NWA and R200 in CARA are not an incentive for compliance.

To rectify these problems requires a timely process of institutional and legal reform, and increased capacity in the applicable fields. As an interim measure, a set of tools is required to support the decision-making of enforcement officials. As part of WRC project K5/2036, 'Determining enforcement procedures for rehabilitation activities on urban river reaches', a set of basic tools is being developed, including:

- A legislation search tool, which uses key words to search for all legislation applicable to a given activity
- A rapid site assessment decision-support tool based on layman indicators for land use, hydrology, water quality, geomorphology, riparian vegetation, aquatic invertebrates, fish and habitat integrity. The intention is to enable links with existing tools, such as the Ecoclassification Process and the River Health Programme.
- A user-friendly guideline and site inspection form.

### **Ms Eustathia Bofilatos – (DWA Institutional Oversight). Effective institutional arrangements for good governance (E Bofilatos and T Sigwaza)**

The presentation was given by Ms Eustathia Bofilatos (DWA Institutional Oversight).

As part of the recently published second edition of the National Water Resource Strategy, institutional arrangements for governance in the water sector were revised.

Change is needed in water sector governance due to poor delivery of outcomes; too many people without access to water supply and sanitation; slow water allocation reform; the need for the management of pollution; illegal water use; infrastructure backlogs and poor maintenance.

The current arrangements for governance of the water resources include:

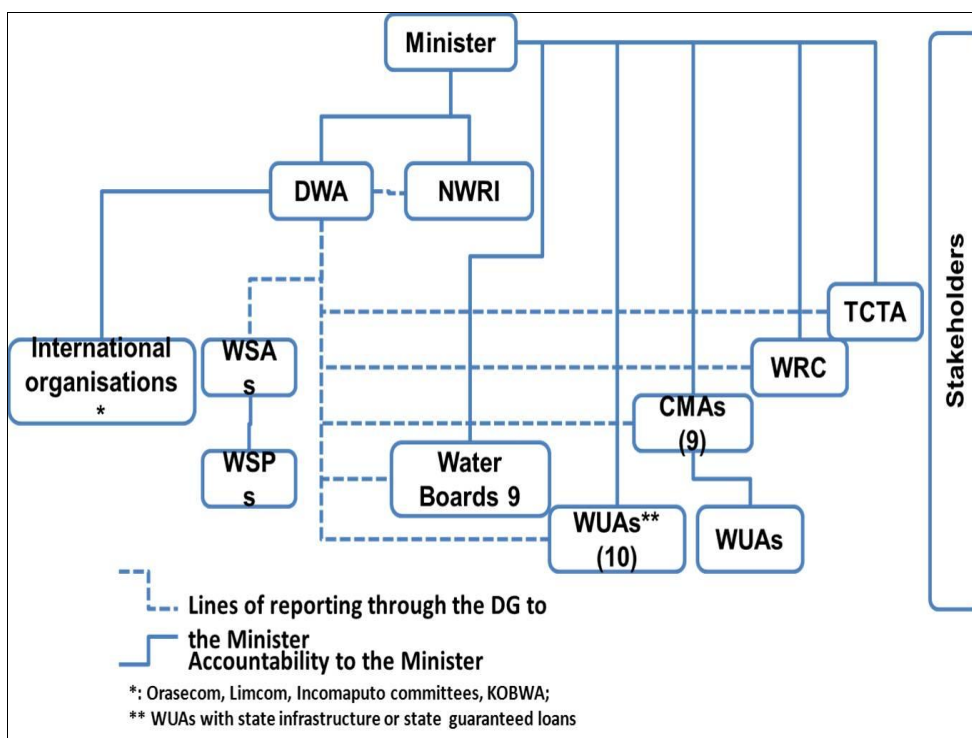
- TCTA, which manages infrastructure and reports directly to the Minister
- Water Research Commission, which reports directly to the Minister
- Two established catchment management agencies (CMAs)
- Irrigation boards: of the original 179, 50 have been transformed to water user associations and 129 remain
- Water user associations, of which there are 79
- Water boards, of which there are 12.

Water services authorities are municipalities that manage water services. There are also efforts to establish international bodies.

The vision for the water sector institutional landscape is to create sustainable water sector institutions that will facilitate effective service delivery. Figure 2 shows the envisaged future water sector institutional arrangements, to be established over the next four years. The overall trusteeship of the water value chain will remain with the Minister. DWA will set policy, regulate and provide support. The ownership, financing, development, management and operations and maintenance of national water resources infrastructure will be strengthened. The development, financing, management, operation and maintenance of regional bulk water and wastewater services will be strengthened through the consolidation of existing water boards. Water resource management will be strengthened through consolidation and the establishment of nine CMAs (rather than the initially proposed 19).

Water user associations will facilitate the management of local water resource infrastructure. The development and management of the four international river basins will be undertaken by trans-boundary water management institutions. Water research, information and knowledge management will contribute to improved water resource management and sustainable water service provision.

Economic regulation is being explored; the objective is to ensure, by the end of 2014, that water provision and services are provided in an efficient, fair and sustainable manner.



**Figure 2: Future water sector institutional arrangements**

**Catchment management agencies**

National government is the custodian of the nation’s water resources, as an indivisible national asset. The Minister (as public trustee) must therefore ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner. The Minister may establish suitable institutions to perform water resource management functions.

CMAs are established in terms of section 78(1) of the National Water Act (NWA) (Act No 36 of 1998). Statutory bodies established in terms of Chapter 7 of the NWA are listed as schedule 3a entities in terms of the Public Finance Management Act (PFMA) (Act No. 1 of 1999) and are service-delivery

public entities. In the absence of established CMAs, DWA undertakes these functions. CMAs are accountable both to the Minister and to their stakeholders.

The reasons for establishing CMAs are to achieve equitable access to water, and sustainable and efficient use of water. Through CMAs, water resource management will be delegated to the regional or catchment level and will involve local communities within the framework of the National Water Resource Strategy.

The revised map of water management areas was gazetted for comment on 20 July 2012. The comment period will remain open until the comment period on the National Water Resource Strategy closes. The establishment of the following nine CMAs is proposed: Inkomati-Usuthu, Pongola-Mzimkulu, Mzimvubu-Tsitsikamma, Breede-Gouritz, Berg-Olifants, Orange, Vaal, Limpopo and Olifants. The new boundaries were proposed in order to facilitate integrated planning (for example, there will be a single CMA for the Vaal, as opposed to the initially proposed three). There has been concern that the consolidation of water management areas will hamper stakeholder participation in decision-making with respect to water resource management, which is one of the main arguments in favour of establishing CMAs. There will, however, be mechanisms in place in water management areas to facilitate stakeholder participation, including water user associations and advisory committees.

### **Lessons learnt**

The lessons learnt in relation to change in water sector governance relate to the following three key areas:

- Political leadership and strategic direction
- Organisational readiness for change, letting go and embracing the future
- Clear institutional framework and roles and responsibilities.

The eight key lessons relate to:

- Political stability: there have been five Ministers and four directors-general for water over the last five years, each of whom has had different priorities and flagship projects, which has made it difficult to develop a common vision for the sector.
- Resource intensive: effective institutional arrangements for good governance are resource intensive.
- Change management: a strong change management communication strategy is needed.
- Policy on financial support: it was initially envisaged that over time, CMAs would become financially self-sustainable; however, it is now understood that functions for public interest and regulation will continue to be supported from the fiscus, as is common throughout the world.
- Delegations of functions, staff and budget: the transfer of budgets and staff from DWA regional offices to CMAs has proved to be a long process. DWA may have to revisit the process of negotiation that it has used to date and stipulate the timeframes within which staff will be required to move from the department to the CMAs, on the understanding that their conditions of service will not be worse than they were before.
- Stable system integration: CMAs need systems such as WARMS and SAP in place for effective billing and water resource management.
- Governance: the NWA is clear that CMAs should be governed by representative boards, with local and provincial representation, as well as the representation of existing and potential water users. DWA adhered to the requirements of the NWA in terms of representation in constituting the governing boards of the two established CMAs, but found that equity and transformation often suffered in the way that the boards operated, and that it was difficult for sector representatives to avoid a conflict of interest between their own interests and those of the CMA. The approach to the constitution of CMA governing boards may therefore need to be revisited, with some stakeholder representation remaining on the board, and provision for robust stakeholder participation in processes such as the development of the catchment management strategy and business plans.
- Oversight and monitoring: the NWA makes it clear that CMAs are required to develop a business plan and annual report for oversight and monitoring, but there is no blueprint, and these reports and plans are likely to be guided by the local context of each CMA.

Within the next three years, DWA intends to gazette all nine CMAs, although they are not all likely to be fully functional within that period. The department has reached agreement on a common vision for CMAs.

### **Water user associations**

Water user associations (WUAs) are established in terms of section 92 (1)(a) of the NWA. Without these institutions at a local scale, there will be a need to rapidly upscale staffing levels at regional offices and CMAs. There are issues of sustainability related to WUAs, as DWA does not provide sufficient seed funding, support and capacity building. The department has found it more difficult than envisaged to transform irrigation boards to WUAs.

DWA will transform all remaining irrigation board to WUAs within 12 months in order to bring them within the ambit of the NWA. A differentiated approach will be used, based on a transformation scorecard.

A differentiated approach will be used FOR the regulation of irrigation boards. WUAs with government water schemes and state loans will be regulated by DWA. The establishment and accountability of WUAs will be the responsibility of CMAs.

The Minister has a Flagship Project on Land/Water and Agrarian for Resource-poor Farmers in order to provide effective support for the establishment of WUAs for resource-poor farmers. DWA will drive the support programme on resource-poor farmers in conjunction with the departments of Agriculture, Forestry and Fisheries, and Rural Development and Land Affairs.

### **Management of regional water infrastructure and future role of water boards**

Water boards will be strengthened through consolidation and expansion, so that they become regional water utilities. Underperforming and marginal water boards will be strengthened through consolidation. Gaps in regional infrastructure provision will be addressed through expansion. The management of water resources infrastructure will be improved by utilities taking on water resource assets and improving sector alignment (for water resource management from source to tap). Strong, financially viable regional institutions will be in a position to access financial markets to raise finance for investment. Stronger water boards can play a more effective role in supporting municipalities.

### **Water Research Commission**

The National Water Research Plan will be introduced in order to coordinate water research in South Africa. The review of the Water Research Act (Act No. 34 of 1971) will be fast-tracked, and the review will be completed within six months and gazetted for comment.

### **Managing national water resources infrastructure**

At present, DWA manages most of the national water resources infrastructure, while the Trans-Caledon Tunnel Authority (TCTA) finances and project-manages specific water projects as per ministerial directives. Where possible, projects are financed off budget, and the investment costs are repaid through user charges. DWA is revisiting this approach and considering a social component of financial support in terms of the revised pricing strategy.

Key areas of concern are poor financial management, low revenue collection, poor customer management (including poor customer data), delays in procurement of key maintenance contracts, high staff turnover, loss of skills and low staff morale.

A draft business case has been developed for the creation of an optimal institutional model in terms of the agency and government components, the main advantages of which are increased accountability and transparency, and improved performance.

### **Reporting and governance**

The role of the Portfolio Committee is to review reports and plans, and where necessary, to conduct hearings and undertake visits. The Minister appoints boards and approves shareholder compacts. Within DWA, Institutional Oversight will have both a national and regional role with respect to overseeing institutional establishment; governance (managing board appointment processes, training etc.); shareholder compacts; and business plans, quarterly performance reports and financial statements.

Public institutions report to the public and Parliament through annual reports and annual financial statements and to the department with quarterly performance reports. WUAs will report to CMAs and not to the Minister. The nine water boards will report to the Minister. In terms of the planned future water sector governance arrangements, there will be more streamlined oversight, with fewer institutions reporting directly to the Minister.

## **Regulation**

Due to limited human and financial resources, a targeted approach to the regulation of water use must be adopted. A 'one size fits all' regulatory approach is not appropriate in the South African context; regulation should focus on high impact users where the most gains can be achieved with limited resources, and on a parallel process of support and development for small water users. The development of an effective regulatory framework and implementation plan for water resource management, linked to the activities of other sectors, will ensure responsiveness and efficiency in the system, simultaneously providing support to developmental organisations.

## **Good governance**

Good governance requires strong stakeholder participation, whether organised or not, with engagement in decision-making at all levels. An effective institutional arrangement framework is required. Above all, an appropriate regulatory framework is required for the sector to ensure efficiency in service delivery and financial sustainability.

## **Dr Guy Pegram, Pegasys – Governance considerations for the development of collective action initiatives by companies**

The presentation was based on work done by Pegasys over the last four years at the global, national and local levels around the emerging understanding of the risks that water poses to companies in the private sector.

### **What is corporate engagement with water?**

Until about ten years ago, companies and the general public were not very aware of water or its associated risks. Over the last five years in particular, across the world, there have been constant discussions about water. This is a symptom of growing understanding of climate change and the emergence of crises in certain parts of the world with respect to water quality and quantity as well as flooding, and the risks to companies and civil society. Financial institutions have become increasingly aware of the risks to companies that are exposed to water.

In 2009, a global survey was done among 32 000 people as well as companies in various countries. For the first time, most of the respondents identified water as a bigger issue than climate change and most environmental sustainability issues. A survey of 350 companies found that 92% agree that a water crisis is looming, and 70% believe that the risks of water scarcity are equal to those of carbon emissions.

Pegasys conducted a small survey around the world of company responses to water and found areas of agreement and disagreement: The respondents agreed that:

- Increasing water scarcity is a reality.
- There is a greater role for corporates in basins.
- Climate change plays a significant role in the water focus.
- The respondents' water risk focus and expenditure had not reduced due to the financial crisis since 2008, and in fact increased in most of the companies.
- Water initiatives are funded as part of core business.

- Perceptions of the response were socially benign or positive.

There was disagreement among the respondents with respect to:

- Approaches to the assessment of water risk
- The optimal way to engage stakeholders and governments
- The usefulness and longevity of global corporate initiatives
- The valuation and pricing of water.

### **What is water-related collective action?**

There have been a number of global water-related corporate initiatives. The United Nations Global Compact launched the CEO Water Mandate to which many South African companies have signed up. This has established a global platform for companies to take a responsible approach to water.

Other prominent global initiatives related to water include the World Economic Forum, which has produced the 2030 cost curves; and the World Business Council for Sustainable Development, which has developed water tools.

The responses of companies can be divided into three broad categories:

- Assessment: various tools are available for understanding footprints and the various aspects of risk
- Disclosure: fund managers and investors are starting to look for disclosure related to the risks that water poses to companies and their investors
- Response: the Alliance for Water Stewardship, for example, is promoting the view that corporates need to consider more than just efficiency and to move beyond the factory fence.

The CEO Water Mandate released the *Guide to Responsible Business Engagement with Water Policy* in 2010, which expounded the following key principles:

- Principle 1: Intent to advance water management that is sustainable
- Principle 2: Respecting public and private roles
- Principle 3: Inclusive partnerships in engagement
- Principle 4: Pragmatic and integrated engagement
- Principle 5: Accountability and transparency in engagement.

There has been considerable scepticism with respect to corporate interest in the water sector. It should be noted, however, that this engagement does not take the form of lobbying in the corporate interests, but improving governance and infrastructure, as failures in these areas will have a direct bearing on the continued operation of companies.

### **What is water-related collective action?**

The ladder of corporate engagement describes the general pattern of companies' engagement with water-related issues. Initially, companies' responses to the water risk results in internal actions for more efficient water use. Next, companies begin to address water issues in their supply chains, particularly those companies in the food and beverage sector. These approaches can only have an impact up to a point. Becoming more efficient may even increase the risks to a company during times of drought, as all companies may then be required to reduce their water usage by a fixed percentage across the board, without any recognition for companies that have already reduced their water consumption through responsible stewardship.

Companies have therefore realised the need to become involved in local action together with local government, communities, community based organisations (CBOs) and non-governmental organisations (NGOs); in catchment governance in conjunction with catchment management agencies (CMAs), water user associations (WUAs) and through stakeholder platforms; and in policy matters at provincial and national government levels. Such measures are aimed at ensuring consistent, stable and predictable governance. Corporates construct risk profiles for their organisations, in which water is related to the entire water–food–energy nexus.

Pegasys was involved with the CEO Water Mandate in developing a guide to water-related collective action based on experience around the world with respect to how companies manage their risk.

Different companies will become involved in collective water-related action for their particular reasons. Collective action becomes desirable or necessary when unilateral action will not produce these outcomes:

- Managing operational pressures resulting from inadequate availability, supply or quality
- Maintaining or enhancing their legal or social licence to operate by demonstrating responsible resource management
- Assuring investors and other stakeholders that water risks are adequately addressed
- Upholding corporate values and commitments related to sustainable development.

Collective action can take place across the water cycle. In relation to catchment water resources, the action might involve receiving water resources, catchment ecosystems or upstream water resources. In relation to the water infrastructure system, the action might involve water supply and treatment; company, supplier and community water users; or waste water and storm water treatment and discharge. Corporates might also become involved at the level of water governance and management, which straddles the whole water cycle.

The CEO Water Mandate guide to water-related collective action proposes four distinct levels of engagement related to collective action, through Informative (information sharing), to Consultative (considering perspectives) and Collaborative (making joint decisions), and Integrative (jointly implementing), across a range of action areas. Importantly, the formality of the governance arrangements increases along this continuum, with each level requiring specific considerations to ensure that all parties are involved and protected through the process.

The higher the level of collective action, the greater the need for strong interest, as well as capacity, from both the company and external stakeholders. If external capacity is weak, the company's ability to engage actively is reduced. Collective action at the informative and consultative levels can be relatively easily effected through catchment platforms and forums. However, in moving into collective action at the higher collaborative and integrative levels, the expectations are higher; there is a need for investment of resources; and governance arrangements change. Companies tend to start their involvement in collective action at the lower levels and gradually move into the higher levels. There are challenges to the company not to become inextricably involved in collective action, but to build capacity that can be handed over to the public sector.

Companies that engage in collective action should observe the following principles:

- Ensure that their own house is in order (this is a prerequisite)
- Create clarity, trust and credibility to combat the inherent mistrust between sectors
- Support interaction and responsiveness
- Establish transparency and accountability
- Build in the ability to adapt.

### **What does this mean for water governance?**

The risks of collective action include refocusing attention on corporate issues and concerns; companies 'replacing' government delivery; and institutional capture in decisions. The public sector and civil society are still not clear about how to respond and what they want from governance relationships with the private sector.

However, there are opportunities to leverage corporate capacity, build effective relationships and gain access to various players outside water governance that the public sector would not otherwise have access to.

Through consultation and partnerships between the corporate and public sectors, it is possible to channel informative and consultative engagement into existing platforms (local and catchment). Developing partnerships for collaboration and integration requires integrity. It is necessary to align expectations, and to clarify mandates and interests, thereby building trust, understanding resource commitments by both parties, and acknowledging timeframes and evolution.

There are opportunities for national frameworks for engagement and collective action, for example, the Strategic Water Partnership. The issue is whether there are opportunities in relation to regulation and offsetting, stewardship and accreditation, and water use efficiency; for example, would a corporate that had engaged in collective action be treated differently than if they that had not entered into engagement? Such issues are likely to become increasingly pertinent.

There are opportunities for government and civil society to engage with corporates in future.

## **Discussion**

**Ms Deborah Mochotlhi (DWA):** In order to achieve applicable regulation for enhanced accountability, there are a number of issues to consider, both in terms of policy and implementation, for example:

- What does regulation mean in a developmental state?
- What regulation mechanisms and governance need to be put in place to achieve the objectives of government?
- What needs to be done to put responsibility where it resides; for example, the polluter-pays principle, or the promotion of self-regulation? This would entail a paradigm shift from the present situation in which some sectors complain about water pollution as if they do not contribute towards the pollution of the water resources.
- Can we afford to say that unlawful water use is not a crime, especially in the context of not meeting equity objectives and in the face of delivery protests?

**Dr Lucia De Stefano (Universidad Complutense de Madrid, Spain) to Mr Ginster:** (1) Why are irrigators not getting water lawfully; is this because of financial or legal constraints? (2) The amount of water that is abstracted unlawfully is equivalent to about five years' projected increase in demand. It might be more efficient to curb the increase in water demand than to tackle the problem of unlawful abstraction.

**Mr Martin Ginster:** The irrigators are within the legal system. The issue is to determine the actual amount to which they are lawfully entitled. In many cases, unlawful use is not blatant (although blatant unlawful use does occur), but falls into the grey area of using more than one's legal entitlement. It should be understood that unlawfully used water has been allocated to urban and industrial users in the inland regions and paid for by those users. (2) We need to tackle the problem on all fronts, including addressing unlawful water use; water conservation/water demand management, which is curbing the projected demand for water through efficiency; and introducing additional new water. All these measures are required to bring water security to the inland region.

**Mr Derrick du Toit (Association for Water and Rural Development), to Dr Pegram:** (1) One of the most effective expressions of collective action can be seen in collusion and price fixing. We have to be careful to avoid uni-sector collusion in the guise of collective action, which could have an unforeseen outcome in manipulating water allocations. The real value of collective action is through integration in multiple sector environments, otherwise we risk becoming vulnerable to powerful entities. (2) It is not in the interests of any parties that are involved in unlawful activity to engage collectively.

**Dr Guy Pegram:** Companies globally are starting to act, and they will do so regardless of whatever else happens. The CEO Mandate, which falls under the United Nations Compact, acknowledged that companies need to take action in the face of risks, and considered how to guide the way they act, in order to avoid companies capturing decision-making processes. The present discussion is not about collusion, but to guide companies that want to move outside the factory fence to do so responsibly, and to use effective and appropriate mechanisms that are already in place, which are usually multilateral

Where a company faces problems of water supply, they have two options. In Dar es Salaam, for example, water supply depends mainly on boreholes and faces challenges of salt water intrusion. Salination resulted in the closure of 12 of the city's 20 boreholes. SAB in Dar es Salaam had the option of fixing the city's water problems, or desalinating only for their own use, and opted to act collectively in the general interest. Companies need guidance in how to act in such a situation to avoid allegations that they are capturing the process in their own interests. There are cases where engagement with the local community or municipality is effective at local level, but once the company

moves into the catchment, action has to be multiparty. Companies that engage in collective action have to be lawful; if not, they will not be taken seriously. The fundamental point of departure of all collective action is that the company should already be efficient and legal in their water use.

**Dr Harrison Pienaar (CSIR), to Ms Bofilatos:** It appears that the nine CMAs will still report directly to the Minister. Would it not be better for DWA to have direct oversight over all water management institutions, with a dotted reporting line to the Minister, so that trusteeship remains with the Minister? The situation should be avoided in which an organisation can claim that it does not report to the department but rather to the Minister. The assumption is that the department should have appropriate skilled resources for the necessary oversight for the sector.

**Ms Bofilatos:** DWA will take these issues into consideration in governance and reporting mechanisms.

**Mr Mpho Mulaudzi (Rand Water Graduate Internship Programme):** (1) What are the roles of water boards as related to agencies? (2) What are the reasons for the delays in establishing CMAs? (3) Will the proposed CMAs be financially dependent on DWA, or will they be able to generate their own revenue?

**Ms Bofilatos:** (1) Water boards are established in terms of the Water Services Act in order to provide bulk water to municipalities and water users. CMAs manage the water resources as service delivery vehicles on behalf of the Minister as trustee of the national water resource. Water boards can be contracted to perform many of the functions of CMAs, but cannot serve as CMAs.

There have been many delays in establishing CMAs. Firstly, there were frequent changes in Minister, each of whom had different priorities. The CMA establishment process is very resource intensive and requires considerable public participation; the process required by the NWA may thus need to be revisited. A common vision for CMAs has been lacking, since the DWA regional offices are already performing resource management functions. There has not been a strong policy for financial support of CMAs. Many questions have been posed about the viability of CMAs and whether they will necessitate an increase in water-use tariffs in order to be sustainable.

CMAs will collect water-use charges for water-use management, but there will be public interest and regulatory functions that will be supported by the fiscus. The extent of the fiscal support will differ between CMAs and depend on the extent of their social component functions.

**Prof. Raymon Ison (Monash University, Australia):** Regulation is only one form of governance, and is a very expensive governance mechanism. Regulation is easy to put in place, but difficult to implement and enforce. Other governance mechanisms need to be explored, for example, social learning, which relates to compliance by changing practices that are in place. There have been a range of systemic issues addressed in all the presentations that warrant further questioning about how governance is unfolding. One of these relates to the implementation of organisations stipulated in the National Water Act. Systems theory uses Ashby's Law of Requisite Variety, namely that only variety can manage variety. It is a matter of grave concern that Ashby's Law will come into play in what is about to unfold and serve as a constraint.

**Mr Derek Hazelton (TSE Water Services cc), to Ms Bofilatos:** Has there been much discussion of the boards of water boards? I have come across unhappiness over the existence of water boards because they report directly to the Minister, but I do not think that it is necessary to create that link to satisfy municipalities. I am pleased that DWA is not considering wall-to-wall water boards

**Ms Eustathia Bofilatos:** DWA is considering the realignment of water boards, and in that process, the department will revisit the issue of the appointment of their boards. The boards are constituted on the basis of skills and expertise, and that paradigm remains.

**Mr Derrick du Toit (Association for Water and Rural Development):** A major concern about CMAs is that that they spend so much of their efforts on corporate governance and compliance, and on their fiduciary responsibilities, that they neglect their primary role of water resource management. These issues will become more complicated in collapsing the initially proposed 19 CMAs to nine, because stakeholder processes will become highly problematic due to the increased size of the areas that

CMA's cover, and the reduced opportunity for stakeholders in outlying areas to participate. Catchment management committees should therefore be considered as the real sources of representative involvement of stakeholders. Catchment management committees are stipulated in the NWA, but have not been established, which is a lost opportunity.

**Ms Eustathia Bofilatos:** Catchment management committees will be essential for better communication in the enlarged water management areas. Section 95 of the NWA allows CMA's to establish catchment management committees. Such committees would be constituted with local representation and would probably develop the catchment management strategy. The board would be a 'skills board' that would be responsible for the CMA's budget, business plan and fiduciary duties. DWA will not attempt to impose a 'one size fits all' solution. In areas where WUAs are well established, they might be the main vehicle for local representation, whereas the forums that exist in other areas might become catchment management committees.

**Dr Mark Dent (University of KwaZulu-Natal):** It is encouraging that the thinking is moving towards self-regulation. If we leverage the capacity to self-regulate, we can spend more capacity on the 5% that do not comply.

**Mr Martin Ginster:** I concur about the effectiveness of the self-regulatory, or co-regulatory, approach.

Ms Deborah Mochotlhi closed the session by thanking the presenters, thanking participants for their attendance and participation, and pointing out that comments on regulation can be made as comments on the gazetted National Water Resource Strategy.

## **SESSION 6: MARKERS OF GOOD GOVERNANCE**

**Chair: Dr Chris Dickens (Institute of Natural Resources, INR)**

**Mr Brendan Bromwich, UNEP, Switzerland – Keynote address: Relationships and resources: Quality of relationships as an indicator of good governance and peace-building for shared use of natural resources**

The presentation focussed on a part of the overall United Nations Environmental Programme (UNEP) programme in Sudan to promote sustainable and equitable governance, management and use of environmental resources.

The measurement of relationships is a new concept and is being addressed in the UNEP study, which has set a precedent in this respect. The UNEP's Sudan programme uses an approach developed in partnership with the Relationship Foundation and Relationship Global. The main message of the presentation is that good governance and peace-building both need good relationships.

Darfur's water sector has huge distortions on the basis of a quarter of the population of 2 million people receiving humanitarian assistance. Ultimately, the three Es of sustainable development: environment, equity and economics, will have to be balanced. There are three levels of conflict taking place in Darfur:

- The local level conflict in which natural resources are significant
- The conflict between Darfur and Khartoum
- The conflict between Sudan, Chad and the Central African Republic.

The international response on water in Darfur is entirely rights based and is carried out through humanitarian programmes and emergency responses. In dry land ecosystems such as Darfur, people can be given a sense of entitlement over and above what the ecosystem can support. Darfur has to find a route for governance that assures sustainability of the water resource, with the interface between traditional and formal governance as the central issue. Government has taken a fragmented approach to the management of natural resources. The conflict in Sudan has meant that traditional governance and the formal processes of government in have broken down and government has to look at regulating a new livelihood, particularly to replace the current gold rush, which endangers thousands of lives.

The government is in transition and this transition is strongly relationship based. Community to community peace-building needs to be replaced by the state water corporation in the long-term. UNEP's programme is looking at three types of relationships:

- A. Institution to institution
- B. Institution to community
- C. Community to community

UNEP aims to improve type A work, involving policy and practice within ministries, to enable types B and C to improve. It is important to use indicators to measure progress in building relationships. Relationship metrics are done by the Relationships Foundation in the UK and by Relationships Global in South Africa, which are social policy think tank/advocacy groups that apply relationships as a lens with which to view social policy. Metrics were developed to do this work. Relationships can be described using the five parameters of relationships: contact, shared purpose, multiplicity, parity and continuity.

The Nile Basin Initiative deploys team leaders in each country from one of the other Nile Basin states. This promotes directness and multiplicity, and through a 6 year process, it provides continuity. The depletion of groundwater in Darfur occurred in the context of a lack of coordination of programmes due to weak relationships at various levels. Indicators and cash flow strongly favoured water abstraction rather than resource management and a lack of parity was compounded by a lack of directness.

UNEP demonstrated that the work done on environmental policy has improved collaboration in government. It was found that there had been limited contact between the Ministry of Environment and the Ministry of Petroleum and in order to encourage both Ministries to work together it was necessary to identify areas of commonality and establish parity through laying down preconditions for working together followed by a form of memorandum of understanding that ensures continuity. A key stage in the relationship building process occurs when preconditions for working together have been met and problems are resolved through working on the relationships between government Ministries. The relationships may be enhanced by continuing to work together and developing shared experiences. A mature enhanced relationship then develops between the parties, which often requires months of negotiation between two groups.

The relationship metrics were applied to integrated water resource management (IWRM) in Darfur. In the beginning, water demand and IWRM in terms of water supply were unclear. Two study tours were organised by the WRC, which gave a team from Darfur an opportunity to grasp the reality of IWRM through relationship building and to develop areas of commonality. These tours will be followed up by an international conference on reconstruction for Darfur, which is expected to raise the profile of IWRM. The improvement in relationships has enabled funding for the development of the first catchment management agency (CMA) in Darfur, as well as several other IWRM developments in Darfur. It is anticipated that type B and type C relationships will be improved through collaboration at ministry level and through supporting work on policy reform and best practices. Building governance will enable communities to collaborate on natural resources.

This methodology builds on extensive work had been done by the Relationships Foundation in the private sector in South Africa and elsewhere, in peace-building in several countries and in prison reform and National Health System reforms in the United Kingdom. The relationships framework allows relationships to be measured and interventions to be better designed and better evaluated. The methodology addresses the need to show progress and provides the type of analysis that would enable solutions to some of the water sector issues in South Africa. UNEP invited partners to collaborate in exploring these approaches, and particularly to consider a more detailed analysis of the challenges facing water governance in South Africa.

#### **Ms Adri Venter, Eon Consulting – Local government in South Africa: Opportunities and challenges related to water governance**

This is a tale of two cities: Dismal City and Paramount City. The latter represents the future of good governance.

The role of local government is defined as follows in terms of the Lisbon Principles:

- Access to clean and affordable drinking water is a fundamental right
- Water and sanitation services are ensured for all
- Water must be governed as a common good
- Water must be protected as the ecological foundation of life
- Water must be managed as a finite economic resource
- Water must be preserved as a shared cultural asset.

The Constitution of the Republic of South Africa states that the objectives of local government in terms of environmental and related issues are to:

- Provide democratic and accountable government for local community
- Ensure the provision of services to communities in a sustainable manner
- Promote social and economic development
- Promote a safe and healthy environment
- Encourage involvement of communities in matters of local government.

Some of the challenges faced by local government include service backlogs, sanitation provision, water supply and housing development. These challenges are expected to become more serious as the majority of the population migrates towards urban areas within the coming decades. There is a wide array of legislation available to local government, including by-laws in metropolitan areas. Environment Management Inspectors (EMIs) have a duty to monitor and enforce compliance with the National Environmental Management Act (NEMA), Specific Environmental Management Act (SEMA) and numerous other Acts. NEMA makes provision for the Minister to delegate powers to local government so that local government officials can act as EMIs. In order to utilise the provision of NEMA the officials must be designated and trained as EMIs.

Dismal City and Paramount City face similar challenges related to services backlogs; urbanisation and the extensive array and complexities of typical urban service delivery; skills shortages; financial constraints; and organisational structure of local government.

Dismal City management viewed water governance as a separate issue and not their business, but the business of provincial and national government. The city took a short-term view on development that was aimed at quick-wins. It failed to recognise the integrated nature of fresh water conservation, governance and planning and under-estimate the value of ecosystem services. Management was not based on data and a reactive approach was taken to challenges and problems. Storm water drainage problems resulted in increased levels of flooding, sewer overflows, erosion and water pollution. Surface impoundments silted up and tourism and recreational industries began closing down. Communities that are dependent on water resources for their livelihood suffered. Poverty and unemployment increased and gastro-intestinal diseases were common. Inhabitants of Dismal City believed that they were not responsible for the havoc in their city.

In contrast, Paramount City was thriving. Water governance was integrated into all aspects of city governance. The community was empowered to partake in the governance and take ownership of the water resource. Local government created a social and economic playing field while acknowledging their dual role in terms enforcement as well as compliance with legislation. The community understood and respected the vital role of ecosystem services in making the city sustainable. Paramount City was not forced to crisis-manage backlogs and concentrated all efforts on improving and maintaining high standards. Productive water resource management (WRM) was rewarded with bio-mimicry in storm water management, sustainable livelihoods through the use of ecosystem services, a sought-after investment, a residential city and high quality drinking water delivered to all its residents. The community was environmentally aware, tourism and recreation benefited from the attractive, clean city and the many opportunities to interact with the rich biodiversity. Citizens were healthy and content.

Aspects of the governance programme of Paramount City included:

- Viewing water resources as live systems
- Awareness of wetland systems and the value of these systems in reducing flooding, erosion and pollution
- Taking water governance into consideration in issues of land use

- Mimicking natural systems in the design of storm water systems and respecting wetland water courses
- Elimination of alien invasive flora
- Diligent monitoring of water quality and pursuit of those who pollute the resource.
- Efficient incident management
- Green Drop sewage management and dependence on residents to report sewage blockages.

As local government in South Africa is extensive, it would be appropriate for it to be involved in fresh water governance.

Some suggestions of how to improve the accountability of local government include:

- Education of local government officials at all levels
- Monitoring performance, holding officials accountable and rewarding good behaviour
- Greater scrutiny of Integrated Development Plans and master plans in order to assess the extent to which water governance is addressed
- Providing local context to data and information
- Sharing case studies
- Providing practical assistance and not more toolkits
- Addressing challenges in large urban centres
- Intervening purposefully in all 'Dismal Cities'
- Training and designating EMLs.

### **Discussion**

**Mr Pieter Oberholzer (DWA):** Municipalities of small towns throughout the country have the status of 'water services authority', yet councillors and municipal managers are not informed about proper water governance. Where there is no capacity, local government should make use of sector departments to educate officials at all levels of municipal management.

**Mr Martin Zimmerman, Darmstadt University of Technology, Germany – Policy development for sustainable transformation: The analysis of systemic feedback loops in the case of the water supply in central northern Namibia (M Zimmerman and W Urban)**

The presentation was given by Mr Zimmerman. The case study took place at the Cuvelai Etosha Basin and the empirical grounded modelling approach was applied in this PhD thesis.

The Cuvelai Etosha Basin is named after a system of ephemeral and intermittent rivers which drain the precipitation of southern Angola into central northern Namibia. The region is characterised by high rainfall variability, a very high evaporation rate, ground water is saline and there are no perennial rivers. Furthermore, around half of the Namibian population, approximately one million people, reside in this area and have to survive without having access to water resources.

The solution involves a large technical system that brings water from the Kunene River bordering Angola and Namibia into the region. Water is extracted on Angolan territory at the Calueque Dam and brought into the region through a 150 km-long open canal where it is distributed by the water utility through a pipeline scheme of more than 2500 km long. However, this system experiences numerous problems relating to maintenance, vandalism and misuse, governance and management, population growth, urbanisation and more. This example is typical of an ill-defined problem that can be address by modelling.

The modelling approach follows the classical stages starting with grounded theory which lays down the foundation for the model, followed by a number of tools for structural analysis, the simulation of scenarios and the assessment and interpretation of the results. Grounded theory was used as a foundation for the model because classical qualitative data analysis is deductive where a theory, a hypothesis or a model is verified or falsified in data for instance by using statistical significance. However, this approach would not be appropriate, particularly in the development context of the project. Grounded theory is able to develop a theory or a model directly out of the data in a scientifically sound manner.

Around 60 interviews were conducted with more than 50 relevant stakeholders from a variety of sectors using open or focussed interviews. The content of the interviews concerned the provision, acquisition and utilisation of water. There were two main outcomes of the application of grounded theory in this project:

- A set of 37 system variables that represent the core topics or problems mentioned by the interviewees.
- The system variables are interrelated and influence each other. It became clear that modelling is all about data, the reduction of information and the recognition of patterns.

The interdependencies of the system variable could be represented by a so-called cross impact matrix, which is part of Frederic Vester's Sensitivity Model. In brief, a calculation of the sums of rows and sums of columns produced a characterisation of the system variables. Interdependencies are the interrelations between two system variables and can be positively related and negatively related. During the analysis of the interviews it became clear that the statements on the interdependencies were diverse due to different perceptions, world views or intentions of the interviewees. By using a heterogeneity indicator it was possible to assess the interdependencies in order to identify outstanding homogeneous and heterogeneous interdependencies. At the same time, the interviewees totally agreed that more traditional livestock farming reduces the quality and availability of grazing land and vice versa. Remarkably, interviewees were unsure whether the large-scale water supply system improves or reduces water supply security.

Based on the heterogeneities and polarities identified, it was possible to analyse feedback loops. The system dynamics software VENSIM was used to do this exercise. Balancing and self-reinforcing feedback loops could be identified and could be used for closed loop control or could be unstable and therefore precarious. There were literally hundreds, and in some cases even thousands, of feedbacks. By data reduction, it was possible to identify 98 relevant feedback loops of which 70 are positive and 28 negative - a sign that the overall system is unstable, particularly in terms of the large-scale water supply system. The interviewees stated that more traditional livestock farming leads to a lower quality and availability of grazing land which, in turn, weakens traditional livestock farming and vice versa. This can be seen as a typical example of a balancing feedback loop.

The interviewees state that the variable 'large-scale water supply' contributes directly (such as through the open canal) or indirectly (such as through providing tap water to farmers in rural areas) to traditional livestock farming. This, for instance, reinforces subsistence and poverty and limits the regional economy, which in turn slows down urbanisation as well as the growth of the large-scale water supply system and vice versa.

Self-reinforcing feedbacks as vicious circles show that an increase in little dams would intensify traditional livestock farming and, in turn, lead to a worse 'regional economy', and more subsistence and poverty that would eventually reinforce the alternative water supply technique and vice versa. Using more rainwater harvesting, for instance, would reduce the lack of irrigation and horticulture and therefore boost the 'regional economy' and in turn reduce subsistence and poverty. This leads to more utilisation of rainwater harvesting (and vice versa) and is therefore a self-reinforcing feedback.

The simulation of different water supply scenarios was difficult. For example, one scenario is defined by the centralised large-scale water supply regime and another is defined by alternative water supply techniques, especially traditional, small- to medium-scale and decentralised techniques. Furthermore, other key variables or driving forces like population growth, urbanisation, and climate change were simulated to identify stable and unstable scenarios.

The first major results of the modelling approach concern perceptions and power. Different perceptions of problems as well as correlations between certain world views and specific stakeholder groups were identified. In doing so, inherent power structures could be revealed which enable or prevent systemic transitions. The second major outcomes are risks and vulnerabilities. Critical system variables, unstable feedback loops and critical scenarios were identified. Finally the model produces results in terms of the regulation and transformation of socio-technical systems or regimes. Regulation mechanisms were identified for closed loop control and open loop control. Furthermore, balancing feedbacks that act as vicious circles for the system due to their resilience or inertia were identified on the one hand and on the other hand, self-reinforcing feedbacks were identified, which

could be used as an impetus for systemic transitions. All these results serve to develop policies for sustainable transitions of socio-technical regimes.

### **Discussion**

**Dr Sharon Pollard (Association for Water and Rural Development (AWARD)):** What has been described is a complex system that has numerous characteristics. From work we have done in analysing feedback loops, one of the key characteristics is the dynamic nature in space and time, which VENSIM does not do well. You did not show any variable strengths and this is critical for real world analysis. Drivers such as governance regime insist on boundaries. Once this model is taken into scenario development and it has policy implications without considering system dynamics, this could be problematic.

**Mr Derek Hazelton (TSE Water Services):** Are you going to spend more time in Namibia and are you going to try and use the findings to see if they have positive outcomes?

**Mr Martin Zimmerman (Darmstadt University of Technology, Germany):** I agree. I have done pure qualitative modelling and numbers were not used, for example, for system dynamics. I am not able to tell from the inter-relations feedback loop whether, for example, a positive feedback loop is stable or unstable. I am not able to quantify any of the feedback loops.

My work is a typical example of strong disciplinary research. To finish the circle I would have to apply it in the real world. The project is linked to a project financed by the German Ministry of Education and Research, and unfortunately I will not be able to test the results of my work. The CUVE Waters project, WHICH establishes an integrated water resources management in the Cuvelai-Etoshia Basin in central-northern Namibia, is entering its third phase and some of my results may be helpful for the project.

**Mr Derrick du Toit, AWARD – The language of sustainability: Are governance structures a part of it? (D Sefatsa and DR du Toit)**

The project is situated in the Lowveld and looks at a set of basins in the Limpopo area where water courses are shared by Mozambique, South Africa and Swaziland, and much of the research has a broader application.

The NWA of 1998 was set to change 'business as usual' by introducing a 'new discourse' for WRM. The issue of sustainability is predominant in the discourse and is considered a fundamental objective of the legislation, viewed from a legal perspective.

Figures produced by DWA in respect of water availability and water requirements per water management area (WMA) show that requirements exceed availability in a number of WMA's. The question is whether the new discourse engendered in the NWA will be able to deal with this situation and it is necessary to consider the framed background of the emergence of the discourse of sustainability.

The emergence of the concept of scarcity was raised in Movik's work in 2010. A new discourse should be able to engage with the context of scarcity. Movik talks of transitions in the South African context, the first being the transition from abundance to scarcity in the latter part of the 19<sup>th</sup> Century. The language in the discussion on WRM was developed in a scenario of abundance, but would have to change in the transition to scarcity. This work looks at whether the NWA responds to these transitions and whether it is the language that is necessary for scarcity or the language grounded in an outdated situation. The second transition is from scarcity to deficit. Projections show that South Africa is faced with absolute deficit by 2015, which means that all WMAs will face requirements that exceed availability. Once again, it is important to consider whether the language of legislation responds adequately to this scenario. Is the legal framework sufficiently robust, specifically in terms of sustainability, and could the NWA be expected to be an adequate legal framework in the context of demands that exceed resources?

Every one of the Lowveld catchments is converting from perennial to ephemeral rivers, and there is higher non-compliance with the environmental water requirement post-policy and management

interventions under the NWA than prior to the NWA. Policy has therefore not contributed to improved sustainability of the resource. This raises the question whether this language of sustainability features in thinking and planning around WRM.

There are three different sources of this discourse: legal (using terms such as laws and regulations), ecology (using terms such as biodiversity, complex systems and conservation) and economics (using terms such as employment, growth, profit and loss). Questions are raised about commonality in the language of sustainability, which discourse is being drawn on in the discourse on sustainability in the water sector, and who is doing the mediation between the three languages or is there parity.

Work by Sharon Beder that describes all the principles of sustainability was used by Ms Sefatsa to come up with the following environmental protection principles used in the water sector and some of the associated concepts:

- Sustainability principle: limits to growth, sustainable development
- Polluter pays principle: liability, extended producer responsibility
- Precautionary principle: Burden of proof, evidence, scientific uncertainty
- Equity principle: Inter-generational equity
- Human rights principles: Equality, rights, transparency
- Participation principle: Right to know, public participation
- Economic mechanisms: Cost benefit analysis, offsets, trading.

Ms Sefatsa analysed some of the sustainability principles in primary South African legislation to assess whether and where the environmental protection principles feature in IWRM and found that the local government legislation, not the NWA, has the most thoroughly developed discourse on sustainability and recognises the seven environmental protection principles. It was also found that the principles are associated with each activity in the framework for IWRM. An arduous legal task of disaggregating each activity is being undertaken to establish whether practitioners could apply the principles in the legislation and in the strategic guiding document in their daily IWRM activities and regulatory practices.

Should IWRM be audited against sustainability principles since the NWA and the Constitution of the Republic of South Africa are clear that future generations must be considered in terms of sustainability of resources? Do the CMAs, DWA and civil society need to have a good understanding of the particular language contained in these principles in order to be able to assess which principles apply and who should be held accountable in this regard?

Water management challenges include:

- Practical application of the environmental protection principles
- Allocation of duties
- Coordination of duties
- Monitoring and compliance
- Enforcement and reporting against the environmental protection principles
- Adaptive management
- Flexible standards
- Reasonableness
- Focusing on the future.

There are massive legal implications for IWRM in South Africa in terms of:

- The application of principles in addition to the application of sections of the law. The NWA is enabling but is silent with regard to legislative procedure on a particular transgression
- The integrated sustainability discourse that is new and may conflict with other discourses
- Obligations and liabilities in relation to the principles
- Adequate consideration for intergenerational equity.

As a non-governmental organisation (NGO), AWARD believes that it has an important role to help government to approach and work towards greater levels of sustainability configuration.

## **Discussion**

**Mr Derek Hazelton (TSE Water Services):** It would be interesting to do the same presentation replacing 'sustainability' with 'equity', ensuring that there are no contradictions in your presentation.

**Ms Christine Colvin (World Wildlife Fund South Africa (WWF SA)):** It is important that we are explicit about a further principle that should be added around transparency and public access to information, which is core to the process of accountability within a sustainable context.

**Mr Derrick du Toit (AWARD):** I think that this principle is implied in the participatory principle from the discourse and I agree that it needs to be highlighted.

### **Prof. Dr Mariele Evers, University of Wuppertal, Germany – Factors for success and failure in IWRM (M Evers and L Lange)**

The presentation was given by Prof. Dr Evers and focused on the results of a study that looked at the factors that could support or hamper IWRM.

The Global Water Partnership's (GWP) definition of IWRM states that it is 'the process of coordinating conservation, management and development of water, land and related resources across sectors within a given river basin, in order to maximise the economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems'.

Problems associated with IWRM highlighted the need to concretise IWRM. The concept is vague and lack practicability. The meaning of 'integration' in the context of WRM is elusive and IWRM implementation processes are unclear.

The study uses the hypothesis that factors for successful IWRM can be identified and aims to identify factors for success (and failure) by developing an assessment to evaluate processes. The methodology involved a literature study, the development of a category system and assessment criteria that were applied in the analysis of case studies, and finally the refinement of the assessment criteria. Thirty-three case studies across twenty-four countries were investigated and analysed.

The category system was based on:

- Dublin Principles, particularly the principles that water management should be based on a participatory approach and that women play a central part in provision, management and safeguarding water.
- Four Basis Principles of IWRM (Neubert/Theesfeld 2000), which refer to location along river basins, integration of the natural and social system, cross-sectoral water management and the support of participative and cooperative structures.
- Implementation Elements (GWP 2004) that refer to the role of institutions, management instruments and an enabling environment.
- Integration axes (Cardwell et al. 2006) of time, objectives, institutions and space.

The following six categories were identified:

- Integration axes
- Culture/Gender
- Enabling environment
- Management
- Participation/Cooperation
- Knowledge management and capacity development.

In terms of the overall results of the study, it was found that the assessment sheet could be used as a checklist and was a successful method to analyse IWRM in the case studies. Some important factors were confirmed and several new aspects were identified. A disadvantage of the methodology was the study's dependence on case study documentation. It was recommended that the number of case

studies should be increased and the scope broadened. Potential collaborators were invited to participate in the next phases of the study.

### **Discussion**

**Dr Junaid Alam Memon (Pakistan Institute of Development Economy):** I understood that the study has confirmed some of the factors and identified new factors. Can you specify these?

**Prof. Dr Mariele Evers (University of Wuppertal, Germany):** The importance of stakeholder dialogue and open and flexible management structures were confirmed as factors that contribute to the success of IWRM. There are no studies on the use of these instruments and so it was helpful to see how they could be applied, particularly if they are developed in an interactive way. The instruments can be used as vehicles for communication and dialogue. We also noticed, in terms of the assessment criteria based on the Dublin Principles, that none of the case study documents mentioned the role of women in IWRM.

### **Dr Richard Meissner, CSIR – Governability of South Africa’s water resources: towards a progressive framework for analysis**

The study was work in progress as part of the CSIR’s Water Sustainability Flagship Programme.

A study conducted in 2011 indicated that 86 per cent of water governance research is based on the positivist paradigm. Most of the research was found to be state-centric, based on the NWA (No. 36) of 1998, predominantly covering CMAs and orientated towards the natural sciences.

Positivism is a scientific paradigm that concerns knowledge generated from empirical testing of hypotheses against facts or evidence. Methodologies from the natural science are used to explain society. Facts are separated from values and concepts are defined into precisely and accurately measurable variables. Post-positivism, on the other hand, deals with human perceptions. Facts, concepts and theories are not separated from values and are influenced by a human agency. Observations are human constructions.

It is argued that because of the predominantly positivist paradigm in research on water governance a broader examination of water governance is necessary without totally rejecting positivism as it has a valuable contribution to water governance knowledge. A change at the knowledge acquisition (epistemological) level is necessary in order to move towards a post-positivist agenda that opens new ground and fills the gaps in positivism. The framework provides alternative theoretical lenses, infuses novelty in the decision-making processes and focusses on theory that simplifies reality, and makes a huge volume of data interpretable. It is also central to policy processes and informs decision-makers’ choices. A positivist paradigm tends to have blind spots and the uptake of panaceas in the policy processes can occur. The paradigm referred to is a pattern, model or perspective assisting in organising and guiding research, and it concerns the key assumptions and how to best understand them.

The way forward would involve taking Thomas Kuhn’s ‘The Structure of Scientific Revolutions’ into consideration. Alternatively, a fuller picture is needed than that presented by positivism, such as normative aspects. It is possible to have an amalgamation of positivist and post-positivist thinking. In order to move beyond the current situation it is necessary to develop a progressive framework based on two post-positivist ideas or theories: agential power or the capacity to influence policy, and governability.

The progressive assessment framework is based on two organising questions:

- Who are the actors, what makes them act and what are the consequences?
- What causes change in nature and what are the impacts on society?

In addition the dominant theoretical paradigms that underpin research and practice should be ascertained in order to identify the paradigms at play around the issue and the policy processes to address the issue. Sub-questions would be aimed at identifying how problems and recommendations are framed within research and around the issue in terms of seeing, explaining, measuring and

proving (positivism) or through observing and assessing ideas, understandings and interests for decisions and actions (post-positivism).

The next step in the framework would be an assessment of agential power, by asking questions about:

- Thinking and Acting/Ideological Power
- Trade and Money/Economic Power
- Strength and Authority/Political Power
- Relationships/Interaction.

The framework also assesses governability by looking at:

- The diversity, dynamics and complexity
- Ways of governance
- Images, instruments and action
- Orders of governance.

Progression or moving forward is also accommodated in the framework, by continuously asking:

- What is missing within scientific domains and especially in the way knowledge is constructed?
- What is the state of the art around epistemological and/or theoretical developments?
- Which theories or paradigms can be converged for infusing policy debates through scientific variation?
- Is the governance system invested with panaceas?
- Is this assessment framework becoming a panacea?
- How do different role players perceive the policy issue; simple, complicated, complex, chaotic or disordered?

**Dr Junaid Alam Memon, Pakistan Institute of Development Economy, Pakistan – Emerging issues in the implementation of irrigation and drainage sector reforms in Sindh Province of Pakistan (JA Memon and U Mustafa)**

A treaty between Pakistan and India on shared water resources from the Indus River marked the beginning of the construction of irrigation infrastructure, which raised challenges as the users paid very little towards the operation and management of the system. Challenges in terms of the equitable distribution of irrigation led to corruption and bureaucracy on the part of large land owners that were politically influential and used water to gain access to power.

Policy-makers realised that participation in WRM by farmers and other water users was an essential element in resolving the issues and recommended institutional reforms in Sindh Province, involving a three-tier system: Provincial Irrigation and Drainage Authorities, Area Water Boards (AWBs), and Farmer Organisations (FOs) and Water User Associations.

Pakistan has claimed that its Sindh Province has one of the largest irrigation networks in the world. The system irrigates 95 per cent or about 5.2 million hectares of farmlands through 14 canals, 1446 distributaries and 45000 water courses.

Recently, the Pakistan government commissioned a study to assess the efficiency and impact of the institutional reforms in the water sector. The methodology of this study included a descriptive analysis of more than 350 FO profiles, face to face and telephonic interviews with the Sindh Irrigation and Drainage Authority (SIDA) and other irrigation officials, informal discussions with FO management committees and a literature survey.

In terms of the overall implementation of institutional reforms in Sindh Province, the study found that only the Provincial Irrigation and Drainage Authority, 3 of the required 13 AWBs (Nara Canal AWB, Left Bank Canal AWB and Ghotki Feeder AWB), and 338 of the required 1400 FOs had been established. About 16 FOs had been formed outside of the three AWBs, primarily through the intervention of NGOs. No progress with regard to the establishment of water governance institutions had been made since 2009 and the formation of the regulatory authority was not yet complete. About 259 FOs have assumed responsibility for irrigation and drainage management through formal

agreement, involving the distribution of water and the formulation of water charges, keeping 40 per cent of the charge for maintenance costs and giving 60 per cent to the relevant AWB.

Several government and non-government agencies were involved in the formation of FOs between 1998-2009 including SIDA, On-Farm Water Management, the Oxford Committee for Famine Relief and the International Water Management Institute. Both large and small land owners are included in the FOs but farmers who do not own land are excluded from membership of the FOs. It was found that about 40 per cent of the largest landholders, 19 per cent of the small landholders and 1 per cent of women farmers were members of FOs. The majority of women farmers and small land holders did not participate on FO management committees, and most of the committees were chaired by large landholders.

It was observed that, as the demand for institutional reforms had not been generated by water users and managers, the implementation of the reform process was half-hearted, and water users were generally ignorant about drainage. The project approach to the formation of FOs was found to be unsustainable and SIDA was partly responsible for the lack of social mobilisation and FO formation. Even though some of the findings of earlier research that cautioned about an institutional reform process, authorities had gone ahead with the implementation of the process.

Further topics for research were identified, including:

- Determinants of equitable irrigation distribution, channel maintenance and cost recovery.
- Re-evaluation of the prospect of participatory irrigation management in the context of local power structure.
- Determinants of the willingness of water bureaucracy in supporting the institutional reforms.
- The capacity and willingness of farmers to manage the system.

#### **SESSION 7: MULTI-LEVEL WATER GOVERNANCE AND ADAPTIVE MANAGEMENT / THE ROLE OF INTERNATIONAL PRESCRIPTION OF WATER GOVERNANCE. CHAIR: MS RUTH BEUKMAN (GWP)**

**Dr Elke Herrfahrtd-Pähle, German Development Institute (*Deutsches Institut für Entwicklungspolitik*) (DIE), Germany – Keynote address: Catchment management as a means for increased spatial fit? The implementation of IWRM in South Africa**

Dr Herrfahrtd-Pähle cancelled her participation in the conference due to illness. The abstract of her paper is included for the sake of completeness.

#### **Abstract**

Since the 1990s Integrated Water Resource Management (IWRM) is widely acknowledged as guiding paradigm for water resource management and governance. Among other things IWRM calls for the management of water resources along hydrological boundaries, i.e. river basin or catchment management. It assumes that a close (spatial) fit between institutional arrangements and the resource they manage serves to increase effectiveness. In line with this, a number of countries transform their water management regimes towards river basin management, among them South Africa.

Starting with an overview of the goals of catchment management, this paper illustrates how the concept has been implemented in South Africa – a country which has been lauded for its state of the art water law, but currently struggles with its implementation. The example shows that implementing 'pure' catchment management is almost impossible due to the nature of the resource. Trade-offs exist between (1) a correct classification of Water Management Areas along hydrological boundaries (which is sometimes difficult to achieve) and (2) "boundaries" of social organisation such as a feasible size for effective management, meaningful stakeholder participation and financial viability. Furthermore the improved spatial fit of the institutional arrangement and water resource boundaries is to the detriment of interplay, i.e. increased needs of coordination and cooperation arise between water management organisations at different levels and scales. These difficulties are reflected in the current discussion of the viability of catchment management in South Africa and a reduction of the number of Catchment Management Agencies (CMAs). The paper intends to provide a contribution to this discussion. It concludes that catchment management (and thus an increased spatial fit) has a role to play in water resource governance. A premature return to administrative boundaries of water governance would imply other trade-offs and needs for increased coordination. However, besides the

hydrological dimension there is a need to acknowledge the social and natural dimensions of water governance. These include the political economy of reforms and economic considerations as well as environmental dynamics, e.g. in the context of climate change.

### **Mr Ashwin Seetal, SSI Engineers and Environmental Consultants – Compulsory licensing case studies: first lessons**

Mr Seetal presented on compulsory licensing case studies and lessons learned. He mentioned the complexities involved in water legislation in South Africa, specifically with regard to the implementation aspects, compulsory licensing being one of them.

It is now more than 14 years since the promulgation of the National Water Act (NWA) (No.36 of 1998). At the time, the NWA was lauded internationally as “state of the art” legislation. However, there has been a slow implementation of key interventions, for example, compulsory licensing.

The objective of compulsory licensing (NWA sections 43–48) is the creation of a uniquely South African process that epitomises the implementation of Integrated Water Resource Management (IWRM) and the NWA. It will be an intervention mechanism that aims to achieve four goals: fair water allocations for equity and to address stressed systems; promotion of the beneficial use of water in the public interest; facilitation of the efficient management of water; and the protection of resource quality. Compulsory licensing is both a proactive and reactive water resources management tool.

The question is whether compulsory licensing is a panacea for all water management problems. Mr Seetal said that it probably is, but ‘why use a sledgehammer when a claw-hammer will do?’

The study premise is that a licence is the basic unit for all water allocations. How licences are issued has a significant bearing on achieving the objectives of compulsory licensing mentioned above. There is a key conflict of interest in allocating and managing water resources among existing competing users and potential new users in redressing past imbalances, and ensuring sustainable and productive use of water resources. The challenge is to create, promote and maintain an enabling environment for all stakeholders to engage in IWRM and the water allocation reform process in a *constructive* manner. All water allocation processes are underpinned by public engagement to varying extents. Many activities either precede or run concurrently with compulsory licensing. These include inter alia: registration of existing water use; verification of existing lawful use; national water resource strategy (NWRS) and catchment management strategies (CMSs); classification of the water resource; setting the resource quality objectives; reserve determination; international and strategic obligations; and resource availability for allocation.

### **Early approaches to compulsory licensing**

Original work-flow processes were developed in 2001-2002, including the Perkins and Wessels Model, May 2002, which was a comprehensive process with a number of linkages and cross-linkages. Importantly, this model identified the building blocks that needed to be in place before compulsory licensing could commence. A team was created for the Implementation of the National Water Act (TINWA) Model 1, Version 4, July 2002.

The approach was very systematic, methodical, generally linearly structured and DWA-centric, with a number of discrete DWA line-function inputs at different phases of the process. The pre-requisites were a very high coordination requirement (singular vision); commitment and accountability for input requirements; and no single line-authority. The implementation time-lines were out of sync with reform implementation demands and the process design resulted in isolated outputs; it required consolidation for stakeholder communication and engagement purposes. Implementation was envisaged over a 20-year timeframe.

### **Revised approach to compulsory licensing**

Compulsory licensing was one of several tools within a bigger Water Allocation Reform (WAR) programme toolkit – basically, the ‘sledgehammer’ in the box. It was structured into phases, with compulsory licensing within one of the phases. The building blocks for compulsory licensing were placed in earlier preparatory phases, as it was recognised that the timing for completion of critical

building blocks (CMA, CMS, resource directed measures, water availability assessments and water resource modelling, WC/WDM strategies) were not synchronous, and should not delay compulsory licensing implementation. There was acknowledgement of the many linkages and associated complexities with processes outside the water sector, but there was attempt to package these in a systematic, methodical and less confusing way.

The approach included several disciplines (technical, social, environmental, legal, administrative) and was designed to be meaningful, practical and less complicated. The aim was to minimise the capacity/resource burden on the DWA, other role-players and stakeholders. Intensive inter-governmental collaboration and stakeholder engagement took place, and empowerment processes were outlined, such as addressing the transformation and service delivery agenda. Compulsory licensing was a point of focus for water management implementation.

A comparison was performed across various parameters in terms of the early and revised approaches. The parameters are process complexity; resource and competence requirements; overall management requirements; process design and structure; framework robustness (conformity to legislative requirements); implementation flexibility; process inclusivity risks and (DWA internal and external stakeholders). Differences were especially apparent for three of the parameters, as indicated in Table 2.

**Table 2: Differences between the early and revised approaches**

Parameter	Early approach (1998–2003)	Revised approach (2002–2007)
Process design and structure	Structured Generally linear and webbed DWA-centric	Structured Phased Input and feedback-oriented
Implementation flexibility	Low: All preparatory processes to be in place before compulsory licensing commencement	High: Recognises preparatory processes at different stages of completion; implementation commencement dependent on process risks analysis
Process inclusivity risks (DWA internal and external stakeholders)	High	Low

Since 2003, projects were initiated in several catchments and areas around South Africa and preparative steps commenced. However, it was only in 2010 that the first formal announcements of compulsory licensing were gazetted for the following three geographic areas/catchments:

1. Tosca Molopo in the Lower Vaal Water Management Area of the North-West Province
2. Jan Dissels in the Olifants-Doorn Water Management Area of the Western Cape
3. Mhlathuze in the Usutu to Mhlathuze Water Management Area in KwaZulu-Natal.

### Case-study lessons

#### ***Mhlathuze***

On the positive side there were a few ‘anchor’ members of the project team. On the negative side, there was a lack of project continuity, and stakeholder frustration with a stop-start project and incomplete processes. There were raised expectations by HDI stakeholders regarding the process benefits, and the sincerity of participants was in question; the extensive early principles and proposals were in large part subsequently disregarded. Overall, there was general cynicism about the participants’ commitment to compulsory licensing.

#### ***Jan Dissels***

On the positive side there were a few ‘anchor’ members of the project team. On the negative side, there was a lack of project continuity (including preparatory phase projects), and a high turnover of project staff. The extent of analyses did not match the expected economies of scale for the size of

catchment and number of users. Overall, there was general cynicism about the participants' commitment to compulsory licensing.

### ***Tosca Molopo***

On the positive side there was early engagement with stakeholders, unlawful water uses were addressed, voluntary formal agreements were made among stakeholders, and there was an open relationship between regulator and stakeholders. On the negative side, there was a lack of project continuity, a high turnover of project staff, and a slow project close-out in terms of issuing the licences. Overall, there was general cynicism about the participants' commitment to compulsory licensing.

The case studies revealed that it is essential to scrutinise the reason for invoking compulsory licensing. Local/regional involvement is crucial, as generally it was found that there was inadequate internal buy-in. Early external stakeholder engagements are critical. A regular and concerted communications campaign is vital, as is visible project support and cooperative governance.

The current (revised) process is in line with Draft NWRS 2 proposals and recommendations for implementation. It is a multi-disciplinary, integrated programme with initial high resource competency requirements. The issues emerging from the case-studies are not insurmountable, but calculated risks must be taken to fast-track implementation. The establishment of a high-level DWA programme management and implementation unit is recommended as is a bold and new communication context.

### **Discussion**

**Dr Barbara van Koppen (International Water Management Institute [IWMI] / WRC Board):** 60 to 70 licences equates to less than 1% of South African settlements in areas with many small-scale water users. It appears as if the previously existing informal entitlements of historically disadvantaged groups are being disregarded, and there is now a concentration of legal entitlements in control of water. The informal rights already existed; now discriminatory licences and administrative systems are being imposed.

**Mr Ashwin Seetal (SSI):** In all the compulsory licensing projects, issues of race and gender redress, small-scale, subsistence-level and small-livelihood-level use are addressed as part of the allocation plan. Those that had previous entitlements had to cut back, as in the case of Tosca. Opportunities for empowerment of HDIs and communities are taken into account; not all water is allocated – some is set aside for redress.

### **Dr Magalie Bourblanc, CIRAD/CEEPA/University of Pretoria – The international dissemination of policy norms in the water sector: the South African National Water Act as a case in point?**

Dr Bourblanc from Agricultural Research for Development (CIRAD) and the Centre for Environmental Economics and Policy in Africa (CEEPA) presented the international dissemination of policy norms in the water sector, saying that transition of the water sector in South Africa would not be easy.

Many observers believe that the South African NWA (1998) is experiencing an implementation gap. This seems especially true for the CMA establishment process. Almost 15 years after the Act was created, only two out of the planned 19 CMAs are functional and report annually to the minister of Water and Environmental Affairs (DWAE 2011).

The study attempts highlight the implementation gap to better understand it through the study of the international transfer of policy norms.

The Ecological Reserve as the only water right is an ambitious act from an environmental perspective, in a country whose priority challenge is to redress past inequalities in access to water. The decision has been made to create decentralised river basin organisations in a country where, since the 1950s, most of the rivers are interconnected through massive inter-basin transfers.

In terms of how water resources have been managed in South Africa over the past 60 years, a large number of rivers have been diverted to cater for water needs in deprived areas. One might think that introducing river basin organisations in the country is a huge challenge, because river basin

boundaries mean so little. A question arises as to what extent the introduction of such provisions might be linked to the influence of international norms and so-called “best practices” on the NWA.

There is a strong influence of international actors on policy norms. It is an interesting issue to reflect upon, as the introduction of international policy norms in countries can be ill-suited and does not always take the local context into account.

The research question focuses on the international/transnational dissemination of policy norms, paying particular attention to knowledge production and diffusion at both international and national levels. It asks: How did these two provisions (Ecological Reserve and CMA) get introduced into the National Water Act?

One of the objectives of looking at the international diffusion of policy norms is to try to highlight and better understand the implementation gap of the NWA in South Africa. Another objective is to assess whether there is a ‘South-North’ policy transfer of policy norms in terms of an ecological reserve. The literature revealed that South Africa does have a degree of influence on the United Kingdom, Australia, Tanzania and others in terms of the concept of an Ecological Reserve.

## **Discussion**

**Ms Noxolo Ncapayi (DWA):** I disagree with your assertion in your empirical puzzle that the ecological reserve is the only water right. The only right that we talk about is the ‘reserve’ which incorporates both basic human needs and the ecological reserve. You talk about equitable access to water. There is a hierarchy in terms of the allocation of water. It starts with the reserve, then goes to schedule 1 use, then general authorisations, and then to water for strategic use. Equitable access to water needs to be understood in conjunction with that hierarchy. When the rural services act of 1997 was developed, there was a focus on addressing access to basic human needs and services, such as access to clean tap water.

**Dr Magalie Bourblanc:** There is a small mistake on the slide: ‘The Ecological Reserve as the only water right’ should read ‘The Reserve as the only water right’. However, my point about a paradox is still valid. In the National Water Act, South Africa clearly attempts to address the problem of inequality redress, but the ecological reserve is still part of the reserve, which is very interesting. On top of the huge social challenge, South Africa has also introduced an extremely progressive environmental provision, unlike other developing countries.

**Mr Alexis Carles, National Fund for Scientific Research (FNRS), Belgium – From regional to global powers: building legitimacy. The cases of Brazil, China, India and South Africa on trans-boundary water resources**

International politics currently face a twofold evolution: on the one hand, emerging actors, such as regional hegemony constantly challenge the global balance of political power, while on the other hand, nation-states are no longer the sole decision-makers of international relations.

The study analyses how emerging regional hegemony react to the resulting hypothetical shifts of political authority (to lower or higher levels of decision-making) implied by this situation. The study shows how a selection of powerful states ensure their interests, though with very different behaviours towards their neighbours, and thus with very diverse consequences on their regional political legitimacy as leaders.

There is a ‘double’ reality: the Emergence of regional hegemony, and the shifts of political authority from states to other levels of decision-making. The research question is based on this evolving double reality. To be perceived as legitimate, entities should be at a regional basin level. The research studies how these powerful states react in the face of regional (and global) political authority shifts.

The study examines the behaviours of Brazil, China, India and South Africa on case-specific shared trans-boundary water resources (TWRs):

- China on the Mekong river basin
- India on the Ganges-Brahmaputra-Meghna river basin
- Brazil on the La Plata river basin

- South Africa on the Orange river basin.

The study methods involved water-related events' data analysis and a detailed literature review of those events, analysed through the lens of power and hegemony theories (Table 3). Study sub-questions:

1. Do they participate actively in the events in their respective basin?
2. How do they participate? What is the main strategy they use? Do they act unilaterally? Do they provide leadership?
3. How do they react to (existing or hypothetical) multilateral cooperation schemes at the basin level? What type of agreements do they favour?
4. What type of hegemon are they? On the basis of those findings, how did we characterise their hegemony at the basin level? Why?
5. How do they react to the development of customary international water law? Is it coherent with their attitude at the basin-regional level?

**Table 3: Study results**

Indicator	China	Brazil	India	South Africa
1. Participation	Low	Moderate	Very high	Very high
1. % Cooperative events on the basin	84%	81%	67%	86%
1. % Conflictive events (hegemon included)	High	Moderate	Very high	Very high
2. Main participation strategy	Resource capture	Integration	Containment	All three
2. Any unilateral actions?	Yes	No	Yes	Yes (through co-optation of Lesotho)
2. Any leadership?	No	Yes	No	Yes
3. Type of agreements favoured	Bilateral	Both	Bilateral	Bilateral
3. Behaviour toward basin-wide cooperation	Limited involvement	Positive	Negative	Positive
4. Type of hegemony	Restrictive	Benevolent	Controlling	Omnipotent
5. Vote on UN 1997 convention <sup>1</sup>	Against	For	Abstained	For
5. Signing/ratification of the UN 1997 convention	No	No	No	Yes
5. Coherence: regional vs. international levels	Yes	Partial	Yes	Yes

<sup>1</sup>Convention on the Law of the Non-Navigational Uses of International Watercourses

There are two very different upstream hegemons. Midstream hegemons use more power resources to compensate their riparian position. Bilateral agreements can be very cooperative, but they can also become a central strategy for maintaining and consolidating hegemony. India and China are far from being perceived as legitimate regional hegemons (on TWRs). Brazil, however, seems to be a legitimate leader on the La Plata river basin. The case of South Africa is more complex. Now that it has ensured satisfactory water allocation through the Lesotho Highlands Water Project (LHWP), it is more inclined to cooperate multilaterally with its riparian states, and its attitude progressively becomes one of a legitimate leader.

## **Discussion**

**Ms Nora Hanke (University of Stellenbosch):** Did you look at the dependence of the hegemons on these rivers, in terms of cooperation vs. conflict? If a country is highly dependent on the shared river flow, does it tend to secure water more through the threat of military invasion, or is there a tendency to be more cooperative? Did you consider correlations between type of hegemon, dependence on water flow and their approach to securing water?

**Mr Alexis Carles (FNRS):** A limitation of this research is that it did not look at the degree of dependence on the water supply by the hegemon or its riparian states. Even if the hegemon does not require much water, or require it immediately, it will always be a concern due to being in the basin. If upstream and downstream states urgently need large amounts, hegemony generally strive to remain involved. For example, the Mekong river is not China's most important river. For downstream countries, such as Thailand and Laos, there is a tendency to actively work together, which is why China stays involved. Although China does not have an immediate need for the water, it controls access to it. I did not quantify levels of dependency; that might be an area for future research.

#### **Mr Dawid Bosman, TCTA – Integrated water resources management: towards large-scale desalination in South Africa**

Mr Bosman presented the move towards desalination in South Africa using four international examples. The topic of desalination was only obliquely aligned with water governance policy; it represented a pragmatic, hands-on view of the strategic landscape currently under focus. The rationale for the study tour was provided by the fact that the DWA 'recognises desalination of a variety of waters as an important current and future source of water'. The National Desalination Strategy earmarks Trans-Caledon Tunnel Authority (TCTA) for roles in financing and implementation of large-scale desalination projects, and for hosting a centralised hub of knowledge in this field. TCTA has committed to establish the knowledge hub.

During June 2012, TCTA visited Australia and Singapore to study large scale desalination and reuse projects, and water resilience in general. Australia was selected due to the fact that, since 2006, Australia has launched six major desalination projects, in five cities, mainly in response to the drought of 2003-2010 (the 'Millennium Drought'). The aim of the study tour was to gain a broad learning of the key elements of large-scale desalination projects, inter alia: considerations relating to feasibility and site selection; considerations around institutional arrangements and procurement processes; financing options; and regulatory approval and environmental considerations.

#### **Gold Coast desalination plant, Brisbane**

Project issues relating to quality and specification were detailed in a report by WaterSecure to Queensland government in July 2009: plant life expectancy may be compromised; methane releases from the landfill site; Numerous corrosion issues; leakages due to pipe thread incompatibility; sub-standard materials, and poor application of "value-engineering" solutions; excessive vibration of energy-recovery devices; contaminated groundwater intrusion due to poor civil works; and no proof that the marine tunnel can be drained, due to concerns over the quality of marine works.

#### **Port Stanvac desalination plant, Adelaide**

The project was characterised by a robust approach to procurement, consistent political support and intensive community involvement. An interpretive centre allows public education. There is a robust approach to transparency and public communication, and the project appears to have avoided many of the earlier mistakes that were made.

#### **Kwinana desalination plant (Perth 2)**

Kwinana is a relatively problem-free project. It is Perth's single largest water source (17%) (and will be surpassed by the Southern plant). Western Australia is a largely arid region, with a long history of water constraints. It appears that public acceptance of desalination was relatively easy. The project is characterised by setting the standard for environmental approval procedures, and a very intensive on-going ocean monitoring programme.

#### **Southern Desalination project (Perth 1)**

Many lessons from Kwinana were taken into Southern Seawater Desalination Plant (SSDP) Phase 1, and then from Phase 1 into Phase 2. Engagement with the affected community was exemplary. The "competitive alliance" procurement approach appears to yield very positive results.

## Summary of lessons learned:

- Water resource diversification: develop a portfolio of reliable water resources, including sea water desalination and/or wastewater reuse, to minimise the dependence upon surface resources (i.e. establish climate independence).
- Prioritise wastewater reuse: where possible, pursue wastewater reuse options first. This leads to much lower capital and operating costs. 'Fit-for-use' principle: recycled water can substitute potable water through dual reticulation systems or irrigation schemes. Consumer education is essential.
- Procurement models (Cont.): Australian projects favoured an "Alliance" approach, through a "Design, Build, Operate, Maintain" (DBOM) model, characterised by rigorous evaluation and dual-stage elimination of competitive bids: Alliance philosophy: collective responsibility for risks, equitable sharing of risks and rewards, and alignment of commercial interests. The approach requires a mature business environment.
- Stakeholder management and public participation is extremely important - desalination projects often attract fierce criticism on grounds of (inter alia) environmental concerns, tariff escalations and conflicting priorities. An approach based on the following seems effective: engage and consult; educate: promote science, not quasi-science; be transparent; communicate often and clearly; and listen, respond and act.
- Site selection: complex considerations with a long-term impact: proximity to power, water and transport grid; site elevation; comprehensive and extended period of sea water characterisation; prior utilisation of site; geo-technical survey; and characterisation of off-shore currents. All implications are quantified and modelled for net present value (NPV) comparison.
- Design and engineering: know and understand the available technology, and how it suits the specific project (e.g. matches the feed water characteristics), when going to the market. Metallurgical specification and "value engineering" solutions should be implemented with caution. Sub-standard civil works, especially on marine intake structures, are very hard to remedy later.
- Achieving value for money: capital and operational efficiency can vary, depending on how well the project is designed and executed. Site selection, permitting/approval, appropriate specifications, alliance partner selection, community engagement and diligent procurement are all key factors. Benchmarking demonstrated how some of the later Australian projects achieved greater efficiencies through learning from the mistakes of the earlier projects.

"...the biggest risk in the desalination business is not technology or operations – it is on the demand side. If a water agency contracts a desalination plant it does not use, it ends up wasting a whole lot of money, no matter what happens." (Christopher Gasson, GWI Publisher, Oct 2012)

Table 4 shows the top ten desalination disasters, as classified by the Global Water Intelligence

**Table 4: The Global Water Intelligence (GWI) top ten desalination disasters**

Rank	Project	Comment
1	Wonthoggi, Australia	\$1bn additional Engineering, Procurement & Construction (EPC) costs
2	Hong Kong	A big stand-alone Multi-stage Flash (MSF) plant which never ran
3	Carboneras, Spain	Farmers failed to pay for the water
4	Tampa Bay, Florida	Foul-up on the EPC contract
5	Carlsbad, California	Nearly a decade in permitting
6	Ad Dur RO, Bahrain	Pre-treatment failure
7	Point Lisas, Trinidad	EPC costs spiral, and parties dispute
8	Santa Barbara, California	Rained off
9	Jeddah 1 MSF, Saudi Arabia	"Acid attack"
10	Palm Jumeirah, United Arab Emirates	Demand miscalculation

South Africa will enter the large-scale desalination market, probably within the next three-five years. The understanding of such projects, and the capacity to procure them, needs to be developed now. Even in advanced environments, and despite mature technologies being employed, expensive lessons are still being learned. The challenge is to anticipate and avoid such lessons locally. The study of both failures and successful projects will continue, and culminate in a knowledge hub.

## **Discussion**

**Dr Bloodless Dzwauro (Durban University of Technology):** (To Dr Bourblanc) Could you please explain who or what benefits from the results of your study – is it the environment, developers or country?

**Mr Andrew Pott (DHI):** (To Mr Seetal) (1) With regard to compulsory licensing, looking at the gazette, irrigation will be curtailed by 40%, but no mention is made of the assurance of water supply. How can water users access that information? (2) Is any form of compensation payable?

**Mr Johnny Beumer (Aurecon):** I have a comment on Mr Seetal's presentation. Mr Seetal showed us the programme for the 20 years from the time of the first edition of the NWRS. At that time I was also part of the project, and it was supposed to be a wall-to-wall strategy. In hindsight, I believe that 20 years was too ambitious. We have realised that compulsory licensing is less appealing than we initially thought it was. There are many interventions that could be considered before compulsory licensing, for example, Water Demand Management (WDM), Water Conservation/Water Demand Management (WC/WDM) and the removal of alien plants. Compulsory licensing has a very long lead time. The processes of verification and validation take around three to four years. The entire compulsory licensing process takes around eight to 10 years. Is it that appealing an intervention? I don't think that we should consider a wall-to-wall compulsory licensing solution.

**Dr Magalie Bourblanc:** In terms of the benefits of the study results, I am trying to highlight to what extent we can explain the implementation gap in the policy of South Africa by the fact that maybe the policy norms due to be implemented were designed by international actors. Therefore maybe those policies provisions were not adapted to the national context. The study could help to better understand the implementation gap.

**Mr Ashwin Seetal (SSI):** (To Mr Pott) (1) After the compilation of the proposed allocation schedule, many intensive stakeholder workshops took place. Stakeholders were able to have first-hand discussions with the team on how the assurance of supply was factored into the modelling for the different stretches of catchment where allocations were made. (2) The act provides for curtailment compensation, but it depends on the reasons. There may be cases where compensation will not be paid.

(To Mr Beumer) As to whether compulsory licensing should be implemented on wall-to-wall basis, I agree that there are other tools that could be used.

**Dr Harrison Pienaar (CSIR):** I have a few comments on the various presentations. In terms of the presentations dealing with some of the empirical questions as far as legislation is concerned, it may be good idea for South Africa to start highlighting and packaging the implementation successes experienced since 1994.

The presentation by Mr Carles was interesting, but it is also important to look at the economies of scale between the case-study countries, as well as the socio-political landscape. It would have been interesting to see what the trends would be had Russia been included in the study as a BRIC country.

Desalination is energy intensive, but it was interesting to see how the desalination experiences of Australia compared with those of other countries, such as Saudi Arabia, Israel and others. It is interesting that desalination was the option chosen out of all the possible options, even in drought situations. The presentation highlighted some hard lessons learned that South Africa should take into account. Looking forward, it appears that desalination is an option worth considering, amongst others.

**Mr Tendai Saunyama (IWR Water Resources):** (To Mr Seetal) I wondered if you have had similar experiences to ours: we have different departments dealing with licence applications, and in some situations, people apply for a licence, but are supposed to do an environmental impact assessment (EIA). So, for example, Water Affairs might grant a licence, whilst unaware that the EIA has not been done. There is little coordination between ministries and departments.

**Mr Ashwin Seetal (SSI):** Your question warrants a lengthy discussion, but in brief, in terms of commercial and forestation licences, there are stream-flow-reduction Licence Assessment Advisory Committees (LAACs). The committees are made up of provincial and national members who come together to assess compliance with legislation and to identify gaps. However, much of the success of implementation is dependent on the officials at a local level, and their capacity for facilitation and coordination. Ideally someone from the department should respond to your question, but based on my experience, although we need national coordinating committees, it is important that coordination happens at a local level.

**Mr Ivor Hoareau (DWA, Durban):** There were problems in past when certain steps were skipped, but there are several checks and balances in place now. A licence will not be issued if the boxes are not ticked. However it does sometimes become a circular process, with multiple departments waiting for information one another. To my knowledge though, no licence would be issued now until an EIA has been granted.

**Ms Ndileka Mohapi (DWA):** (1) As Mr Hoareau said, a licence would not be granted without EIA. In terms of procedure, an alignment process is taking place between the Department of Environmental Affairs, DWA and the Department of Minerals to assess issues such as EIAs and also the long waiting times for application processing. There should be one entry point into the system, and a means of checking that all the steps have been addressed. (2) Dr Bourblanc's response to an earlier question from Ms Ncapayi revealed a lack of understanding. If you talk about the reserve and basic human needs it relates to social elements. In terms of basic human needs we have stipulated a minimum amount, not a maximum amount. Your conceptualisation misses some of the issues, particularly in terms of social inequality. On the other hand, one can't say that ecology is of less importance; the two have to be balanced.

## **SESSION 8: WATER – FOR EVERYONE AND EVERYTHING**

**Chair: Mr Desigen Naidoo, WRC**

### **Mr Mike Muller, National Planning Commission – The role of water in development**

South Africa's challenge in respect of development and water and its response to these challenges have some relevance to other countries.

Water security is increasingly used as a goal around which the water sector is focussed. One of the definitions of water security is '...the reliable availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.' The definition captures the destructive floods and droughts, as well as the important broader environmental and biodiversity goals. It is necessary to recognise that water resources are a critical enabler, or a constraint for most economic activities and social needs.

Water resource development and management supports societies. Most South African rivers have variable flow, while activities along rivers depend on a reliable flow and are exposed to potential flooding. Management interventions even out, reduce or increase the flow and minimise the impacts of flooding without destroying the environment or biodiversity. More investment, greater productivity and social benefit result from these interventions. Water is not the only factor that contributes to growth and development of society. Other factors include people, the environment, institutions, land and finance. These factors can be constraints or enablers. Contrary to current expectations water and WRM alone cannot deliver poverty reduction or equity.

The National Development Plan (NDP) considers implications for the water sector. It has been very widely consulted, adopted by Cabinet and Parliament, and all political parties have expressed their support for the plan. The core objectives of the NDP are elimination of poverty and the reduction of inequality through:

- Uniting South Africans of all races and classes around a common programme to eliminate poverty and reduce inequality
- Active participation of citizens in their own development, in strengthening democracy and in holding their government accountable
- Raising economic growth, promoting exports and make the economy more labour absorbing

- Focusing on the key capabilities of people and the country: skills, infrastructure, social security, strong institutions and partnerships both within the country and with key international partners.
- Building a capable and developmental state
- Strong leadership throughout society, working together to solve our problems.

The NDP's cycle of development illustrates that strong leadership, effective government and active citizenry working together will create the conditions, the opportunities and the capabilities to grow employment, reduce poverty and raise living standards to achieve a degree of social cohesion.

The importance of water for development is widely recognised and the National Planning Commission regarded water as one of the key factors in development from the onset of its discussions. The water sector regards itself as playing a central role in development. Water is addressed in all the sections of the NDP and extracts from the NDP illustrate the practical role of water resources in development, and possibly water services.

It is common knowledge that South Africa is a resource-intensive economy that is based on wealth gained from natural resources that are not renewable. Equally, many of the country's resources, such as water, are renewable and must be used well if the country is to achieve the goals of its society. It is necessary to recognise the history that structurally binds the country to an economy that is based on the exploitation of its natural resources rather than its people and its knowledge. Water is part of a general problem faced as a resource dependent economy.

In terms of the key drivers of change in relation to environment for employment and economic growth, the NDP states that there are binding constraints on growth, investment and employment creation and suggests that these must be addressed much more rigorously and systematically than they have been to date. The most urgent examples include energy generation and distribution, urban planning approval processes, water supply and waste-water management, the logistics platform, telecommunications, licensing for water and minerals, and environmental permits.

The section in the NDP relating to climate change, states that, 'The effects of the planet's warming are felt mostly through water - storms, floods and inundations, droughts and desertification, and rising sea levels....'. If today's variability can be managed then it will be possible to manage change tomorrow. The effects of climate change will be felt mainly through water. One of the criticisms of the earlier draft of the NDP was its strong focus on climate change and carbon and its weaker focus on the environment in general. This has been taken into account in the final version of the NDP, which states that the challenge in the next two decades will be to develop the new structure of the economy and society, helping people to adapt to new risks and challenges, and adapting land and water management to protect livelihoods. Water scarcity is going to be one of the main constraints in the future.

The NDP incorporates a section that deals specifically with water. It speaks of the current reality and explains that since 1994 a great deal has been done to take potable water to people and to a lesser extent, to improve sanitation. There has been a greater focus on the management of water resources as in institutional management rather than in infrastructure. Much remains to be done in terms of implementing broader water resource policies that address equitable allocation and protection of the resource, building infrastructure, and moderating and managing demand. There should be no delays in addressing these challenges. Parliament recently deliberated whether the progress and challenges of the past years had been sufficiently analysed to be used as a foundation for the future. Delays, such as those in issuing water licences and building of new infrastructure are undermining growth and development. These challenges need to be recognised and addressed.

While it is important to understand the past, it is also necessary to have a vision of the future. The NDP envisages that by 2030, 'effective management of water and water services will support a strong economy and a healthy environment. The country's development will reflect an understanding of available water resources and effective water planning that cuts across different economic sectors and spheres of government. All main urban and industrial centres will have a reliable water supply to meet their needs, while increasingly efficient agricultural water use will support productive rural communities. Natural water sources will be protected to prevent excessive extraction and pollution. Water will be recognised as a foundation for activities such as tourism and recreation, reinforcing the

importance of its protection. Where rivers are shared with other countries, South Africa will ensure that it continues to respect its obligations.' The NDP also presents a vision for water services.

The NDP suggests that planning for demographic changes is important especially in the face of growing pressure on food, energy and water supplies, greater population mobility, additional demands for jobs and social support, and the uncertain effects of climate change. Neglecting this nexus could result in the serious misallocation of resources and inappropriate interventions.

The NDP refers to the necessity to improve the quality of WRM in order for the country to continue its dependence on the extraction and use of natural resources over the next few decades. The financial resources gained from our natural resources are used to fund the transformation and restructuring of the economy. At the same time, it is necessary to influence the changes taking place in the country. One of the issues in the NDP's chapter on a national spatial framework refers to the need to make important political and strategic decisions about resource-critical regions, which have natural resources that provide ecosystem lifelines to the country and may require specific policies to ensure their sustainability.

South Africa is increasingly becoming an urban society and the concentrations of human settlements require the development of large sources of energy and water as well as good transport connections. These essential developments together with the urbanisation process place strains on the surrounding natural environment have serious implications for the future of water resources.

The NDP suggests that there should be an understanding of the impacts of climate change and adaptation to those changes should be factored into all the dimensions of development planning. As the NDP presents ideas and a vision for the future of this country, it is up to society as a whole to make the vision become a reality. In the commission's discussion on the implementation of the NDP it became evident that clear roles and responsibilities had to be allocated. Water is used to illustrate the general problem relating to the need for accountability and responsibility if the NDP is to be realised.

The NDP has some detailed elements. There are limits to the number of people that can live in rural areas of this country. Contrary to the advice of the water sector, the NDP contains ambitious proposals for irrigated agriculture as a means to address its primary concern about poverty reduction, equality and improved livelihoods. The plan proposes that one million new jobs can be created through structural and social transformation, application of a great deal of skill and intelligence, and substantial expansion of agricultural land under irrigation through the better use of water resources and the development of new schemes.

The NDP emphasises the importance of reviewing land, agriculture and water policies and development strategies to provide a basis for sustainable rural regeneration. The water sector alone, by allocating water, will not achieve anything. The water sector must provide creative responses to water resource development and agricultural development. In order to create one million new jobs, the NDP recommends a substantial increased investment in water resource and irrigation infrastructure where the natural resource base allows, and the improvement of the efficiency of existing irrigation to make more water available. The plan points out that there will be trade-offs and risks for agricultural expansion, presenting a challenge to the water sector. In most areas, additional water can only be made available if there is a concerted programme to improve the efficiency of existing irrigation, reallocate water and ensure that new entrants use the water effectively. This will require a substantial support programme that would best be introduced in partnership with existing farmers.

The NDP provides for a research focus supported by science and technology, and recommends that the WRC should continue its current programme to understand the potential impacts of climate change on the nation's water resources. Several of South Africa's challenges can only be addressed through regional cooperation. An important dimension of the NDP highlights areas of cooperation between South Africa and its neighbours in areas of energy, food security and water and recommends that urgent attention should be given to water scarcity and take action to promote regional production and improve resilience.

The NDP mentions that the water sector should develop new water schemes that are necessary for urban and industrial centres, the new irrigation systems in the Umzimvubu river basin and Makatini

flats, and a national water conservation programme to improve water use and efficiency. The plan uses a broad definition of infrastructure, which is as much about demand management as it is about new supplies.

The main chapter of the NDP refers to the National Water Resource Strategy (NWRS), the draft of which has been tabled for consultation, and identifies several other key institutions where urgent action is required, namely:

- A national water-resource infrastructure agency as the critical intervention
- Catchment management agencies to undertake resource management on a decentralised basis, with the involvement of local stakeholders
- National capacity to support research, development and operation of water reuse and desalination facilities
- A dedicated national water conservation and demand management programme, with clear national and local targets for 2017 and 2022, and sub-programmes focused on municipalities, industry and agriculture.

Water runs throughout the NDP and is critical to the economy and to the environment. Water is critical to urban as well as to rural areas. Through water, it is necessary to understand South Africa's relationship with the region, how WRM supports society in all its dimensions and the institutions required in order to make it work. The water sector generally and broadly, the whole institutional family, will have to play its part in understanding and supporting the national plan for development rather than continuing in the silo mentality. The NWRS draft is a beginning but the challenge is to change it into an action-oriented, prioritised and sequenced programme that will support the broader thrust of the NDP.

The NDP views implementation through integrating departmental plans and the NDP, ensuring participation from the private sector and civil society, piloting and adapting, and learning by doing. There has to be flexibility to change when there is evidence to do so and there has to be buy-in from stakeholders. Implementation will be successful if there is clear accountability.

Critical success factors for implementing the plan are:

- Focused leadership over a long period of time
- The continued assertion that this is a plan for all South Africans, and that everyone in society has a role to play in implementing the plan
- The need for institutional reform to develop a capable and developmental state
- The need to mobilise resources and agree on trade-offs
- The willingness to prioritise and the need for careful sequencing
- Clarity on responsibility in each area.

The National Planning Commission is halfway through its term, and over the next two years will:

- Mobilise support in society for the plan
- Conduct research on long term priorities
- Advise government and the broader society on implementation of the plan
- Work with relevant bodies to report progress on the targets in the plan.

The commission has offered support to DWA and the water sector generally to refine, strengthen and implement an action- and development-oriented national strategy.

### **Dr Ursula Eid, United Nations Secretary General's Advisory Board on Water and Sanitation (UNSGAB), Germany – Where to for water and sanitation? Perspectives on the international debate**

It is a well-known fact that 2.5 billion people, or 37% of the world's population, continue to lack safe sanitation, and 887 million people lack an improved source of drinking water. Many people do not have a reliable source of safe drinking water and the consequences in relation to public health, education and human dignity are incalculable. Recognising this reality and the lack of progress globally, former United Nations (UN) Secretary General, Kofi Annan, convened the Advisory Board on Water and Sanitation (UNSGAB) in 2004. His instructions to the group of about 20 people from around the world were to use all their skills, networks, knowledge and passion to advocate for

increased action and political will to reach the Millennium Development Goal (MDG) target to halve the number of people lacking access to safe water and basic sanitation by 2015.

Since 2004 the board met with Ministers of Finance, Water, Health and Education in every region of the world. Agreements have been signed with the World Bank and all the major regional development banks and with the Organisation for Economic Co-operation and Development (OECD). The African Union (AU) was encouraged to sign a declaration to accelerate the achievement of water and sanitation goals in Africa, the so-called 'Sharm El-Sheikh Declaration', and the UN member states were encouraged to declare 2008 the International Year of Sanitation. The objectives of UNSGAB are captured in the Hashimoto Action Plan, which bears the name of the first chair of the board. The current chair is the Prince of Orange. The plan distils numerous existing agreements and declarations into a set of actions for financing, monitoring, sanitation, integrated water resource management (IWRM), and water and disaster. The MDG is at the centre of the work.

Established in 2000, the MDGs set time-bound targets for health, education, poverty reduction and maternal mortality. In March 2012, UN Secretary General Ban Ki-Moon announced that the MDG drinking water target had been met. This is one of the first MDG targets achieved by the international community. This news is encouraging as 2 billion people have gained access to drinking water and drinking coverage globally increased from 76 per cent in 1990 to 89 per cent in 2010.

These figures are considered in the context of the growth of the global population by 1.6 billion people in recent years. Virtually all the growth has taken place in developing countries. This means that drinking water coverage has kept pace with the population growth and has exceeded it by 25 per cent, a testament to the dedication, perseverance and sheer will of countries and their leaders working alongside individuals, utilities and communities. For many reasons this should not be declared a victory. It is evident that any global target will mask certain regional disparities and social inequities. Half of the individuals gaining access to drinking water live in China or India, and only eleven of the fifty countries in sub-Saharan Africa have met the MDG drinking water target, a particular challenge to countries that started from a low baseline in 1990 and experienced high levels of population growth. An astonishing 275 million people gained access to drinking water, amounting to an average of 37 000 people gaining access each day during the last 20 years in sub-Saharan Africa. There is reason to celebrate the enormous efforts of African leaders, professionals, civic associations, grass-root activists to bring this essential service to the people.

How equitable is the increased access to drinking water? When the figures are examined, a dramatic story of inequity is revealed. In many developing countries, the richest 20 per cent of the population enjoy almost universal coverage, while the poorest 20 per cent of the population have pitiful coverage. It is women and girls who bear the brunt of the inequity as the main carriers of water when it is not conveniently available in their households. Many lack this luxury. This is the partial motivation for the adoption of a UN resolution recognising safe drinking water and basic sanitation as a human right essential to the full enjoyment by all. There is also reason for caution as water quality has not been possible to measure globally. The indicator, the use of improved sources (meaning the availability of provisions that are not contaminated), has been used as a proxy for access to safe sources. While it is known how many people have access to drinking water it is unknown whether the water is safe to drink. In fact, studies have determined that a significant number of improved sources are not safe for human consumption due to poor maintenance or poor construction. Drinking contaminated water begins a cycle of ill-health and further impoverishment that has severe personal and financial costs. There are reasons not to take the MDG achievement too seriously. Lessons, experiences and insights will be absorbed by those working on the post-2015 framework.

In terms of sanitation, it is ironic that water MDG targets are bundled together with the sanitation MDG target, which is off-track. It is inexcusable and immoral to live in a world where 2.5 billion people lack a proper toilet. At the current rates of progression, the sanitation MDG target will not be met until 2026. Experts offer different explanations and various reasons for the lack of progress. Politicians, leaders and people in general worldwide simply do not want to be associated with toilets. This stigma influences the international and national development agenda. It is necessary to continue fighting to keep sanitation at the centre of development discussions. Sanitation, often coupled with water issues, receives significantly less attention and resources. However, there has been a move in the right direction. There is empirical evidence available about the economic benefits of sanitation coverage. The World Bank assessed the annual economic cost of poor sanitation at US\$53.8 billion in India and

US\$6.3 billion in Indonesia. This evidence makes it difficult for politicians and policy-makers to ignore the value of sanitation. Increasingly, governments are acknowledging the fact that basic sanitation is a key component of any development strategy.

The UNSGAB was instrumental in encouraging UN member states to adopt a resolution calling for an end to open defecation along with a commitment to support the sanitation drive to 2015. The sanitation drive was launched in 2011 by Ban Ki-Moon demonstrating his willingness to act as a champion for toilets and put an end to open defecation. The sanitation drive to 2015 is keeping sanitation at the centre of the development dialogue. This effort will encourage political commitment, financial investment and education. Reaching the sanitation MDG target is the UNSGAB's first priority.

At the same time, the UN member states, civil society groups and communities are already working on the post-2015 development agenda. In September 2012, the UN Secretary General appointed a high level panel of eminent persons on the post-2015 development agenda. The study is co-chaired by the President of Indonesia, the President of Liberia and the UK Prime Minister, and the panel comprises 27 members from civil society, private sector and government leadership. The panel met for the first time earlier in November 2012 and will deliver a report to the UN Secretary General in 2013. The UN is also overseeing a large set of country consultations and thematic consultations under the banner, 'The World We Want – 2015'. A thematic consultation on water was added to complement consultations on governance, education, equality and conflict.

Following on the Rio+20 United Nations Conference on Sustainable Development in June 2012, countries are also considering the development of a set of sustainable development goals to address the broad challenges of poverty eradication, environmental protection and sustainable consumption and production. Delegates of the International Conference on Fresh Water Governance for Sustainable Development are encouraged to look for opportunities to make the case that water and sanitation must figure prominently in whatever emerges from the many 'The World We Want – 2015' consultations and participate in the thematic consultations on water in their respective countries. Delegates should write letters to the panel indicating the importance of setting strong targets to inspire action for sanitation and water, find out the position of their respective countries in terms of the sustainable development goals and contact decision-makers stating the importance of access to safe drinking water and basic sanitation by every person. Compelling arguments can be made for water as the key to sustainable development. Delegates are invited to join the UNSGAB in advocating for water and sanitation.

The three messages that the UNSGAB shared at the Rio+20 Summit are:

- Keep striving for universal access to basic sanitation and safe drinking water - two essential elements for human security.
- Currently, the MDG targets only aim to halve the proportion of people lacking basic sanitation and safe drinking water by 2015, and in 2010 the UN General Assembly recognised that access to water and sanitation are human rights, essential to live a productive life. Any development framework for the future must exceed the MDG target by calling for universal access to water and sanitation. The UNSGAB also promoted a collective vision that waste water management is necessary and should be agreed in Rio because sanitation does not only involve toilets. Unless excreta are safely treated after the toilet the multiple benefits of good sanitation will not be realised.
- There is a global need to produce more food with the available water. Agriculture is by far the biggest user of water and it is therefore not only desirable, but also imperative that water systems for agriculture be more efficient in order to increase productivity of farmlands.

These messages relate very closely to the water, energy and food security nexus. The UNSGAB met during the Water, Energy and Food Security Nexus Conference in Bonn last November. The announcement that the global population had reached 7 billion was widely publicised prior to the conference and sparked a discussion about natural resources, rising inequity and the future of life on the crowded planet Earth. These issues were addressed at the conference. Growing demands for water, energy and food are putting extreme pressure on natural resources. A more sustainable path that recognises inter-linkages is necessary. The nexus approach attempts to enhance water, energy and food security by increasing efficiency, reducing trade-offs and building synergies across sectors. Since 2011, it has been exciting to see how the nexus concept is taking root around the world. Later

this month, the UNSGAB and the AU are convening an African nexus dialogue with decision-makers, private sector representatives and politicians in Nairobi, to address specific challenges such as foreign investments in agriculture, public service infrastructure and turning waste into food.

**Mr Reggie Tekateka, Chairperson: African Network of Basin Organisations – Strengthening transboundary water governance through inclusion**

The Southern African Development Coordination Conference (SADCC) was initiated by the frontline states to forge regional security and reduce dependence on apartheid South Africa. Despite claims of institutional inefficiencies of its decentralised structure, SADCC achieved high visibility within member states and a strong sense of belonging. It broadened the notion of collective security beyond military security to include economic, environmental and livelihood security and spawned SADC in 1992 with a mission of regional cooperation and economic integration.

The change in South Africa in 1994 brought a sense of renewal and hope for the region's future. Regional attention focused on mobilising towards regional integration and there was an early recognition of the critical role of water in the integration process and as driver of economic development. Major sector challenges included forging a common approach to governance of the region's water resources in the face of uneven distribution of rainfall in time and space to ensure adequate access to safe drinking water for the majority of region's population and governance over 15 river basin organisations, in the context of cyclical floods and drought.

The regional water sector was established in 1996 as a standalone sector, against the backdrop of:

- The integrationist SADC regional indicative strategic development plan the master-plan against which the regional water policy and strategy were crafted, envisaging harmonised legislation and policies
- Negotiations to craft a regional protocol to domesticate the international water law principles enshrined in the UN Shared Water Courses Convention
- The Lesotho Highlands Water Project being the object of attention in the region, as well as the object of close scrutiny as the large dam discourse and World Commission on Dams were anchored in the region.

The Global Water Partnership (GWP) set up its first regional branch, the Southern African Regional Technical Advisory Committee (SARTAC) which later became GWP South Africa. SARTAC mobilised civil society and government officials in regional consultations to formulate 'The Africa Water Vision 2025', presented at the World Water Forum at The Hague in 2000. The debate was led by the Southern African ministers because they drove cooperation on WRM. The vision was later adopted by the African Ministers' Council on Water (AMCOW) in time for World Summit on Sustainable Development in August and September 2002.

AMCOW was established in April 2002 to address the Continent's crisis of water governance. Its main purpose was to provide political and strategic guidance in water governance, driven by conviction that water was to play a critical role in pursuit of MDGs in general. Transboundary water resources management was a key concern given the preponderance of shared water courses in Africa. The need for a common approach to WRM in the continent was recognised and water supply and sanitation was prioritised. AMCOW attracted wide ranging support from multi-lateral, regional and national bodies, and moved rapidly to engage with African civil society, later recognising and partnering with the African Civil Society Network on Water. Consistent with the adoption of IWRM in 'The African Water Vision 2025', GWP was also recognised as a partner. AMCOW went on to establish formal relations with other African ministerial bodies, mainly Ministers of Energy, Environment and Science Technology, and decided to establish the Groundwater Commission to develop a coherent governance approach, including institutional aspects of managing groundwater.

The African Network of Basin Organisations (ANBO) was recognised by AMCOW as its technical arm in matters relating to transboundary water resources management. ANBO features prominently on the implementation strategy of the AMCOW work plan at continental, regional and national levels, alongside other partners of AMCOW. The New Partnership for Africa's Development (NEPAD) Water Centres of Excellence were established, opening the way for knowledge development through research with a developmental focus. AMCOW also developed an African water sector gender policy.

The AMCOW work plan is the outcome of four key documents: The Africa Water Vision 2025, the eThekweni Declaration, the Tunis Declaration and the Sharm El-Sheikh Declaration. The work plan is broken down into seven thematic areas:

- Water infrastructure and economic growth
- Managing water resources
- Meeting the sanitation, hygiene and water MDG targets
- Global changes and risk management: climate variability and change
- Governance and management
- Financing
- Education, knowledge and capacity development.

An important element of the work plan is the requirement set by the AU Summit to report on progress on an annual basis.

The rollout of the work plan is expected to take place at the regional level (transboundary, national and basin levels) under the guidance of the Regional Economic Communities, which are expected to take an inclusive posture that draws in regional capacity and builds on existing partnership arrangements and networks, UN agencies active in the sector, as well as the donor community. The strategy emphasises drawing on local knowledge and experience through public participation and prioritises adaptation and preparedness for climate change.

The SADC region is particularly susceptible to the impacts of climate change, which is expected to have

major yet diverse impacts on Southern Africa with generally hotter and more humid conditions, seasonal changes with major implications for regional agriculture and rural livelihoods, more regular and severe drought, floods and storms. These changes are expected to severely damage the already limited and often weak regional infrastructure, spread vector-borne and other human and animal diseases, and rising sea levels that bring a high risk of salt water contamination. The poor rural population is most susceptible to the impacts of climate change. It is estimated that inadequate water supply and sanitation services cost between 3.26 per cent and 5 per cent of the regional GDP, exceeding total flows of aid and debt relief. SADC estimates that low coverage costs US\$11.5 billion or 3.5 per cent of the GDP, while others estimate that poor sanitation alone may cost sub-Saharan Africa up to 5 per cent of GDP, exceeding annual aid flows and debt relief.

It is essential to develop more knowledge and use available knowledge in order to adapt to and prepare for the threatening impacts of climate change. The setting up of NEPAD Water Centres of Excellence is a clear indication of AMCOW's embrace of science and research. A broad policy framework is in place at the continental and SADC levels for development of new knowledge, and it is crucial that researchers work within that policy space for relevance and ease of uptake. Knowledge gaps and entry points exist at regional, trans-boundary, national and local levels.

Given ANBO's advisory mandate, there are signs of interesting developments by regional basin organisations in terms of local projects with regional benefits in SADC. Some of these projects are:

- The creation of National Stakeholder Committees under the Zambezi Watercourse Commission offering a platform for the empowerment of stakeholders at local level and the introduction IWRM
- Sasol-German International Cooperation Orange-Senqu River Commission (ORASECOM) partnership with eMfuleni Municipality on water demand management, involving the private sector
- A set of six local level projects implemented by ORASECOM (Lesotho, Namibia and SA) and the Limpopo Watercourse Commission (Botswana, Mozambique and Zimbabwe), which have excellent potential for replication and up-scaling.

Sufficient knowledge exists to immediately commence replicating and up-scaling promising ideas for projects, such as women-led adaptation projects on the continent and beyond showcasing the role women play as guardians of household assets and sources of livelihoods. Women are widely regarded by financiers as dependable borrowers who tend to reliably service their loans. They play a lead role in land use management and local agricultural production. However, this calls for legislative land reforms in most African societies.

Questions are raised about whether:

- The SADC region is ready to take the necessary and often tough decisions or collective steps

- required to respond to the immediate and immanent challenges posed by climate change
- The vision that inspired the creation of the SADC water sector or indeed the founding fathers of SADCC and SADC is still shared
- It is time to re-examine the advisory mandates of the river basin organisations and whether these institutions are adequately capacitated
- Lessons can be learnt from other models
- The notion of sovereignty is constraining.

In discussions with practitioners or communities at the receiving end of major projects it is often heard that the public participation process is unsatisfactory. This matter should be taken seriously, particularly with a view to addressing climate change. Many people who serve on regional basin organisations or the water resources technical committee and senior officials within SADC tend to use delaying tactics in terms of decision-making, damaging confidence that is necessary in order to move ahead. This issue must be taken seriously. A more open and honest approach and increased engagement with other development sectors are essential factors in meeting MDG targets.

**Prof. John Williams, Australian National University Crawford School and Wentworth Group of Concerned Scientists, Australia – The water, food and energy nexus: Lessons for the water-energy-food-climate trade-offs with expansion of unconventional gas production in the US and Australia (J Williams and J Pittock)**

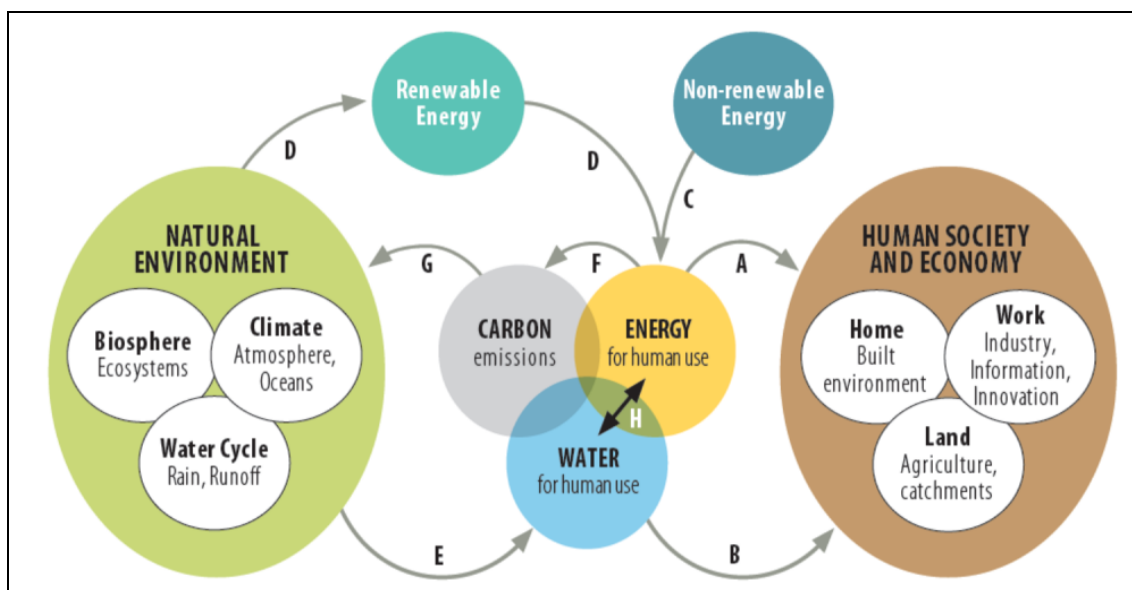
The World Economic Forum's book called, 'Water security: The water-food-energy-climate nexus' contains salutary reading. When an important body such as the World Economic Forum takes on this issue, it serves to remind others that they should be considering water, food, energy and climate together and the interactions before them when developing policies and plans. One of the key messages in the book builds on the quotation by John Muir, 'When we try to pick out anything by itself in nature, we find it hitched to everything else in the Universe', and this must be recognised. Many of the old narratives have to be challenged.

A century later at the World Economic Forum, the same phenomenon was discovered when four hundred top decision-makers listed the myriad looming threats to global stability, including famine, terrorism, inequality, disease, poverty and climate change. They found that when addressing each diverse force, all the forces were attached to one universal security risk: fresh water. The same statements could be made from the perspective of energy, food and climate change. It is essential to move away from thinking of the water sector as a standalone sector, as a separate entity, and drive the science and knowledge towards new thinking. This view is also being taken by big, international business.

The role of narrative in shaping the water-food-energy-climate future is important. The following quote sums up this view: 'In shaping our shared energy-water-climate future, the evolutionary contest between growth and finite-planet narratives is just as important as the dynamics of the natural world.... The future therefore depends upon the evolution of more subtle and resilient narratives about human-earth interactions, in which energy, water and climate are central... The evolutionary fitness test for these narratives is to empower a transition to a society that lives within the means of a finite planet and improves global wellbeing at the same time.'

The juxtaposition that there is unlimited growth as well as a finite planet does not make sense. The challenge faced in looking at this nexus is to find a transition to a society that lives within the means of a finite planet and improves global wellbeing at the same time. Food, water, energy and climate change must be looked at in a collective, communicative manner, understanding how to put landscapes together and hold them together with all the pressures placed upon them.

In Australia, the mining and energy sectors have tended to be given an operating mode that is outside of the legislative framework for agriculture, fisheries, forestry and urban development and planning. This is being challenged because mining and energy development should be treated the same as other pressures that are put on the planet to generate human wellbeing. The Prime Minister's Science, Engineering and Innovation Council of Australia produced an analysis of the nexus.



**Figure 3: The Water–Food–Energy–Climate nexus**

Figure 3 shows carbon, energy, water at the centre and its connection to the human society and economy, as well as the natural environment's strong connection through the biosphere's ecosystems, climate and the water cycle. If surface- and groundwater continue to be managed as separate aspects of the water cycle, WRM problems will be resolved. Surface water and groundwater feed back and forth between energy production in various ways. The different forms of energy all have a carbon emission impact, whether or not they are renewable. Surface water systems in the natural ecosystems are being drawn upon to provide urban ecosystem functions. Food and fibre production ecosystems connect strongly to surface and ground water. The food and fibre produced by modern agriculture is driven by an energy source that is of utmost importance. The green revolution was driven by cheap energy to drive the fertiliser, the pesticides and the fuels. This connection will become increasingly important over time.

Work done by Dr Pittock and his team looks at the actual energy-water trade-offs and synergies and shows that although in many cases both energy and water win, in desalination processes and inter-basin transfers, energy wins and water loses and in biofuel production and carbon capture and storage, energy loses and water wins.

Unconventional gas production intersects strongly with natural resource management in Australia and the USA. The following possible impacts of gas operations need to be considered separately and together:

- Effects on biodiversity versus effects on habitat and vegetation
- Impacts on land used for agricultural and forestry production
- Effects on surface water and ground water resources
- Air emissions, including those from processes related to gas production
- Social impacts, including effects on community amenity
- Economic impacts, local, regional and national.

Gas is extracted and compressed for transportation. The Americans use their gas as gas, which has an instant huge energy benefit. Carbon emissions have fallen since moving away from coal to gas. In Australia, much of the gas is converted to a fluid and exported. Huge resources of shale gas are available across the planet, and much of Africa's gas is found in South Africa. Managing water, food production, energy and climate change requires close monitoring in the future.

Gas fields in Australia are having a profound effect on the biodiversity. This is an important issue for Australians. The growth rate in population requires a huge increase in food production from now to 2050. The trade-off for increased food production could be either food or environment. It will be an enormous task to avoid the emerging food crisis without further damage to the environment. Increasing food production will necessitate minimising further impact on the environment, at a time of

rising energy costs, water shortages and the spectre of climate change. This is another element in the nexus. It remains unclear whether in the long-term agriculture can co-exist with gas production. The food production issue, together with water scarcity, is still on the agenda. Perhaps this would result in the competition of extraction of water and loss of ecological function in river systems. Extraction of water from a river that results in a destroyed river does not serve to alleviate poverty. It is much more costly to correct an environmental natural resource problem that is not properly resolved than to avoid the problem in the first place.

The following issues with respect to unconventional gas production and water resources must receive attention:

- Water extraction to depressurise coal seams and the impacts of subsequent water pressure changes on water movement to and from freshwater aquifers located in other strata of the geological basin.
- Replacement of the extracted water in coal seams once gas production has ceased. The water originally extracted is likely to have been disposed of or used, and must be replaced from sources rarely specified and by some redistribution mechanism within the geological stratigraphy.
- Disposal of the extracted water and salt and other chemical entities liberated from coal and other geological fabric during the dewatering process
- The containment management and disposal of hydraulic fracturing (fracking) fluids. Management of fracking fluids and any resultant contamination is a high profile issue with the general public.

Strategic regional planning to give impact assessments and cumulative risk assessments by looking at systems and whole systems is a critical component of managing the nexus, and is the fundamental driver for improved regional planning. Current planning efforts focus more on development assessment processes than on strategy, while the focus needs to be reversed to ensure that most of the effort is worked out at the strategic level. Billions are spent on environmental impact assessments that would be unnecessary if the correct strategies were in place. The approach used for assessing gas developments (and any other developments) should be begin by understanding the regional landscape capacity (how much degradation can the landscape incur before it starts to lose function), and then determining if there is capacity for the development without crossing landscape limits. Current development approval processes should be updated to approve new developments only on the basis of landscape limits and the expected cumulative impacts of the existing and proposed developments. Good regional and catchment action planning with appropriate spatial definition should be able to identify no-go areas for mining for gas and coal, and go-with-care areas in which mining can be conducted without unacceptable outcomes within a regulation framework.

Some of the basic principles of integrated catchment management are:

- Take a holistic approach to the management of land, biodiversity, water and community resources at the water-catchment scale
- Involve communities in planning and managing their landscapes
- Find a landscape functional integration between resource use for mining, agriculture, tourism, urban development and so on.

Planning should be based on best available information, at the right scale, be aligned with the whole of government, engage communities, include cumulative risk management, have independent audit built around monitoring and evaluation and open access to information.

The principles of strategic planning include:

- Whole-of-government
- Part of a consistent hierarchy of aligned, nested plans
- Integrated across different levels of government
- Able to be adjusted in response to changing circumstances
- Developed with early and effective community engagement.

This approach cannot be followed when working in silos and ignoring the overlapping areas of energy production, climate change mitigation, water resources, food and fibre production and the protection of biodiversity. This requires more knowledge and new tools that enable cumulative risk analysis of multiple land use developments to be understood by the people inhabiting the landscape. Without

new knowledge and its application in a whole-of-systems perspective, the way ahead will be littered with attempts to solve one problem whilst creating another.

Some of the interventions that enable integration and optimisation of policies and actions in order to transition to the new narrative of living on a finite planet and improve human wellbeing at the same time, are:

- Better cross-sectoral knowledge to inform decisions
- Whole-of-system regional strategic planning
- Identification of technologies which have co-benefits
- Markets with broader cross-sectoral participation (including linking water and carbon markets)
- Better integrated governance institutions.

## **Discussion**

**Mr John Harrison (eThekweni Water and Sanitation):** Mr Muller, how do you intend reconciling the one million jobs and increased agricultural production when there are indications of cut-backs on job opportunities because of the lack of water?

**Mr Jonathan Denison (Umhlaba Consulting Group):** Mr Muller, small holder irrigation currently covers about 100 000 hectares in South Africa and utilisation is currently very low and on a decline against sophisticated commercial sector irrigation. Apart from the major soil and water limitations, is it realistic to look at agricultural expansion of 30 000 hectares per year for the next 18 years at a cost of around R3 billion per year for returns of around 10 cents per kilolitre of water, 20 to 40 times less than other competing sectors? Why is the NDP silent on run-off water harvesting and conservation, which would have application to 1.3 million rural South Africans who have access to arable land and which would bring the NDP in line with global practice?

**Ms Christine Colvin (WWF SA):** Mr Muller, although we heard much about water infrastructure being developed to support irrigated agriculture, how can the National Planning Commission step in to protect natural water infrastructure from mining? This is one of the most urgent threats to water security that is not being addressed in an integrated manner. This is exactly the kind of issue that a coordinated planning commission should be able to address with urgency.

**Mr Balarabe Bello (Lake Chad Basin Committee):** Dr Eid, as a grassroots practitioner I cannot accept that the MDG targets for drinking water have been met. The realisation is not visible as so many people in sub-Saharan Africa are still without water. The UN should not be deceived. I would like to see more positive support to water institutions with transboundary impact. In terms of the UN declaration that water is a human right, it does not appear that much is being done to encourage all member states to adopt the declaration into their government and municipal legislation. It should be able to be enforced or it will have no relevance.

**Mr Brendan Bromwich (UNEP):** Dr Eid, does UNSGAB have an overview of the humanitarian sector as well as the development sector? Lessons learnt from Darfur have seen some very problematic practices in the longer term for the water sector in Sudan. The issue is about rights to water in a dry land ecosystem. In Darfur people are only used to having about 7 or 10 litres of water per person per day. Two million Dafurians are displaced and have a right to 15 litres of water per person per day. The UN survey indicates that half the water (that is chlorinated and provided for free) is sold in towns and becomes dirty water and is used for brick-making because of the rise in home construction as a result of the presence of the international community. Brick-making is also destroying forestry. We are finding that the some communities are getting a sense of entitlement to water over and above what the ecosystem can supply. Can there be a high-level review of standards in respect of dry land programming? This is a matter of urgency with the situation in Syria, Libya and other dry land countries. There needs to be more focus on balancing the three E's of sustainability (environment, equity and economics), rather than on rights only, in cases where the ecosystem is strained.

**Dr Junaid Memon (Pakistan Institute for Development Economics):** Dr Eid, the UN is moving from MDGs to sustainable development goals. How do the two differ and how would the UN rationalise the shift?

**Mr Tiego Mpho (Okavango Research Institute):** Mr Tekateka, I have recently started a PhD study on transboundary water governance. You pointed out that sovereignty should be viewed as free agency. I would like to know what is preventing states from giving regional basin organisations the mandate they require instead of the low-level advisory mandate.

**Prof. Ray Ison (Monash University, UK):** Prof. Williams drew attention to taking the whole-of-systems approach. An important system notion is where the boundaries should be drawn. I felt that Prof. Williams may have drawn the boundary too narrow because he made the assumption that it was morally acceptable to continue to produce carbon from these particular technologies. It seems that South Africa has the experience of transformation and both South Africa and Australia need to consider how to transform our economies and societies away from carbon pollution as a key economic activity. If we are to move to a more strategic form of planning, can we build in the notion of intergenerational equity? Unless economic mechanisms are built in that make people responsible for environmental problems it will not be addressed. Do we need to invent a sustainability court that keeps everyone honest?

**Mr Sipho Mosai (Rand Water):** South Africa has serious challenges of poverty, joblessness and deprivation, yet we hear of trade-offs and of protecting the environment at all costs. We need to move from a society that talks about sustainable development to a society that prioritises its challenges and begins to put people's needs first. Emphasis must be put on addressing the challenges of the people.

**Mr Mike Muller (National Planning Commission):** When the National Planning Commission was looking at the trade-off between carbon emission control, poverty and inequality reduction, there was a real contest between positions. In the end, the key objective of the plan addresses poverty and inequality and putting people first was recognised. It is fundamental. If we were to do a discourse analysis of Prof. Williams' approach we would hear a high priority to environmental protection, a long-term intergenerational equity issue, which might be entirely appropriate for Australia. I think we have to have a debate in South Africa where we have a huge divide between a competent and technologically advanced and well-off environmental community, and a lot of poor people for whom jobs and livelihoods come first.

With reference to Mr Harrison's comment, there is not a water shortage in the eThekweni area. There was an administration failure to develop the infrastructure necessary to supply eThekweni from widely available sources in time. This is separate issue to the bigger question that was raised. One of the reasons for raising this issue in this meeting is that there seems to be a belief in DWA that somehow water can be allocated to agriculture and it will be used for that purpose. The real challenge we have is that we have had agriculture policy and implementation failure since 1994. The 1994 policy gave preference to large scale commercial farming and this has not been changed. Small farmers will fail to make useful livelihoods. This is not a water problem. It is frustrating that the water community fails to raise its voice about its limited resources that have to be used carefully and together with the agricultural community. What has happened is that agriculture is blocked, and jobs in rural areas are destroyed because the right discussions are not taking place.

In response to Ms Colvin's point, I continue to be worried about the environmental preferences trade-off that we make. The need to take strategic re-decisions about land use have been identified by the commission, which leads the drafting of legislation for spatial planning that will enable to take strategic zoning decisions. It is ironic that environment impact assessments are part of the problem in Australia. We regret introducing the assessments in this country. I am worried that another big drive of what everybody calls best practice today will turn out to be worst practice. This ties up with the question about systems thinking. How can we think about complex systems? How do we get to take robust strategic decisions in real time about such complex systems without interest groups intervening? The challenge is as much for the environmental community, which is a great advocate but sometimes a bad compromiser. Can the environmental community become more robust and flexible in its approach rather than the campaigning approach that locks us into long term failure to act?

In terms of the viability of the irrigated agriculture target, it is a huge challenge to make the transformation to small holder farming. The NDP has indicated that if we want to create one million jobs and 500 000 hectares of expansion, we have to use best practice. The challenge is to the agricultural community to show us what you can do. I am satisfied with the target but I am nervous

about the challenge that has been put to our agricultural community to create a small holder farmer community that can use water efficiently.

**Mr Reggie Tekateka (ANBO):** In response to Mr Mpho's point, the reason for the advisory mandate of regional basin organisations was sound at the time. The challenge was to ensure a levelling of the playing fields within the commissions. One of the priorities was to ensure that all available data on the river basins is credible to all parties. In addition, time was needed to build confidence in the organisations in this sensitive and possibly divisive area of sharing water resources. It is possible that Ministers of Water Affairs do not feel a need at this point in time because there is no sense of urgency. The reports they receive assure them that things are running smoothly. The average member of an organisation is not involved on a full time basis. There is never an opportunity where the running of the organisations is assessed by member states. However, the need for collaboration to find solutions to strengthen resilience is encouraged by imminent climate change.

**Dr Ursula Eid (UNSGAB):** In response to Mr Bello's question, the MDGs do not say that in 2015 everybody has to have access to water. The MDGs state that on the basis of the population figures of 1990, half of the proportion of people who have no access to water and sanitation should have this by 2015. This means that the other half does not feature in the MDGs. The people that are referred to are the other half. It is misleading to say that the MDG on water has been fulfilled. I did not openly criticise the Secretary General's statement but noted that most of the people who got access in the last years live in India and China, and not in sub-Saharan Africa. The human right on water is the second step towards universal access. The human right on water is not legislated. However, the resolution should be used as an instrument to put pressure on governments to develop a better water and sanitation strategy.

In response to Mr Bromwich's comment, the UNSGAB comprises about 20 people who are volunteers, not within the UN system and we come together twice a year. We have set up working groups. I think that the working group on water and disaster is looking at disaster situations where there is too much rather than too little water. I will take your advice to the next meeting and verify whether what you have said is also part of the consideration of the working group. Thank you for this intervention.

In response to Dr Memon, there are many organisations and many processes in the UN that cannot all be tracked. The UNSGAB looks at what the panel that deals with the post-2015 MDG process is doing. In parallel there is a panel dealing with the sustainable development targets. As a board we try to ensure that both processes are merging. The MDGs only focus on the access to water and not on the quality of the water. We believe that the MDGs have shortcomings and we are eager to see the merging of the two processes.

**Prof. John Williams (Australia National University):** The important thing in the gas and the climate change issues is that we have to look at the system and recognise that once a carbon pricing regime really starts in Australia it will determine how much shale gas is developed. Most people think that gas is a transition fuel to cut emissions while moving to renewables and therefore the system allowed for that option, bearing in mind that the carbon pricing will change over time and may well change the transition fuel. In terms of strategic planning and intergenerational equity, work has been done in communities using a resilience framework has shown that people are good at looking at the actual thresholds that will impact on subsequent generations in the use of the resource. It is a powerful tool.

Concerning the question whether an environmental impact court would work, the principles are in place in Australia (I cannot comment about South Africa), but are rarely referred to. The idea of having independent commissions that report progress against these scores is essential.

One of the more fundamental questions has been heard at this conference and is about the trade-off language. The only thing that was ever traded-off was the environmental resource base. In Australia, this happened at the turn of the century and important lessons were learnt. We need to move to the new narrative of recognising that we should not in principle damage the asset that will produce our future in order to reach an immediate, short-term goal and how we do it requires stiffening of our legal act to face the issues rather than beginning on a slippery slope of going the other way.

**SESSION 9: ACCESS AND THE RIGHT TO WATER. CHAIR MR JOHN HARRISON (ETHEKWINI WATER & SANITATION)**

**Mr Gert Jan Veldwisch, University of Wageningen (Germany) – Keynote address: Water grabbing: dynamics in southern and eastern Africa (Gert Jan Veldwisch, Lyla Mehta and Jennifer Franco)**

Foreign direct investment in agriculture has led to large-scale land acquisitions and the reorganisation of agricultural production processes globally. Popularly referred to as 'land grabbing', the process has attracted a high degree of media and policy attention. Recently, the water implications of land grabs have become the explicit point of study, showing that water is frequently a key driver of land grabs.

In 2010, the World Bank reported that 45 million hectares were being distributed under new land deals. It is difficult to analyse the data, but the most extensive effort to date is the land matrix. In Southern Africa there is approximately 9 million hectares confirmed under large-scale land deals that have taken place over the last few years. That only represents the 'tip of the iceberg', as the majority of land deals cannot be verified and are not taken into account in the land matrix database.

The word 'grabbing' has negative connotations. The use of the word in the study for both land and water grabbing was intentional. The implication was not that the grabs were all illegal; some deals are semi-legal, or legal under national laws, but at the same time, the question can be asked whether the deals are fair.

Mr Veldwisch said that the presentation was based on work that had begun the previous year for a special issue of the open access journal *Water alternatives: Introduction to the Special Issue: Water grabbing? Focus on the (re)appropriation of finite water resources* (Lyla Mehta, Gert Jan Veldwisch and Jennifer Franco).

The work led to 14 original case papers by various authors, the majority of which were based on Africa, and in particular in Southern Africa. The papers were listed on a slide. Mr Veldwisch said that as part of an open access journal, all papers are freely accessible.

Mr Veldwisch said that the land-grabbing debate was a quickly expanding field. In 2009 and 2010, land-grabbing rumours attracted media attention. In 2010 and 2011, policy frameworks were developed around land grabbing, and initial case studies were conducted. By 2012, many detailed, empirical case studies had been conducted and land-grabbing theories developed.

As land-grabbing and water-grabbing deals have been taking place for a long time, Mr Veldwisch outlined new trends:

- The increasing magnitude of the grabs
- The grabs are in response to multiple crises, such as food, fuel and finance.
- Scale: a fast-growing global issue with local implications
- Large areas and large amounts of capital are involved
- The changing roles of private capital and the state.

Key findings of the land-grabbing debate are that the capital involved is national, regional and international, and does not simply flow internationally from the North to the South. National and local elites play a role. It is not always empty land ('terra nullius') that is involved, nor is it marginal land. More usually prime land is involved. The problem goes beyond demarcated enclosures of land.

The deals are not all about land and agriculture. Land and water are deeply entangled, and yet debates to date have focused almost exclusively on land. There are 'water implications' of land grabbing, but less these are less visible. The land involved is rarely 'marginal'; the water is rarely 'abundant'. The focus is on prime land with good access to water. There is a growing focus on water as the object of the grab itself, for example, the transportation of bulk water from Madagascar to Saudi Arabia.

It is less about grabbing the resource than grabbing control of the resource. The land enclosures that draw the media attention are the 'tip of the iceberg'; the transformation taking place is far deeper than mere boundaries. A radical restructuring of production (particularly agricultural) is taking place

involving the grabbing of control and benefits. Significant debates are emerging on corporate agriculture versus smallholder agriculture.

Mr Veldwisch explained that water grabbing is quite different from land grabbing. In terms of human rights, water is more important than land. 'Control' refers to both political control and physical water control. He referred to the 'slipperiness' of the grabbing process, saying that water flows in the direction of power, not by itself, but through contestation at different interrelated levels of abstraction, such as resources: damming/diverting/pumping; content of policies, rules and regulations; authority and regulatory control; and discourses and narratives. (The ERA approach was developed by Boelens, Zwarteveen and Roth.)

Parallels to land grabbing include unequal power relations and unclear distinctions between legality and illegality and formal and informal rights. Both water-grabbing and land-grabbing are fraught with licensing and negotiation processes. However, there are several characteristics that make water grabbing less clear than land grabbing. It is a fluid resource that is difficult to manage and control, with unclear administrative boundaries and jurisdictions. The effects of water grabbing are dislocated and difficult to visualise. There are fluctuations in water availability over space and time.

### **Case studies**

Case study: Tana Delta Kenya (Duvail, S. et al. 2012):

- Sugar cane (38k ha) and Jatropha (64k ha)
- Canadian and Kenyan capital
- Water use only implicit in Jatropha deal
- Dry-period bottle-neck for sugar deal
- Flawed Environmental Impact Assessments (EIAs).

Case study: ProCana Ethanol project (Van der Zaag, P. et al. 2010 and Borrás, Jr., S. et al. 2011)

- 30 000 ha sugar cane
- Forced eviction of existing villages
- Too little water left for downstream users
- Links into high-level politics
- Flawed EIA.

Case study: Contamination of community drinking water in Tanzania (Arduino, S. et al. 2012)

- 1400 ha for livestock
- Tanzanian and Kenyan money
- Contamination of drinking water sources in neighbouring district
- Flawed EIA.

Other case-study examples that Mr Veldwisch mentioned but did not elaborate on are 'Resistance in Nante, Mozambique' (Beekman and Veldwisch) and 'Contract farming in Chokwé, Mozambique' (Veldwisch. 2010)

The impacts and effects of water grabbing are likely to be felt deeply and widely, and there are implications for policy, research and action. Mr Veldwisch urged the audience to engage with the debate; counter dominant narratives (of abundance and efficiency); make local water-use practices and their value visible; make the water connection to land grabs visible (beyond volumes); and move beyond the logic of market fundamentalism and 'fictitious commodities'.

**Mr Johan Templehoff, North-West University – Living out the dream? A contemporary history of mentalities amongst Moqhaka's water users and water workers (S Berner, M Ginster, J Khoadi, K Magape, R Moabelo, IM Moeketsi, M Morotolo, EJ Nealer, TA Qhena, MP Radebe, A Tsotetsi and AS van Zyl)**

South Africa has state-of-the-art legislation in place supporting a ground-breaking approach to water management:

- Constitution of the Republic of South Africa Act (Act No.108 of 1996)
- Water Services Act (Act No. 108 of 1997)

- National Water Act (Act No. 36 of 1998).

However, the evidence suggests that we are not quite there yet, especially in terms of local authorities in the rural parts of the country, who are experiencing significant problems. An illustrative example is provided by Moqhaka Local Municipality (LM) in the Northern Free State Province's Fezile Dabi District.

Mr Templehoff displayed a map of the region covered by the Moqhaka LM, which incorporates the towns of Vierfontein, Viljoenskroon and Kroonstad. An additional urban settlement was studied at Steynsrus, and the study also encompassed an illegal squatter community close to the Vaal river. The Moqhaka LM has a surface area of jurisdiction in the Northern Free State of 7892km<sup>2</sup> and a population of about 200 000 residents, according to the census of 2001 (the study estimates this to be closer to 230 000). 96% of the population rely on the municipal water supply.

In 2011, Moqhaka was prominent in the news due to sanitation issues in what became known as the 'Toilet Election' (2011 National Municipal election). Makhaza (Western Cape) and Rammulotsi (Viljoenskroon) were prominent focal areas of intense political discourse. Sanitation in metropolitan and rural municipal areas in South Africa came under the spotlight. A group of concerned residents in Kroonstad claimed to be 'gatvol' (they had 'had enough'), resulting in the Gatvol campaign in 2001.

Mr Templehoff said the 'toilet election', the feelings expressed by the electorate during the 2011 local elections and the fact that many toilets remained unenclosed led him to question whether human dignity was respected in South Africa. Mr Templehoff said that the Gatvol campaign revealed that South Africans, across racial lines, were standing together to say that they had had enough, and wanted better services. Part of the research deals with this evolving phenomenon of a new cultural dynamic.

Mr Templehoff and his colleagues were approached by Fezile Dabi in 2008 to conduct a project in the local municipalities of Mafube and Moqhaka, which resulted in the Cultural Dynamics of Water (CuDyWat) project in 2011, funded by Fezile Dabi. The project focused on the environmental health of water and sanitation in its local municipalities of Mafube and Moqhaka. Mr Templehoff explained that the study attempted to outline the mentalities of the water users and water workers. The conclusion reached was that the water users had a mentality of 'disconnectedness' (*Mentalité de déconnexion*) and the water workers of ironic idealism (*Mentalité de l'idéalisme ironique*).

The use of French was borrowed from the concept of *Mentalité*: a prevailing state of mind that evolves over an extended period of time in communities:

- Developed by the French Annales School
- Phillipe Ariès (1914–1984) was an exponent of *histoire des mentalités*
- Pre-modern and pre-industrial and modernising societies in Europe
- Shapes the behaviour of individuals and groups of people
- Sometimes considered a derogatory term (but not by this study)
- Mental processes existing in communities that manifest in many of their actions
- Influenced by assumptions about truth and tradition
- *Mentalité* is an extension of the customs people observe.
- Rites, ceremonies, symbolic acts and forms of religious worship all play a role in determining the *Mentalité* of communities.
- Agency: comprehending how human communities think and respond to events in their daily lives.

#### **Water users: *Mentalité de déconnexion***

Residents described the town (Kroonstad) as 'broken and increasingly becoming more broken', and the Vals River as 'a coffin, carrying the carcasses of dead animals and raw sewage'. A social ecological disconnectedness was apparent. Residents exhibited a low sense of morale; a loss of self-respect and dignity and the loss of good-neighbourliness and hospitality. They lived their lives as if dazed as a result of apparent chaos and disorientation. Metaphorical expression:

- Seeking a literary device for comprehending local mentalities
- TS Elliot's *The Waste Land* (1922), major 20<sup>th</sup> Century poem (written by Elliot as a therapeutic intervention to recover from a nervous breakdown)

- Describes environment, the setting in which people find themselves; the overpowering sense of loss; and the inability to connect with other people and the environment in which s(he) is living
- There is a similar human condition in South African society as a result of dysfunctional water and sanitation.

### **Water workers: *Mentalité de l'idéalisme ironique***

Water workers live their everyday lives as if stunted. Sometimes there is the passion to perform tasks, but it is coupled with the realisation of one's inability to produce the required end product. Outside views of the workers that were expressed included words such as 'carelessness', 'oversight' and 'neglect'. The causes include procurement issues, under-maintained infrastructure and the non-responsiveness of sectoral management to workers in the workplace. There are frustrations around the fact that external interventions, for example, trade unions, are insensitive to local conditions. Some workers are employed in the water sector for a long time and many have memories of good times, when the supply was sufficient and service was 'outstanding' – more than often in the era before 1994. Many work from day to day just to pass the time. Their existential condition is ironic to the extent that in some contexts the observer sees the humour in many of the everyday things being done. Metaphorical expression:

- John Steinbeck novels *Cannery Row* (1945) and *Sweet Thursday* (1954)
- Dr Ed Rickett, a marine biologist of Monterey, California
- Human condition of experience of degradation and collapse, with the ever-yearning hope that the situation will change once again to one of vibrancy.

Mr Templehoff referred to *The human condition* (H Arendt 1958). The human condition forms part of the thinking in South Africa's National Planning strategy due to the realisation of our fragility and that of the world in which we live out our lives. There is a need to become aware of our long evolutionary history as amphibians focused on leading resilient lives in a hydrosphere, where the essential life-giving source of water requires constant care and nurturing.

The objectives of the project were to develop an indigenous discourse, achieve self-disclosure and interaction with local knowledge, recover a sense of local patriotism and restore dignity and self-respect.

Recently Mr Templehoff had listened to a talk on the book 'Panarchy' by LH Gunderson and CS Holling that had influenced his theories. The themes in the book of memory discourse and revolt as an on-going cycle provided a good roadmap to follow to address water and sanitation issues at local government levels. Mr Templehoff said that the cycle of learning, remembering, decline and reconstruction will continue as long as there is a will for preserving the human condition and the sense of being together in an urban environment.

### **Mr John Harrison, eThekweni Municipality – A service-based economy to resolve the conundrum between jobs and resources**

Mr Harrison said he had chosen the topic of the economy, as he believed that the current economy was the cause of 'confused' thinking and prevented the formulation of the right conclusions to problems. Mr Harrison provided the water resources plan as a concrete example of his theory. The title of the plan reads "Managing water for an equitable and sustainable future". Two of the themes in that document are the use of economic principles and instruments to manage water and the use of water equity to eradicate poverty.

Mr Harrison considered poverty to be the social consequence of a 'bad' economic system. The national strategy was to use the same bad economic principles to manage water in such a way as to eradicate the poverty that was caused by the economic system in the first place. Mr Harrison said that the same 'absurd' strategy applied to environmental sustainability. Mr Harrison said that there was a need to change the economic system and to dispel the economic fallacies.

The economy is arguably society's most dominant governance system. However, the economies perpetual need for growth and job creation had created the 'need' to deplete the resources on which the economy and natural environment is based, faster than environmental systems can replace them. Therefore, the economic system is not sustainable.

## Understanding the problem

To illustrate the unsustainability of the current system, Mr Harrison presented an “unsustainability” diagram separated into sections representing supply and demand:

- The supply portion consisted of the total global environmental production and assimilation, made up of the:
  - Sustainable harvestable portion
  - Sustainability deficit (over- harvest).
- The demand portion consisted of the economist’s “demand minus supply”, made up of the:
  - Real economy
  - Financial economy (buying power; far larger than the ‘real’ economy).

The sustainability deficit equates to an unsustainable system of supply and demand. The economy makes no distinction between ‘service’ and ‘disservice’. The real supply and demand should be the difference between the demand from the ‘real’ economy, and the supply from the sustainable harvestable portion.

The real economy is greater than the harvestable portion, hence the problems (and the need for the governance conference). Growth results from the fact that the financial economy is larger than the real economy. Growth is required for profitability for banks and stockbrokers. Money should be measuring and mimicking the real economy; instead the real economy is mimicking money.

The economy is driven by the wrong incentives, such as making money and increasing sales instead of providing services. This has a material effect on sustainability and is characterised by designed obsolescence (‘perverse engineering’) and designing for failure (in order to increase sales).

Mr Harrison said that these ‘wrong’ incentives increase the environmental impact. It is a physical impossibility to sustain continuous growth indefinitely in a finite environment. The incentives to consume are diametrically opposed to resources and security. Our trade and finance based free market economy is unsustainable. This has led to bad decisions by economic and political leaders, a key one being that they have made an unsustainable economic system part of the definition of sustainability in the ‘triple bottom line’ model introduced during the Rio conference in 1992. This has been used as an excuse to continue with an unsustainable economic system. For a sustainable future, it is imperative to change the economic system.

## The natural economy

Mr Harrison said that by turning the unsustainability diagram upside down, one can start to make sense of it. It is important to realise that the limiting condition is the sustainable harvestable portion. The real economy and service economy need to be limited to the size of that portion.

Objective of a natural economy:

- In a ‘full world’, provide maximum social ‘service’ at minimum environmental impact
- Proviso : non-transgression
- Harvestable productive and assimilative capacities
- The reality is that we cannot service all society’s material ‘wants’, sustainably. Therefore there is a need for a politically acceptable social compensation.

Managing according to the natural economic objective:

- Scientific and technical (known but not done):
  - Measure and know the harvestable capacities
  - Know and measure the resource impacts (costs) of each service
  - Limit total service impact to harvestable capacities.
- Social and political change:
  - Know how to measure service
  - The time available to people is a proxy measure of social service.

Time is a factor of wealth and freedom. Unnecessary work (disservice) robs society of this wealth and freedom. *Time can be the compensation to society.*

An environmental benefit of countering designed obsolescence is that long, trouble-free service minimises resources consumption. People should be rewarded while products remain functioning (no work required) and not rewarded while a product is dysfunctional (work required to fix it). The secondary benefits of breaking the negative cycle:

- Fewer products required = less resource consumption
- Fewer resources consumed = fewer mining jobs
- Fewer mining jobs = less travel = fewer resources
- Fewer jobs = more time for society.

The social benefits of giving time back to society (apart from more leisure time) include social restoration (time to care), crime reduction, less financial survival crime, less father absenteeism, time for education, poverty alleviation, better decision making and vision of the future (hope) amongst the indigent and decreased social pressure (the liberation of not having to find a job in order to survive).

Mr Harrison concluding by saying that it is not possible to achieve sustainability using an unsustainable management system. Regaining time could serve as the necessary political 'sweetener' and would also reduce environmental impact. The natural economy is a more rational means of managing the water supply, and stands a better chance of providing equity and sustainability.

### **Discussion**

**Mr Derek Hazelton (TSE Water Services):** (1) What is the basis for your philosophy? (2) I agree strongly with 99 per cent of what you said, but I think that there were some overly pessimistic comments; if we change our entire system in the way you suggest, I think that we would find that the harvestable portion of the environment would increase.

**Mr John Harrison (eThekweni Municipality):** (1) The basis of my philosophy is fundamentally problem solving; it has arisen from 20 years of attempts to refine decision making in my own work. (2) I have been working on my own without significant resources. The precise size of the harvestable portion is unknown. I work in the waste water industry, and much of what we do, had it been done upfront, would have solved many the problems. For example, if we solved the problem of pollution upfront, we would have a lot more water available for use; the cause and effect cycle needs to be broken.

**Mr Pieter Oberholzer (DWA):** The theme of the conference is fresh water governance for sustainable development. Mr Templehoff mentioned problems with falling service delivery levels. I believe that service delivery is failing because of a lack of governance, particularly with the smaller water service authorities. For example, there was a case where babies had died due to water quality issues in the Joe Gqabi district municipality in the Eastern Cape. The council and management made a concerted effort to address the issue, and within two years had obtained two blue drops. Good governance is critical.

**Mr Johan Templehoff (North-West University):** I have found that managers and politicians often want immediate solutions. Once you start breaking down every waste water treatment plant or every water purification plan in the Moqhaka district, it becomes apparent that each one has a different identity and different human drivers behind the processes. Each has a complex social ecology. Environmental health practitioners have a distinct leadership role to play by assisting communities to recover and restore hygiene in the community and to demand proper access to clean drinking water, within an audit system. It is apparent that not all officials are conducting water testing and implementing quality controls. I don't think it is water affairs' fault or the local authorities, but rather a set of circumstances and resulting mentalities. The problems are broad, but I believe there are solutions.

### **Dr Kola Odeku, University of Limpopo – The right to have access to adequate water constitutionally guaranteed South Africa: a myth or a reality (K Odeku and E Meyer)**

In South Africa, the right to access to adequate water is guaranteed in the constitution (1996, section 67). Other laws were also enacted to ensure that right. Despite these statutory and legislative

interventions, water is still not easily available to many people. Where it is available, it is often contaminated and undrinkable.

The situation is exacerbated by the compromising attitudes of those who have the responsibility under the law to implement, enforce and perform prompt and adequate water delivery and services. It is against this background that this paper attempts to contribute to the debate on whether the constitutionally guaranteed right to access to water will ever become achievable, in view of the fact that it has been statutorily provided for in the past sixteen years.

After the democratic elections of 1994 and the formulation of the 1996 constitution, water was classified as an entrenched constitutional right. The reality on the ground is that access to water is linked to privilege and not right. People were given the responsibility to administer and provide water services, and the irony is that those tasked with the responsibility of erasing past sovereignty are now part of the problem and not the solution. Many are advancing themselves for personal aggrandisement. Legally there is recourse against them. However, people are resorting to anarchy and protests. Whilst one may not agree with their actions, access to fresh water was promised for years, and still has not become a reality for many.

Dr Odeku commended South Africa for the right to access to water being well entrenched in the social economic rights in the Constitution. In Nigeria the 'right' to water does not exist, and is not included in the constitution. He mentioned that, in some instances in Nigeria, people are selling on water.

In South Africa, there is poor service delivery in the area of water; there were elements—political or otherwise—that continued not to meet requirements. Dr Odeku asked whether the perpetrators should be allowed to go unpunished; his research focus is on implementation and enforcement. Dr Odeku again commended South Africa for the fact that the courts are proactive and that they also enter into the administrative and managerial aspects of governance. However, it was unfeasible for people to continually go to court. It is unfeasible for indigent people without water to go to court.

Dr Kola Odeku concluded by asking what had happened to the spirit of Ubuntu, when those who are responsible for providing services view tender opportunities as the means to enrichment. Municipalities use the excuse that there are no resources, but a significant problem was that some individuals illegally compromised their positions of authority.

## **Discussion**

**Mr John Harrison (eThekweni Municipality):** What about the rights of the engineer who is producing the water, in terms of the rights of ownership to his work?

**Dr Kola Odeku (University of Limpopo):** The right of the engineer is governed by intellectual property (IP). The right to IP can be registered. But if that engineer fails to deliver through activities that are contrary to the constitution, his right should be in question.

**Mr Tseliso Ntili, Nelson Mandela Metropolitan University – A sustainable operational governance framework as an effective water service delivery for water boards in South Africa (T Ntili, V Mmbengwa and JA Groenewald)**

The purpose of the presentation was to share the outcomes of a research study on sustainable governance for water boards in South Africa in improving water service delivery by strengthening stakeholder development and institutional management within their operations.

Mr Ntili said that the aim of the study is to understand the relationship between factors that have an effect on the sustainable governance of water boards in South Africa in terms of governance quality, governance effectiveness and management effectiveness. The rationale of the study is that problems relating to water around the world are more and more often described as a consequence of a lack of sustainable water governance:

- Second World Water Forum (2000)
- United Nations Secretary General High level Panel (2002)
- Achievement of 2015 Millennium Development Goals (MDGs)
- Reduction of poverty and improvement of peoples' livelihoods

- Access and rights of water services.

The United Nations' MDGs set targets that have to be met by the year 2015. 1990 is the baseline year, which requires that the world halve the proportion of people without sustainable access to safe drinking water and basic sanitation. Mr Ntuli said that the study looked at progress in terms of the MDGs, within the South African context. The study aimed to better understand water governance and to assess the status of water service delivery and water service delivery protest in South Africa. Mr Ntuli presented a map detailing the operational areas of the 14 water boards in South Africa.

The South African water boards are governed by legislation and policy mandates. Water boards derive their mandate from the Water Services Act (Act No. 108 of 1997). Water boards are listed in the Public Finance Management Act (PFMA) (Act No. 1 of 1999), as Schedule 3(B): National Government Business Enterprises. There is a policy mandate in the Strategic Framework for Water Services, 2003. The Minister of Water and Environmental Affairs is the only shareholder of water boards.

Various definitions of water governance include:

- The Global Water Partnership: the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and delivery of water services, at different levels of society.
- United Nations Development Programme (UNDP 1997): an exercise of economic, political and administrative authority to manage a country's affairs at all levels.
- Water governance comprises processes and institutions through which citizens and groups articulate their interests, exercise rights, meet their obligations and mediate their differences.

The proposition for water governance theory is based on the following:

- Governance refers to a set of institutions and actors that are drawn from but also beyond government.
- Governance identifies the blurring of boundaries and responsibilities for tackling social, economic and environment issues.
- Governance is about the autonomous self-governing networks of actors.
- Governance identifies the power dependence involved in the relationships between institutions involved in collective action.
- Governance recognises the capacity to 'get things done' which does not rest on the power of government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide (Stocker 1998).

Water governance types include:

- Hierarchical governance system: state-controlled approach, where the state directs, controls and cares for its citizens and the markets.
- Market-led governance system: came in at the end of the Cold War era. Markets are proposed as the primary mechanisms for allocating resources.
- Distributed governance system, through informal and voluntary sharing of authority and responsibility, such as public-private alliances (Hall 2007; Castro 2007).

A key focus of the study was South African demographics, and he presented a table that showed population increases for the nine provinces between 1996 and 2011 (Table 5).

**Table 5: South African population by province (millions)**

Province	1996	2011	Increase (%)
Gauteng	7.6	12.2	60.5
Western Cape	3.9	5.8	48.7
Mpumalanga	3.1	4.0	29.0
North West	2.9	3.5	20.7
Kwazulu-Natal	8.5	10.2	20.0

Province	1996	2011	Increase (%)
Limpopo	4.5	5.4	20.0
Northern Cape	1.0	1.1	10.0
Eastern Cape	6.1	6.5	6.6
Free State	2.6	2.7	3.8

The statistics highlight the need to service a growing population, to provide them with access to water and to protect that right to access to water. Water service statistics provided by Statistics South Africa for the period 2002 to 2010 show that South Africa managed to make water available to significant percentages of the population. The issue is how to both improve and sustain water service delivery such that clean water is available to everyone.

During the period 2004 to May 2012, major service delivery protests took place. The question had to be asked, given that water was being made more widely available, what the issues were. It transpired that water availability does not meet the expectations of consumers.

Study methodology:

- Sample: officials appointed by water board responsible in managerial and technical capacities; board of directors appointed by Minister for Water and Environmental Affairs; officials appointed by municipality in managerial and technical capacity responsible for water services; public representatives in municipality responsible for water infrastructure and officials in local government and water affairs responsible for water services.
- n=409
- Limitation: only water boards established by the water services act were considered. Customers were not consulted.
- Time of study: July 2010 – August 2012
- Data collection: a qualitative approach was used through the aid of a closed questionnaire. Face-to-face interviews were considered.
- Questionnaire design: measurement scales were used
- Data analysis: Multiple Regression analysis: ANOVA F-test; coefficient and R-square
- Dependent variable: sustainable governance
- Independent variables: critical areas, characteristics, principles, information sharing and strategic development.

The study found that there are positive relationships between the dependent and independent variables, particularly for governance quality, governance effectiveness and management effectiveness. Governance quality depends highly on ethics and good governance principles, such as transparency and integration. Governance effectiveness depends on context, planning, inputs, processes, outputs and outcomes. Management effectiveness relates to carrying out clear mandates.

Mr Ntuli presented a graphic that illustrated the 'diamond model' for stakeholder sustainable governance, with sustainable governance at the centre, and the corners representing DWA, Water Boards, Water Service Authority and Provincial Cooperative Governance and Traditional Affairs (P.COGTA), and the four sides representing internal principles, operational principles, external principles and strategic principles.

Ms Ntuli presented and outlined the 'Sustainable Operational Water Governance Framework', represented on a slide by a graphic that illustrated a sustainable governance management system for water boards. He spoke about the various stakeholders and facets involved, and the relationships between them that linked sustainable governance to sustainable water service delivery.

Governance quality needs to be strengthened through applying the norms and standards of institutional governance. Governance effectiveness depends on the inclusivity of all stake-holders at all levels. Management effectiveness needs to be integrated in order to fulfil mandates. Integration is important, as is linking all government spheres in meeting social, economic and environmental needs. Water users should be included in decision-making processes. The choice of sustainable water

governance solutions is a matter of social justice, economic efficiency, and protection of the environment, where multi-level engagement in all spheres can be attained.

### **Discussion**

**Dr Harrison Pienaar (CSIR):** (1) I found your graph on service delivery protests interesting. Was there any correlation between election years and those statistics? (2) Your governance framework emphasised sustainable water service delivery. Is there also a component for sustainable water resources?

**Mr Tseliso Ntili (Nelson Mandela Metropolitan University):** (1) Yes, the time of elections did play a role. Close to elections, the performance of municipalities comes under greater scrutiny, and people tend to protest more. (2) Yes there is a water resources component. The two (services and resources) have to work together. Both are part of the total water value chain.

### **Panel discussion**

**Chair: Dr Barbara Tapela: Institute for Poverty Land and Agrarian Studies**

Panellists:

Mr Gert Jan Veldwisch (Wageningen University)

Mr Ashwin Seetal (SSI Engineers)

Dr Ndileka Mohapi (DWA)

**Mr Gert Jan Veldwisch (Wageningen University):** We had a really broad session with a variety of different contributions. I was struck by the focus on the valuing of water beyond direct economic value. Economic efficiency plays a significant role in structuring the decisions that are made on who gets water, but it is inadequate as a governance mechanism and needs to be balanced by other governance systems. There is a need to engage with alternative rural development models; we should be looking at what people are doing for themselves, and considering ways to support their local structures, rather than imposing solutions.

**Mr Ashwin Seetal (SSI Engineers):** The presentations were interesting and spanned the whole paradigm, from functional frameworks to philosophy and psychology, and legal implications related to access and rights to water:

- Mr Veldwisch gave a very interesting keynote address at the outset. Water is the invisible resource sitting behind land grabs. The dynamics of the grabs and the implications for rights and access are critical. Water flows in the direction of power; does that power represent an individual vested interest or is there a benevolent element to it as well? If a Government grabs water, is it for the right reasons (equitable distribution and access), as opposed to an individual grabbing it for financial power? Mr Veldwisch also raised an important point, picked up later by Mr Ntili later on - what he referred to as the participation rhetoric: public participation can be a double-edged sword – it can silence critics and deny access, or it can be used as a tool of empowerment.
- Mr Templehoff delved deeply into the human condition and the philosophy and psychology of access and rights. What are the implications if basic constitutional rights are not met? His case study was a good illustration of how it can degenerate the human condition into a downward spiral, where people are collectively beaten into submission and accept an untenable situation.
- Mr Harrison's presentation was also fascinating, and analysed the often debated issue of what constitutes sustainable development. The themes dealt with have severe implications for equity and access. It would be interesting to see the work expanded into the developing country context. What does sustainable development mean in a developing country context with high levels of unemployment vs. the overexploitation of resources?
- Dr Odeku took a legal slant and considered what constitutes a right, and the adequacy of the legal definition of a right in law. The constitution of 1996 made access to water a right and not a privilege, but this is not evident in reality.
- Mr Ntili moved to the practical examination of water boards. He looked at mechanisms to ensure the access and the utilisation of rights. There were critical linkages between his and Mr Veldwisch's presentation in terms of stakeholder inclusivity and the importance of governance and management.

**Ms Ndileka Mohapi (DWA):** Most of presentations focused on service delivery and failures to meet the promises. There are a lot of role players in the field, including government. My question is: what is *my* role as a community member and proud South African citizen? We all agree that our legislature has made the provisions required. Our challenges lie in implementation. There are several role players and institutions responsible for ensuring that services are delivered. Protest can only help to a limited extent; it cannot actually bring the services to people.

Do we say 'I am waiting for Government to do things for me', or do we ask 'what can we do as individuals to make things happen?' When government says that it will provide people with pit latrines, what that means is that after paying a subsidy, people will be able to dig a pit latrine, to be proud of it, take care of it and to ensure that it works for them. Another challenge is that people have their own perceived standards that they wish to adhere to, even when something lesser could suffice. Many people don't want to use ground water, but ground water is as good as water from elsewhere.

The Minister set aside water for emerging farmers, and not all of the water has been taken up, because access to that water is difficult. Most prime land that is close to rivers was taken up a long time ago. In rural areas, sometimes the terrain is too difficult to put in the necessary infrastructure to make access to water easier.

### **Discussion**

**Mr Johan Templehoff (North-West University):** With regard to democracy and service delivery, I studied the history of water service delivery in South Africa from 1994 to 2010. Looking at in the context of the terms of the presidents, some interesting patterns emerge. South Africa is still firmly in a democratic framework; the president is elected. In this system we have had four presidents, which says a lot for democracy. Changes in government affect the manner in which water is managed. It is important to realise that there are historical changes related to democracy active within this process. Protest peaked in 2010 and then began to decline, but became more intense and violent, and involved smaller groups of people. The events at Marikana illustrate an emerging cycle of violence, civil disobedience and civil discontent.

**Mr Lewis Jonker (University of the Western Cape):** I agree with what Ms Mohapi said. I have long been struggling to understand the things that have been put in place at a systemic and organisational level. Finally people are beginning to understand what is happening at a grass roots level.

**Mr John Harrison (eThekweni Municipality):** When you have a resource-constrained environment, how does the Government give out a right to that finite resource?

**Mr Gert Jan Veldwisch (University of Wageningen):** (To Mr Harrison) Different systems operate in different countries. It depends a lot on how close the basins are and how limited the water resource is. In South Africa the situation is fairly tense, and will soon reach a point where government won't be able to hand out more water until someone hands water in. Economic evaluations and politics come into play in different situations. Issues like dignity and the sustainment of people's livelihoods remain very important factors in decision-making.

**Mr Ashwin Seetal (SSI Engineers):** In response to Mr Templehoff, it is good that we have a vibrant democracy reflected in the changes we have had, but there is sometimes a paradox between the vibrancy of the democracy and its impact on institutional stability, and that is a tension we need to be very aware of. As Ms Mohapi said, we have civic responsibilities; rights come with responsibilities. As individuals we need to exercise our civic rights. In response to Mr Jonker, who also touched on civic responsibility, we are almost 20 years into our democracy, but it still needs to mature. There is a great deal of impatience, but we will get there.

**Ms Ndileka Mohapi (DWA):** Looking at our history, you realise that you have to state your intention (i.e. that everyone should have access to water). Without stating the intention, one cannot move away from the past, and those that did not have water in the past will remain neglected. Once the intention has been stated, one has to act on that intention. There have been tools and mechanisms put in place to ensure that water access for all is achievable. My concern is that there are some powerful role players in the water sector who still do not understand their role in ensuring the protection of the resource and access to all.

## **SESSION 10: TOOLS FOR IMPLEMENTATION**

**Chair: Themba Gumbo, Cap-Net United Nations Development Programme (UNDP)**

**Ms Nikki Funke, CSIR – Keynote address: Scenarios for the South African water sector in 2025 (N Funke, M Claassen and S Nienaber)**

The importance of scenarios for the South African water sector is based on the evidence of uncertainties and constant changes in the world in different domains, characterised by variability and anomalies in biophysical (such as annual rainfall), economic (such as growth in GDP), and socio-political domains. Scenarios can help the water sector plan for the future in an uncertain and changing environment.

Scenarios are not predictions of the future. They are one of the ways of attempting to achieve a desired outcome in an uncertain and variable future. Scenarios are a narrative description of a possible state of affairs or development over time, and are useful to communicate plausible futures, to promote discussion and feedback by dramatising trends and alternatives. Scenarios can help decision-makers to explore impacts of decisions, choices and policies.

This presentation focusses on the development of scenarios for the water sector institutional landscape by 2025 and looks at how scenarios can be successfully disseminated and impact on the water sector. The project was commissioned by the WRC in 2009 and ran until 2011, and was developed by the authors and other project team members, with inputs from various experts and stakeholders across the water sector. The workshops that produced the content for the final scenario outputs were facilitated by Chantell Illbury. The rationale was to build knowledge about key drivers and uncertainties that relate to the future of the South African water sector, specifically about the context in which water institutions may operate in future. The methodology used a structured research process to ensure participation of a wide range of stakeholders, as well as literature reviews, semi-structured expert interviews, Human Sciences Research Council (HSRC) social attitude surveys, a web-based questionnaire, interactions with urban and rural schools, and interactive scenario workshops, which resulted in agreement on scenario logic and key elements for fleshing out scenario stories. The two key driving forces that resulted from the inputs were ability to deal with decision-making complexity and sustainable exploitation of resources.

Animal characters were attached to each of the four scenarios:

- **Wise Tortoise:** The character demonstrates the value of a methodical approach, long-term planning and recognising the complexity of the situation. In this scenario, the water sector is not isolated but different sectors work together and treat water as a resource of strategic importance. Increased harmonisation of legislation results in a shared, principle based vision, and there is institutional maturity and stability contributing to an enabling environment that allows governance to work. Strong decentralised systems allow for local regulation and local impacts to be addressed. A strong citizens' voice emerges and this encourages accountability of all stakeholders. Common understanding and awareness of all stakeholders brings an appreciation of true value of water. Water is viewed as a social and economic resource but also as a finite resource that needs to be protected and managed carefully. The environment flourishes, producing a sustainable resource of clean and reusable water. The outcome of the scenario is happy and prosperous people.
- **Busy Bee:** The character has good intentions but its ignorance of the complexity of the situation foils its efforts. This scenario depicts noble intentions but a failure to correctly execute necessary actions, partly due to a distorted perception of the state of affairs. The country appears to have enough water and government appears to be trying to ensure the sustainable supply and management of water, prioritising sustainability at all costs. In effect, government is out of touch with reality. There is little economic growth and social development is slow. A lack of acknowledgement of the complexity of the situation means that government is not taking into account the inherent unpredictability of the water sector and there is increasing inability to deal with the unexpected. People in management operate in silos and cooperation and knowledge sharing do not appear on the agenda. Research is poorly directed and there is no clear research focus. Although there are pockets of passion in the water sector, it is dispersed and diluted. Knowledge is therefore not internalised, there is no time to reflect on decisions and little innovation and new ideas to address pressing and emergent problems.

- **Ignorant Ostrich:** The character is based on the myth of the ostrich sticking its head in sand when danger. This scenario takes neither sustainability nor complexity into account. Government's incapacity to prioritise water as central to development leads to urgency to implement short-term and imbalanced solutions to the ever-growing challenges of a developing nation. Government has a poor understanding of the concept of sustainability and a disregard of its significance, particularly in the context of other more important issues. The population is frustrated with the lack of service delivery, forcing government to make quick and often rash decisions around water issues in the hope to secure quick results as political and social imperatives for job creation and social and economic growth take precedence. Essential work is outsourced to the private sector in order to accelerate service delivery, thereby increasing complexity in the system and transaction costs. A weak understanding of inter-generational equity and a lack of a common vision together with an unyielding quest to realise short-term benefits puts a stranglehold on any considerations of sustainability in the water sector, resulting in water shortages. Government is blind to the danger signs and unable to make decisions that allow for a sustainable and prosperous future for South Africa.
- **Greedy Jackal:** The character is very sly, cunning and greedy, dealing with complexity while exploiting resources in an unsustainable way. This scenario is one of water scarcity. Resources are running dry in a country still in the process of development and addressing backlogs. Government is primarily concerned with the many social and economic demands and represses any pressures to pay attention to environmental responsibility. There is an attempt to address complexity by introducing a multidisciplinary approach. There are discussions about learning by doing, including the discourse around trade-offs, sharing of resources, efficiencies and cooperation. However, conflict increases between competing users and a compromise becomes necessary in order to satisfy specific interests, such as economic, social, agricultural or political interests. Stakeholders are fragmented, affecting the decision-making process and providing a platform for intervention by lobby groups to pressurise malleable components of the decision-making process in order to satisfy specific interests. South Africans are forced to rethink their cavalier attitude towards water, and in frustration they turn to government, which centralises control, is unable to implement the NWA and eventually, it is suspended.

Once the scenarios have been developed they can be made useful to end-users through dissemination. Some prominent scenarios that have been developed at different points in time include:

- **High road to low road scenarios:** These were developed in the early 1980s in the context of the international economic turbulence of the 1970s, with South Africa facing increasing isolation and the government resorting to the rule of force, in an attempt by Anglo American Corporation to look at alternatives to the business planning approach. Two scenarios were developed that were applicable to South Africa. The high road scenario indicated that South Africa would move to a multi-stakeholder democracy with higher per capita income, and become a winning nation. The low road scenario indicated that South Africa would continue on the economic growth path of the mid-1980s and would eventually slow down to eventually become a waste land. The key impacts and dissemination of these scenarios were the presentations by Clem Sunter to audiences of between 25 000 and 30 000 people, contributing to a shift of thinking in government circles and raised the need for change and eventually transition to democracy.
- **Mont Fleur scenarios:** These were developed between 1990 and 1994 in the context of the first democratic elections. The focus was on housing, education and constitutional reform and shaping the first ten years of the new South Africa. The four scenarios included:
  - The ostrich scenario where transition does not take place and there is no negotiated settlement and the situation remains unchanged or worsens.
  - The flight of the flamingo scenario where transition is successful, there is sustainable economic and social policies, and progress is made.

The scenarios were distributed to more than 50 groups of people, a short summary document was published and a video was produced. The participants in the scenario process also explained the thinking behind the scenarios and distributed them to their various networks and a common language and understanding of challenges was developed among the scenario participants.

- **Dinokeng scenarios:** These were developed in 2009 at a time when the world faced an economic crisis and South Africa was faced with prominent challenges in relation to unemployment, poverty, safety and security, education and health. The scenarios identified problems with regard to unethical, unaccountable leadership across all sectors coupled with a disinterested and overly dependent population and a weak state that was unable to address the country's critical challenges. Three scenarios were developed:

- Walk apart scenario: Poor leadership results in an increasingly frustrated and angry population that is suppressed by government, leading to a spiral of decline of the country.
- Walk behind scenario: The state is strong and tries to address the development challenges of the country. However, civil society is marginalised and becomes less interested in the affairs of the country. The state alone cannot solve all the problems.
- Walk together scenario: The state is open to criticism from civil society and works together with civil society to create a more desirable future.

The scenarios were disseminated to a range of audiences through the media and an engagement campaign.

In order to ensure that their scenarios are disseminated effectively and have impact, knowledge producers should conduct a robust scenario development process, plan for an effective dissemination process, pay attention to the packaging and communication of scenarios, ensure buy-in to scenario products and recognise the importance of timing. Knowledge users should ensure they have the scenario information they need to make important decisions at their disposal, by developing scenarios when needed, engaging with science councils, research organisations and boundary organisations to access the latest relevant research, draw in experts across the water sector in strategic planning exercises and make use of scenarios for planning purposes.

Scenarios can help decision-makers identify preferred future states and move towards them, and mitigate risks about the future. The four water sector 2025 scenarios could be used to operationalise the National Water Resource Strategy (NWRS) to continue to implement the NWA and to facilitate decision-making in the water sector with regards to complex issues, such as acid mine drainage and hydraulic fracturing (fracking).

### **Discussion**

**Dr Raphaëlle Ducrot (University Eduardo Mondlane, Mozambique):** What steps will you take to ensure that your scenario is communicated and disseminated to a wide audience?

**Mr Derrick du Toit (Association for Water and Rural Development, AWARD):** Scenarios derive value from their shock value. When a response is elicited from government officials, it is out of the horror of the 'low road'. I am not sure that scenarios offer a creative option to seek solutions in a particular context. The dissemination of scenarios is valuable but I think there is another way to work with this: it is in involving yourself in developing a scenario that you change. It is the practitioners that develop scenarios who benefit the most, and not those who read the shock outcomes of a particular scenario.

**Dr Themba Gumbo (Cap-Net UNDP):** What scenario would you use to best describe the present situation in the water sector?

**Ms Nikki Funke (Council for Scientific and Industrial Research, CSIR):** One of the reasons why we dealt with the issues of dissemination and uptake of scenarios is that this was not required as part of the project brief. There was not a strategy in place and this is a definite shortcoming in this project. It would be necessary to have a follow up project to deal with this aspect.

I hope that not all our scenarios are 'shock' scenarios. I think that one would want to move towards the 'wise tortoise' scenario although this is idealistic. The two middle scenarios contain both positive and negative elements to the degree that they relate or respond to complexity or sustainability. I fully agree that developing scenarios can benefit the people present in the process. A number of thought leaders in the water sector and beyond were included in our process. If those who develop scenarios are also key decision-makers, this could be a way to get scenario-thinking into key decision-making processes. Although scenarios sometimes have extreme stories to tell, they also tell where you should not want to go and where you should be moving towards.

This has been give consideration. The current decision-making around water issues is viewed as the 'busy bee scenario' where there are noble intentions, a focus on sustainability but there is not always sufficient attention being paid to complexity. One would want to move towards a wise tortoise

scenario where different sectors work closely with each other and there is more harmonisation of legislation.

**Ms Tanya Lane-Visser, University of Stellenbosch – Keynote address: Bridging the skills gap: A tool for the development of sound catchment management strategies and water distribution plans (TE Lane-Visser, J Smithers and W de Clerq)**

The NWA (Act 36 of 1998) made provision for the creation of nineteen Catchment Management Agencies (CMAs) spanning the country. This has been subsequently revised to nine CMAs partly because the success rate of initiation has been very low. The main function of the CMAs is to allocate water resources fairly amongst stakeholders.

The creation of CMAs has been referred to as the decentralisation of control with regard to water management and has inadvertently created a skills shortage. There is a lack of skilled personnel available to serve as water managers on CMA governing boards and to develop the catchment management strategies (CMSs). Furthermore, there is a skills shortage in terms of translating a CMS into an actual water distribution plan. This raises the challenge of how to close the skills gap as quickly and efficiently as possible.

The NWA states that, 'water is a limited and valuable resource that belongs to no single South African; rather, it belongs to all the people of South Africa.' The goal of water management in South Africa must be to distribute it in a way that is equally beneficial to all South Africans. The NWA clearly specifies that public participation is a critical element to achieving its goals and strategic objectives. It should therefore be one of the drivers of complexity that is taken into account when water allocation is done. In addition, the reserve (human reserve and ecological reserve) is a right to water set out in the NWA and must be met before any other water is allocated from the resource. Bearing this complexity in mind, how can the available water be allocated among the many water users who demand it?

One of the current approaches used to allocate water to users is the water priority matrix, which helps to determine priority for water allocation, but provides no guidance on allocation volumes. The matrix also becomes outdated fairly quickly and only considers demand as a criterion for allocation. Another approach is a system based on penalty functions, which allocates a penalty level for each water user. A penalty is incurred for every unit of water demanded but not received and the goal is to minimise the total penalty incurred. In essence water users with the highest penalty will receive water first. The penalties are currently only assigned by the analyst, and can therefore be subjective or incorrect, and the system often does not consider the full scope of externalities when determining penalty levels.

Other problems with the current approaches include:

- The lack of a fixed policy on how the penalty related decision is made
- Allocation is generally made based on the experience and expertise (or lack thereof) of the authorities involved
- The decisions can be highly subjective, opening the door for corruption, and are often dependent on skills that are unavailable
- The systems are not comprehensive.

It is common knowledge that current water supply levels of fifteen of the nineteen water management areas (WMAs) exceed sustainable levels.

Specifications for an improved approach to the allocation of water would have to incorporate objectivity, consider multiple criteria, be repeatable, require low skill levels and represent multiple stakeholders' interests fairly. The typical design of an optimisation model has an objective function that is subject to constraints. In order to maximise the benefit over all users per criterion, it is necessary to decide on criteria for optimisation and then calculate a score for each water user based on the relevant objective.  $C$  equals the water user performance criterion score for objective (i) and water user (j) and  $C_{ij}$  is multiplied by the amount of water allocated to the user ( $W_j$ ). More water will be allocated to users scoring higher in terms of the criteria. This is repeated for each criterion. However, this does not fairly represent water assurance levels and it is therefore necessary to elaborate this objective function by accounting for the different levels of assurance of water supply. The function splits the water allocation into the water allocated per level of assurance, forcing the model to allocate the water at higher assurances to the user have better scores in terms of the criteria.

The Water Resource Yield Model (WRYM) developed by Basson et al. (1994) is used to determine the amount of water that can feasibly be drawn or abstracted from a catchment and the level of assurance at which this water can be abstracted. A profile of the catchment can be put together using this model, showing the amount of water available at each level of assurance.

In establishing the criteria used in the objectives, it is suggested that stakeholder workshops are used to come up with criteria specifically suited to a relevant catchment, and recommended that the triple bottom line approach is adopted, focussing on economic, environmental and societal issues to ensure a holistic set of criteria. Economic support refers to the economic contribution of water users to citizens of South Africa, both directly and indirectly. Environmental measures give an indication of how sustainable and environmentally friendly the water user is, and social measures indicate how socially responsible the water user is. In addition, the study used the Global Reporting Initiative (GRI) to produce a shortlist of 26 potential criteria and the shortlist was presented to six leading academics in the field of sustainability who selected nine objectives, or three economic, environmental and social objectives. Every objective is optimised separately, and while they may be conflicting, no objective can be neglected and all objectives are treated as equally important.

Constraints of the model include:

- No more water may be allocated than is available
- Less than zero water cannot be allocated
- Each water user should not be allocated more water than required as this prohibits the algorithm from simply allocating all available water to the superior water user, even though the specific water user may have no use for that amount of water
- Each water user must be allocated at least the water specified as minimum amount, which can be decided by the water authority in collaboration with stakeholders and represents the compulsory water allocations, such as the reserve.

The model output presents a water allocation matrix that gives a volumetric allocation to the water user and is simple to update. Model validation used a basic scenario, an extremely simple, two water user problem where User 1 is superior in all water user performance criteria to User 2. The demands of User 1 should be met before beginning to fulfil the demands of User 2. Given that the amount of water required by User 1 is greater than the total water available, the best possible water allocation should involve allocating all available water to User 1. The model was run one hundred times and the exact water allocation resulted each time, giving the optimal result. The model was then applied to a realistic situation loosely based on the Umgeni catchment, where water is insufficient to supply the required demand, necessitating prioritisation of water users.

This project proposes a system where decision-makers look at all of the effects that their decisions can have. It encourages accountability, objectivity and repeatability of decisions that are based on facts rather than individual preferences or biases. The system provides the ability to emphasise job creation or other strategically important goals and ensures equitable allocation. The interface between the model and user is very simple. This tool makes complex techniques available for use by water managers who may not have the skills or training to use these techniques themselves. The participative approach in objective formulation and the model's ability to handle this complexity encourage water users to act in a responsible manner. In order to use this tool, water managers would have to facilitate a stakeholder workshop to develop objectives, allocate scores to each objective and each water user, collect data on water availability for the specific catchment and ascertain water requirements of water users. This information is fed into the model to produce a fair, balanced system of water allocation that is capable of dealing with complexity and makes complex techniques available to water managers who may not have the necessary skills to develop a water allocation model. The participative approach in formulating objectives enables the model to handle complexity and encourage water users to act in a responsible manner.

It is anticipated that this study can play a small role in guiding South Africa to a better future by improving the allocation of our scarce and limited water resources.

## **Discussion**

**Mr Simon Ngoepe (DWA):** I am one of the key people responsible for the WRYM. I agree that the current penalty structure could be bias in some cases. Is there a way to incorporate the recommendations of your study to another scenario in catchment development? In terms of the WRYM, is there a way that you could recommend improvements or adjustments to the current model?

**Ms Tanya Lane-Visser (University of Stellenbosch):** The proposed model is not radically different from the penalty function and proposes using stakeholder processes to replace or develop penalties. Where the penalty function summarises or combines the objectives or criteria into a single score, the proposed model leaves the objective in their respective units and gives separate scores, finding a balance of the nine objectives and turning the penalty function into a more robust and fair model for water allocation. The study did not look into the detail of the WRYM. However, I am fairly confident that, if it is found lacking, there should be ways to improve it using recently developed techniques and technology. Predictive models have improved over time.

**Ms Ashia Petersen (DWA Western Cape):** In terms of the rationale for the study, you mentioned the lack of skills and expertise in the CMAs. There are only two CMAs and I do not think that the operation of the CMAs has anything to do with the existing skills base. It rather has to do with a policy decision. The CMAs have water resource managers and have CMSs in place. The development of CMSs has nothing to do with the skills base. The other issue concerns water allocation. Allocation schedules done in the compulsory licensing process follows a detailed, scientific model process that can be repeated. The WRYM can be improved but the existing allocation schedule goes through a rigorous scientific process.

**Ms Tanya Lane-Visser (University of Stellenbosch):** The skills gap referred to is not in the current CMAs but in the remaining seven CMAs still to be established. I accept that CMSs have been developed for the two existing CMAs, but how capable are the CMAs of taking the CMSs to implementation? There is a lack of skills on a disaggregated level and not in the strategic formulation stage. Various water authorities were interviewed in the study and nobody knew how to implement the CMS. There appears to be a massive lack of skills and decision-making at ground level. In terms of the allocation model, there was no evidence of a rigorous, scientific approach in place. I am aware that there are other useful processes available, but these are not being used. There was evidence of the penalty system being used. The proposed model is a superior version of the penalty function.

**Ms Ashia Petersen (DWA Western Cape):** I am responsible for the allocation of water in the Western Cape and was not approached by the study team. An assumption has been made based on the CMAs still to be established. There is an existing skills base and people currently in DWA perform the functions. There are skills shortages, but the skills exist. Other challenges should be addressed instead of the shortage of skills and expertise in the CMAs. Incorrectly placed skills and incorrect organisational design are the real problems that should be addressed.

**Dr Mark Graham, GroundTruth Water, Wetlands and Environmental Engineering –  
Development of citizen science biomonitoring tools as a resource for environmental education  
and enhanced community participation in fresh water governance for sustainable development  
(PM Graham, B Madikizela and M Browne)**

The following quote from Wangari Maathai, Kenyan environmental activist and Nobel Laureate, is central to the topic of this presentation and highlights the natural curiosity that humans, particularly children, have about the environment: “I reflect on my childhood experience when I would visit a stream next to our home to fetch water for my mother. I would drink water straight from the stream. Playing among the arrowroot leaves I tried in vain to pick up the strands of frogs’ eggs, believing they were beads. But every time I put my little fingers under them they would break. Later I saw thousands of tadpoles: black, energetic and wriggling through the clear water against the background of the brown earth. This is the world I inherited from my parents. Today, over 50 years later, the stream has dried up, women walk long distances for water, which is not always clean, and children will never know what they have lost. The challenge is to restore the home of the tadpoles and give back to our children a world of beauty and wonder.”

Some of the problems around water resource governance have to do with:

- Community understanding of rights and expectations, including the right to be part of an environment that is not harmful. Communities often do not enjoy this right
- Increasing pollution of freshwater resources
- The lack of flow in water systems and the implications thereof
- A disconnection between actions (what is consumed) and the impact of these actions on the environment, and a poor understanding of ecosystem goods and services
- The lack of consideration of the continuum and spectrums between polluted water or no water
- The political and social will to tackle these issues. It appears that the most pressing issues are dealt with first, and the basic environmental issues tend to be neglected.
- The social license to operate, particularly on the part of corporate companies and government.

The miniSASS is a derivation of the South Africa Stream Assessment Scoring System (SASS), an aquatic biomonitoring tool that has been used in South Africa for over 30 years. This low cost, low technology, environmental education tool is used to distil the 90 and more aquatic invertebrate taxa that are used to derive river health classes into 13 simple groups and produce accurate, scientific data that gives an indication of the health of rivers and is a 'red flag' indicator of problems.

MiniSASS has been used for over ten years by environmental educators and the South African River Health Programme (RHP). The skills learnt from using the technique include the promotion of a level of understanding of the environment. Many of the rural children who joined the groups' studies of the rivers had never before seen the organisms that live in the rivers and discussions around the role and functions of the organisms enriched their knowledge of the environment. There has been increasing integration of the environmental education in school curricula. Useful data can be derived from the process and the tool can be used by community groups to obtain a full indication of the river system.

About 6000 records have been taken from full environmental assessments using the SASS methodology; the data have been analysed, showing very good correlation between the SASS and miniSASS data. The tool itself consists of a simple net and a site information sheet to record samples found in the river and give ecological information about the site. High scores indicate high sensitivity to pollution and low scores indicate high tolerance of pollution. A quantitative score of the health of the system is generated from the information. Support tools, such as field guides, assist identification and understanding of bugs and worms found in the water and form part of the miniSASS tool kit.

The environmental data collected has spatial application and potential in South Africa. Many of the approximately 25 000 schools in the country are located within a short distance of river drainage networks. If each of the 1111 EcoSchools in the country were to adopt a river and if 50 per cent of all schools in South Africa became river health monitoring sites, up to a distance of 50 per cent of the entire length of the rivers in the country (approximately 170 000 linear kilometres) could be monitored.

This cheap, effective set of tools is easy to use and has the potential to make a real change at the community level. MiniSASS provides 'eyes and ears on the ground' in terms of identifying water quality problems and raising red flags. Community involvement and understanding of water quality issues would ensure that connections are made between broader catchment activities and water quality. MiniSASS is an effective way of ensuring that the next generation of consumers, river health monitors and potential polluters, as well as the next generation of leaders have some understanding of what aquatic ecosystems.

The next phase of the project is being developed in collaboration with the WRC and will address the creation of a data platform that allows any school in the country can create a point on a map using Google Earth and begin to log data from a specific section of a river that is being monitored, thereby developing a community science database.

A group of people who walked the length of the Umgeni River over a period of a month applied miniSASS to measure the health of the river. Public participation would ensure that similar monitoring exercises could be undertaken in all the other water networks in the country.

## **Discussion**

**Unknown person:** What role can an environmental NGO such as the Wildlife and Environment Society of South Africa (WESSA) play in ramping up the miniSASS vision? WESSA has recently

partnered with Canoeing South Africa. How could the canoeing fraternity engage with the miniSASS tool, effectively, practically and simply?

**Dr Phillip Mark Graham (GroundTruth):** Much of the miniSASS development was done together with WESSA. Ramping up the EcoSchools programmes in a supportive manner and encouraging them to adopt a stretch of river using the tool to monitor the water would be helpful. The canoeing fraternity could contribute to the monitoring of the rivers they canoe on. The miniSASS project is collaborating with the University of KwaZulu-Natal on a platform that is being developed to integrate the Google Earth platform into a broader platform in order to develop a more comprehensive picture of the health of our water systems.

**Mr Hans Charles Komakech, UNESCO-IHE Institute for Water Education – A game theoretic analysis of evolution of cooperation in a small-scale irrigation canal system (HC Komakech, J H Miller and P van der Zaag)**

Mr Komakech did not deliver his paper. The abstract is included for the sake of completeness.

### **Abstract**

Local self-governance arrangements can often solve water allocation challenges. It is increasingly argued that innovative water governance arrangements should be those that build on the success of those long-enduring water-sharing arrangements that locally evolved. However, before these practices can be scaled up, it is important to understand why they emerged, how they function, and can be sustained. Based on in-depth field research in the Pangani river basin Tanzania, we described several local water allocation arrangements that have evolved over the past 50 to 200 years. In many of these irrigation systems, there is significant inequality of endowment (e.g. access to land). Despite this high disparity between the actors, the irrigation infrastructures are being sustained. At the level of a river, we find a diversity of water-allocation arrangements that have arisen in the same river basin. In this paper, we use a simple game theoretic model of irrigation canal maintenance to understand the emergence and functioning of these various sharing arrangements. Using the game we attempt to improve our understanding of how these arrangements arose and endure, given the inequality in landholding, location asymmetry, and differences in the costs and benefits of collective action.

**Dr Raphaëlle Ducrot, University of Eduardo Mondlane, Mozambique – Measuring impacts of social learning activities to consolidate mesoscale institutions for water and natural resources management: Example of the Uthukela District Municipality (M Pommerieux, R Ducrot and M Bourblanc)**

This project is part of the AfroMaison project which works on the development of an integrated strategy for natural resource management at mesoscale, taking into account local and international scales that influence the mesoscale. The project is being undertaken in five different districts of South Africa, one of which is the Uthukela District Municipality.

The project involved multilevel stakeholder engagement in the operational framework at different stages of the planning process: options identification, plan building strategic matrix integration, participatory simulation to design the implementation plan. The methodology for the study was based on a socio-ecosystem approach using the landscape as the complex socio-ecosystem, and adaptive management. This involved capturing the variability and perceptions of knowledge and developing a plan addressing system functioning, coherence and flexibility through social modelling. In addition, the project aims to build collective adaptive capacity through designing and testing an assessment protocol of collective adaptive learning.

The proposed protocol commences with an initial assessment of actors' perceptions, values and interactions using a standardised questionnaire for key actors, as well as interviews with champions in the system. This is followed by monitoring of key events through an events logbook and an assessment of participation expectation and learning through a short questionnaire before and after the events. The final assessment of the actors' perceptions, values and interactions will be based on input in the standardised a questionnaire.

The ENCORE assessment framework involves an assessment of the whole sequence of activities through different dimensions: external, normative, cognitive, operational, relational, equity, and takes cognisance of the difficulties in tracking normative and cognitive change and conditional learning practices.

Normative perspectives were captured from 14 key actors in the system at mesoscale levels. Actors prioritised industrial perspectives (related to efficiency and productivity) and there was a major focus on a civic perspective (related to equal rights and citizenship), followed by commercial aspects. Other perspectives were grouped under opinions and domestic issues. The widespread differences between the actors showed that it would be difficult to achieve a shared perspective and reach consensus.

In terms of cognitive perspectives, actors were requested to indicate problems. Respondents from local communities were more able to state the areas of problems, although their views were partial, whereas those at provincial level had a very poor idea about the issues at stake and the interconnection of problems. Many of the causes of problems identified by actors were related to social or political issues, but concrete solutions were not offered.

Relational perspectives showed very little interaction between district municipalities (as institutions that could be responsible for integrated management of natural resources) and most of the other actors, particularly local municipalities and the main users. Several actors indicated that they preferred not to interact more with the district municipalities. An initial assessment was that the connection between actors at mesoscale was not well developed.

A forum attended by 29 participants, served as a visioning exercise and was monitored by the project team. The participation process during the event was analysed based on 9 criteria and suggestions and opinions rather than discussions dominated the interactions between actors during the event. The overall assessment of the feedback received from two-thirds of the actors who attended the forum was positive. It was interesting to discover that, although actors had been invited to participate in a visioning exercise for integrated natural resource management (INRM), most perceived it as a training session on INRM.

The project is work in progress with numerous workshops still to be implemented. The protocol will be simplified for implementation in the other case studies that form part of this project in order to evaluate whether the consolidation of mesoscale institutions can be done through social learning activities.

## **Discussion**

**Unknown person:** It was interesting to note the occlusion of values was a concept looked at in the study. Why did you choose to look at values particularly and how do you differentiate between norms and values?

**Dr Raphaëlle Ducrot (University Eduardo Mondlane, Mozambique):** The values used were taken from a specific sociological work that identified different world views, which were translated into sentences, and actors were requested to indicate the sentence they preferred. In my view, norms are what are commonly understood as normal and are commonly believed should be done.

**Dr Lucia De Stefano, Universidad Complutense de Madrid, Spain – Water governance: Concepts and approach framework as applied in the Middle East and North African (MENA) countries (L De Stefano, M Svendsen, J Lautze, M Giordano, B Steel, B Brown and AT Wolf)**

The Regional Water Governance Benchmarking (ReWAB) system is a tool that was developed with sponsorship from the United States Agency for International Development (USAID), Office of Middle East Programmes (OMEP) from September 2008 to February 2010. The work was done in Morocco, Egypt, Jordan, Turkey, Oman and Yemen. The context of the project was to create an international debate about water governance. The presentation focusses on the national level outcomes of the research and some of the lessons learnt in building this framework that was tested in the six countries but could be applied in many other settings.

The project team comprised a balance of members from universities, research institutes and consulting companies working in the six countries. The object of the analysis was deliberated before

all team members accepted the following definition: 'Water Governance is the process, way or manner in which decisions are made related to water resources'.

The team agreed that water governance is a process that uses legislative and policy frameworks, and that water management provides outcomes. Governance is how decisions are made in relation to issues such as strategic planning or water allocation. Good governance is outcomes based. Attributes of good governance are related to the process, not to the outcomes. Good management outcomes and institutions are diagnostic tools to assess which areas of governance are failing.

The development of diagnostic tools to assess the quality of governance for purposes of benchmarking involved a framework comprising several components:

- Process features, which were a set of principles of making decisions that refer to processes
- Structural components, which were necessary in order to make decisions
- Functional components, which were divided in five broad categories with sub-functions that defined the type of activities required of any water system in order to provide outcomes.

The methodology involved:

- A desktop study, which looked for evidence of the presence and support of process features in policy documents and laws, and functions in policy documents and laws.
- Fieldwork in each country, which captured stakeholders' perceptions of organisations' role in functions, the level of performance of functions and the strength of process features.

The tools produced were protocols about the desk study and the field work. Document tagging was used to facilitate reference to relevant legal and policy documentation and a database was developed as a repository for these documents. A desktop scoring process was used to evaluate the documentation's support of the various functions and consistency between policy and legal documents. An assessment identified the strongest elements as well as the weakest links in the water governance systems of each of the countries, presenting areas for discussion.

A comparison of the countries' water governance was difficult as different standards were applied in each country. However, the weakest function in each country was the regulation of water resources and services and the strongest function in most cases was strategic planning. Each country had individual strengths and weaknesses that were identifiable using this method.

The research team recognised that water governance as a process could not be analysed in isolation and that it would be necessary to consider all the other components that contribute to good decision-making, and eventually good water governance. It was concluded that the combination of a documentary analysis and fieldwork had been an appropriate approach. The team considered the balance between local relevance versus international comparison and how to produce questions that elicited strong responses, yet were applicable across a range of countries. The outcome was that the Stockholm International Water Institute (SIWI) and the Water Governance Framework were encouraged by the process and came on board toward the end of the project, and developed guidelines for the development of a methodology for assessing water governance.

## **Discussion**

**Dr Ania Grobicki (Global Water Partnership, GWP):** Could you explain more about the analysis of the results? One example was that the institutions that would have been effective (universities), were not sufficiently involved in water governance, and another was that the right institutions were involved but their efforts were not coordinated. These are two common pitfalls in this kind of process. Have you analysed this to find any other typical pitfalls that you could describe?

**Dr Lucia De Stefano (Complutense University of Madrid, Spain):** A comprehensive report produced on water governance in each of the six countries included numerical scores as well as pitfalls identified and considered areas of commonality. Comprehensive reports and the material are available on the SIWI webpage.

**Dr Themba Gumbo (Cap-Net UNDP):** I noticed that integrity was one of the perceptions measured in the study. This aspect is being addressed in water governance issues in South Africa.

**Dr Lucia De Stefano (Complutense University of Madrid, Spain):** At a few of the meetings with stakeholders in Yemen, senior officials thanked the team for being there and openly raising the issue of integrity. It was useful to have a forum where this issue could be discussed.

**Mr Derrick du Toit, AWARD – Water simulations: can they work in contested contexts? The case of participatory planning by means of water allocation simulations (DR du Toit, SR Pollard, N Ferrand, S Farolfi, G Abrami and H de Fooij)**

The presentation is not on research or on a new methodology, but is an opportunity to critically reflect with practitioners and contrast some of the tools presented during this session. It is necessary to look for new methods to do water allocation and this work is an attempt to assess whether the use of water 'games' or simulations would be successful in allocating water in contested environments.

The water simulations were done in seven catchments of the Lowveld, specifically the Inkomati catchment. Most of the catchments are in water deficit and have transboundary implications. The contested contexts relate to WRM and water governance. Fifteen out of 19 WMAs in South Africa are in water deficit, where available water is less than the demand for water. Water allocations therefore occur within a contested environment that can be highly politicised and conflictual, and where the choice of tools for allocation requires serious consideration.

The presentation deals with the Sand River catchment, where the river is not a massive resource and a variety of water users make claims on the resource in order to sustain livelihoods and the economy of the region. Demands on the resource are not always licenced. It is also necessary to consider neighbouring states downstream, as well as large concerns of governance at a transboundary level and to assess whether instruments that ignore the extent of the engagement with other role players in water allocation could be used.

Issues on a local level include off-takes from the small river that provides substantial water for domestic use, agriculture as well as conservation as a major tourist opportunity in the area. If particular formulas are used to allocate the remaining water in the river they would possibly not be defended. The various sectors would raise arguments that justify their requirement and make claims of economic rationality, which are difficult to work with and to build into numerical models.

As a means to find alternative options for water allocation in contested environments, a more participatory approach, Wat-a-Game (WAG) was developed as a generic tool involving role playing and was used in the Inkomati catchment. The idea was to crystallise principles to use them in different contexts and to respond to conflictual or contested situations. Simplified models and games in a participatory process are used to represent the system before arriving at a water allocation schedule. If a water allocation schedule is put in place without going through this process, users will have a sense of being badly done by.

These simulation processes are used in Bulgaria to address flood and drought risk management in the Upper Iskar Basin. Water users assess their own situation, taking into account challenges and developmental issues with regard to water allocation. It is essential to use instruments that help get rid of the legacies of the past instead of re-entrenching them. Spatial and sectorial priorities also need to be taken into account in water allocation. Stakeholders develop their own representations and question real dilemmas in order to grow into the idea of water allocation. Water cannot be allocated without addressing context. A series of strategies is developed and options are derived from stakeholder deliberations. Senior decision-makers should be drawn into these processes as they will be held accountable for the way in which water is allocated.

Simulations promote system understanding and build familiarity with components of a system (catchment) as well as relationships between up- and downstream users, an extremely important aspect of strategic planning. Simulations use a simplification of systems for purposes of understanding and assist in the development of partnerships. Principles for management are clarified, visualisation is useful and dialogue is extremely important. Understanding starts to emerge in the process and it is necessary to start simply and confirm the understanding during the process. A step by step introduction of new aspects and elements is important. Participants in the simulations provide a map of outcomes for different configurations of management decisions and shift from learning to strategic thinking, building a common language.

Some of the challenges in using simulations include:

- Participants enter these processes with caution in times of water deficits and water stress, and tools must change to accommodate these realities
- The arguments often revert to economic rationality
- There is often a focus on short-term gains
- Role-playing can be trivialised
- Issues of trust and relations might not be adequately addressed in this tool
- Trust in the method and the process, or it will be difficult to do participatory allocation planning
- The process is time consuming
- In terms of multiple stakeholder environments, people bring positions about what they want from the negotiation process, as well as their interests to the allocation processes.
- Inter- and intra-sector competition is down-played and can lead to collusion
- Participants withhold the right to participate
- Participation is delegated to junior staff.

Some questions that require consideration by those participating in the water allocation simulations:

- Are we getting the application correct?
- Are simulations associated with relevant water management practice?
- Can simulations reduce conflict?
- Can we build a culture of stakeholder participation?
- Can we institutionalise the application?
- Are the outcomes taken seriously and is there feedback?
- Who will drive the processes?

### **Discussion**

**Dr Chris Dickens (Institute for Natural Resources, INR):** When I first played the game, it was poorly calibrated to the catchment. People who played had a wonderful time and lots of fun but it did not represent reality. I am concerned about the extent to which the game should represent reality, understanding that if it is not fun people may not get the message that the game is trying to convey.

**Mr Derrick du Toit (Association for Water and Rural Development, AWARD):** It is important to build in steps and get the principles of the game on the table, and not be too concerned about the initial engagement. It is better to run a series of cycles of the game to demonstrate the concepts of particular catchments. The more familiar participants are with the concepts the less likely they are to trivialise the game, and more specific information can be added. This process must be managed carefully. A number of tests were run and showed that without principles, people trivialise the game.

**Unknown person:** My concern is about the replicability of the process with other facilitation teams who do not have the background and depth of experience. This is a methodology and a tool and the intention is that another group, possibly with different perspectives would present the games.

**Mr Derrick du Toit (AWARD):** This is a real concern. Perhaps the CMA staff needs to be familiar with these participatory processes. They will require support. It is important not to become too over-ambitious too soon. There will have to be some form of institutionalisation of the approach.

### **SESSION 11: TRANSBOUNDARY WATER GOVERNANCE**

**Chair: Phera Ramoeli, SADC Water Division**

**Mr Dumisani Mndzebele (KOBWA) – Blending scientific knowledge and water policy in transboundary water management: its successes and challenges in the Komati River Basin (DH Mndzebele, CX Zwane and SM Dhlamini)**

The paper's main thesis is that water governance in the transboundary Komati River Basin is largely about balancing various spheres of influence in decision-making. This balance may be realised through the appropriate blend of science and policy.

Experiences of the Komati basin were presented on how 'blending' science and policy happens in the basin, and a case of dealing with a drought situation.

The Komati river basin covers an area of 11 200 km<sup>2</sup> and is a catchment of the greater Incomati system. The mean annual runoff of the Komati is 1 430 mm<sup>3</sup>, which is about 40% of all runoff in the Incomati catchment. Sixty-six per cent of the basin falls in South Africa, and 34% in Swaziland.

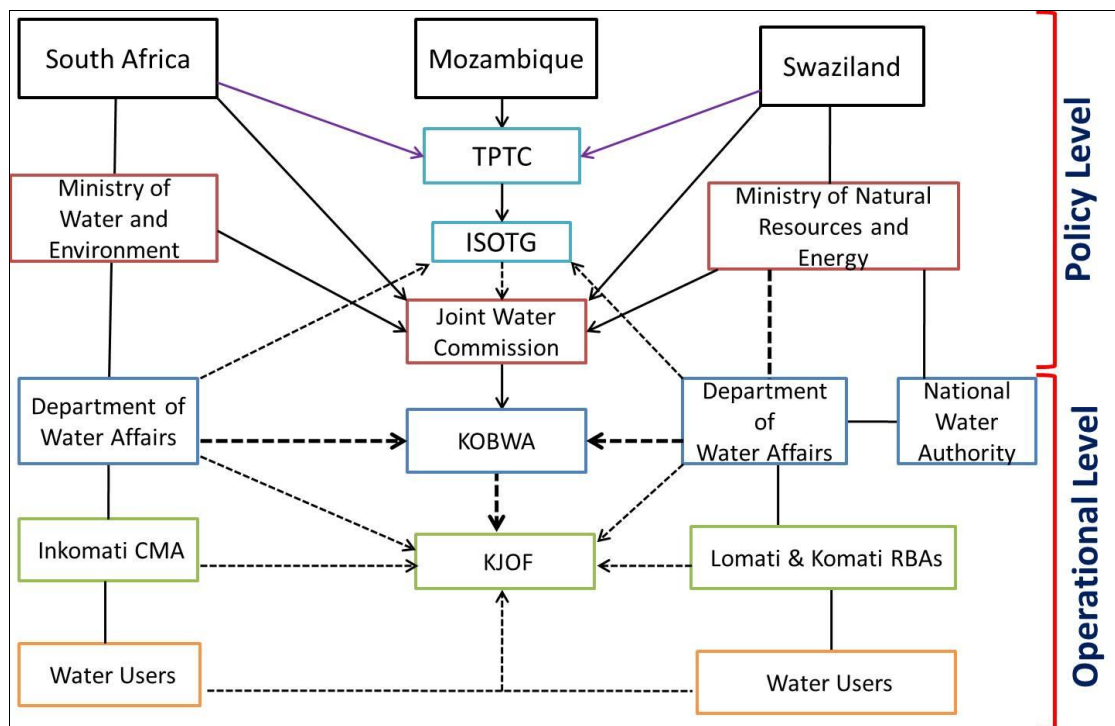


Figure 4: Institutional arrangements in the Komati river basin

### Institutional arrangements

The institutional arrangements in the Komati river basin are shown in Figure 4. At the IncoMaputo level, the Tripartite Permanent Technical Committee (TPTC) is the responsible authority in which South Africa, Swaziland and Mozambique are represented.

The Joint Water Commission (JWC) is responsible for bilateral relations in the basin between South Africa and Swaziland. The two countries took a decision to undertake a joint initiative, which saw the birth of two major dams in the system, namely the Maguga and Driekoppies dams. KOBWA was established as a binational company to manage the system. KOBWA works with government departments of the two countries, particularly the departments responsible for water, as well as water user stakeholders.

The Komati is an example of the often-quoted statement that, 'Everyone lives downstream'. In the Komati river basin, South Africa is both upstream and downstream of Swaziland. There are minimum flow requirements that have to be met as a commitment to the downstream country.

### Conception of policy

Policy is understood to be a combination or function of analysis and authorisation. Good policy has to be scientifically objective and politically feasible. Policy is considered at two levels, namely: (1) long-run policy, which is preserved in the treaties and agreements – in this case, the Pigg's Peak Agreement, Interim Inco-Maputo Agreement (IIMA) and Komati Treaty, and the system operating rules, and cannot change easily because these treaties and agreements are fundamental to the joint venture agreement between the two countries; (2) short-run policy, namely the adaptive decisions of the JWC taken from time to time in response to a given situation (drought in the context of this paper), but within the perimeters of the long-run policy, and much easier to review.

### **The drought situation under study**

The completion of the Maguga and Driekoppies dams unfortunately coincided with a serious drought in the basin, and the water use of low-assurance users therefore had to be rationed.

The reported impacts were that planned replanting of more than 3 000 hectares was suspended in South Africa; planned new planting of more than 2 000 hectares in Swaziland was frozen until the drought was over; crops were lost and some fields were abandoned (not quantified); and cane crushing capacity was reduced.

There were potential tensions. The accuracy of flow measurements at some stations was questioned. Estimates of unmeasured abstractions were contested. Some users felt that their case was poorly represented at the JWC; and they maintained that they should be allowed to attend JWC meetings as observers. There were allegations that allocations in terms of KOBWA's decision-support system were too conservative; and it was suggested that water use should be frontloaded in relation to the annual irrigation distribution curve. Media statements and even some technical papers maintained that the joint initiative between the two countries to build the two dams was a 'white elephant', especially during the drought of 2002 to 2005, when the Maguga dam was operating below half capacity.

### **Dealing with drought situation: the blend of science and policy**

In trying to address the needs of the competing economic, political, societal and environmental spheres, there are opportunities to integrate policy, science and other interests through decision-support systems (DSS). The input to the DSS will include the specified problem or need, the water resource situation, short-run policy considerations, foreseen user requirements and foreseen political interest. The DSS will use these inputs as well as other analyses and new scientific knowledge to generate solution scenarios, which are presented to a user stakeholder forum, where economic and social interests are taken into consideration. The ultimate choice is taken to the JWC for a policy decision. The JWC will test the political feasibility of the chosen solution and compliance with the legislation of the two countries.

### **Trust and confidence building**

A multi-stage decision-making and implementation process is used through a consensus-building progressive escalating cycle through which scientific solutions are taken to the users and policy-makers. The policy decisions that result from this process need wider acceptance for effective implementation, which is monitored. Implementation gives rise to new lessons on whether the solution is effective. If not, the cycle is re-run, with the new learning becoming an input to the cycle, which continues, building on momentum from earlier stages, until the operational model for the system reaches an acceptable level.

### **Balancing sovereignty with a system operations approach**

National political boundaries are recognised as a limiting factor, but water respects no boundaries. The system could be managed either by recognising or disregarding the boundaries. Borders are recognised during water allocation to parties, water use accounting and interaction with water users. The borders are collapsed for the purposes of system yield computation below the dams; water release planning and supply; system storage reconciliation; catchment-wide system yield computation; water resources assessment; and required system-wide monitoring, such as flood management.

### **Successes**

The 'without-borders' system operation mode has enabled conjunctive system operation and balancing of sovereignty and the system approach. It also enabled early commissioning of the utilisation of Maguga water through an active filling mode.

The model for blending policy and scientific knowledge makes provision for speedy and systematic integration of new knowledge into the DSS and management plan. Consensus-building systems allow the systematic introduction of new knowledge to stakeholders and information sharing, which contributes to building trust and confidence. The physical presence of KOBWA in both countries has promoted trust in KOBWA by the parties.

### **Challenges**

The changed hydrological regime resulting from the building of the dams has reduced flows, giving rise to even more stress during drought. There are practical challenges in metering all abstractions. Some users are tempted to over-abstract during low flows.

In terms of the Interim Inco-Maputo Agreement, a full implementation impact study of the building and operation of the Maguga and Driekoppies dams is being undertaken.

### **Conclusion**

The drought period of the past decade has revealed the importance of balance among the contrasting spheres of influence in the Komati. This is generally possible through the systematic blending of policy and science through the DSS.

The progressive escalating cycle consensus model gives rise to continual knowledge impartation and exchange of information.

The combination of 'with-borders' and 'without-borders' modes of system operation result in benefit maximisation and enhanced cooperation.

Managing this way comes with cost, but cost is nothing compared with the price of restoring broken relations.

### **Dr Kuiri Tjipangandjara (Namibia Water Corporation) – Kunene transboundary water supply project: Angola and Namibia – improving water supply security through maximising benefit-sharing**

The Kunene river starts in the Angolan highlands and travels a distance of 1 050 km to the mouth. The river basin covers an area of 106 560 km<sup>2</sup>. The population that benefits from the basin is estimated at approximately three million, as well as between three and five million livestock. The uses of the water from the river basin include agriculture, household and industrial use, power generation and tourism. Eighty-five per cent of the basin falls in Angola, and 15% in Namibia.

The Kunene river basin is governed by the Permanent Technical Commission on the Kunene River Basin (PJTC), which was established in 1966 and ratified in 1991. The PJTC comprises three government-appointed commissioners per country as well as co-opted members. The commission is supported by subcommittees for the Task Force Calueque, Kunene Master Studies, Baines Project and bilateral agreements. The commission meets biannually, with the venue alternating between the two countries. It does not have a full-time secretariat. The PJTC should be transformed into a proper river basin organisation as a matter of urgency.

### **Water supply provision**

Peace came to Angola only after 2002. In the absence of peace, development was difficult before that date. The provision of water and sanitation services was therefore slow.

Namibia attained its independence and peace in 1990, followed by a period of extensive development of water supply infrastructure.

There are concerns and perceptions that the PJTC offers few tangible benefits, and that it is not equitable to both countries. There were questions over the ownership of the river (whether the river is owned by the people of Angola and Namibia, or by the decision-makers in Luanda and Windhoek), payment for services for water and electricity since expectations were created at the time of

independence when free water was promised, and the present relevance of water agreements that were originally signed between the colonial powers.

The PJTC was tasked with investigating these issues, and faced the major challenge of providing water and sanitation to Angola. Calueque is a major dam, located in Angola, that supplies water to northern Namibia, but the village near the dam and other villages in southern Angola had no clean water. There was very little irrigation between the Calueque and the Namibian border.

### **Kunene Transboundary Water Supply (KTBWS) Project-1**

The Kunene Transboundary Water Supply (KTBWS) Project-1 between Angola and Namibia evolved from the need to meet the water supply requirements of the communities along the common border through an international and regional collaborative initiative. Raw water is abstracted from Calueque dam in Angola and conveyed to Namibia, where it is purified. Part of this treated water is intended to be pumped back to Angola.

The project conception of the KTBWS project was excellent, but it was not possible to raise funds to execute the project. After extensive discussion with colleagues in the Southern African Development Community (SADC) and assistance from the GIZ (German Agency for International Cooperation), it was possible to get funds committed by a *Kreditanstalt für Wiederaufbau* (Reconstruction Credit Institute) (KfW) pilot project.

The target populations that will benefit from the project total 300 000 in Angola and 700 000 in Namibia, and these numbers are projected to increase.

The countries involved in the project include Angola, Namibia, Germany, United Kingdom, Australia and Austria. The partners include:

Regional organisation: SADC

Cooperation partners: KfW, GIZ, Australian Government Overseas Aid Programme (AUSAID) and UKAID

River basin organisations: PJTC and Cuvelai basin

Power utilities: *Empresa Nacional de Electricidade* (Electricity Angola) (ENE) and NamPower

Water utilities: Namibia Water Corporation (NamWater) and EPASC.

The components of the project are as follows:

- Calueque power supply
- Calueque pump station
- Calueque village bulk water supply
- Calueque–Mahenene repairs and off-takes
- Mahenene–Oshakati canal repairs
- Water transmission: Oshakati–Santa Clara
- Water transmission: Santa Clara–Ondjiva rehabilitation
- Water supply distribution in Ondjiva
- Basic sanitation in Angolan villages.

The Xangongo–Ondjiva Water Supply Scheme is being developed to supply water from the north (Angola) to the south (including Namibia), forming a water supply loop. This development is 70% complete. This measure is being taken to minimise the adverse effect of climate change on the Calueque dam surface supply system. Complementing these two schemes is the conjunctive use of the Cuvelai transboundary aquifer; once developed, it will be another source of water for the Angolan and Namibian communities in the project area.

Construction of other components is scheduled to start in the second quarter of 2013 and to be completed with 12 to 18 months. In order to sustain the investment, a water utility is being set up in Angola's Kunene province, and this aspect of the project is progressing well.

The KTBWS Project-1 has the unique feature of being transboundary, inter-basin and an integrating water supply system.

### *Challenges and lessons learnt*

The finalisation of the agreements between the many parties was a long process.

Border crossings of goods and vehicles were hampered by security issues, and cross-border movement of people was hampered by immigration and customs (i.e. the pace of approval of work permits and visas). This has been addressed by issuing those involved in the project with border passes. The buy-in of stakeholders, including politicians, was slow. The diverse operational practices among the various partners have presented challenges.

Changes in project management have meant that there has been a lack of continuity. There is poor community awareness about the project. The scope of the project has increased, along with the project budget. There were delays while additional funding was mobilised.

### *Achievements*

The KTBWS Project-1 has succeeded in building trust; developing improved understanding of the water supply situation in Angola and Namibia; developing increased understanding of river basin management; cooperation on flood monitoring and management in the Cuvelai basin; skills and technology transfer; and providing access to much-needed funds. The project is a good model of transboundary cooperation.

Building on the success of the project, it has been possible to secure additional funding from the European Union Infrastructure Trust for feasibility studies, Calueque canal replacement (153 km) and the appointment of a consultant from January 2013.

### *Benefits*

The benefits of the KTBWS Project-1 include:

- Building institutional capacity in the management of the basin, the water utility and transboundary water supply.
- Maximising benefits from the Kunene river to the riparian states
- Saving on costs by sharing water supply infrastructure
- Preventing water conflicts
  - Coping with changes in regional climatic conditions, such as re-current floods
  - Improving water security.

### **Mr Christoph Mor, UNDP/GEF Strategic Action Programme – GEF International Waters: lessons in transboundary collaboration on shared water systems in southern Africa – Christoph Mor and A Yamamoto**

The Global Environment Facility (GEF) was an outcome of the Rio Conference, the first United Nations Conference on Environment and Development. It is a funding facility for environmental projects, covering a broad range of topics, including biodiversity, climate change, land degradation and persistent organic pollutants, as well as facilitating cross-cutting capacity development. Since 1991 when the fund became operational, some 2 500 projects have been supported, to the tune of about US\$10 billion. GEF International Waters has received a relatively small share of this funding.

### **GEF International Waters projects in southern Africa**

GEF International Waters is providing support to the Orange-Senqu River Commission (ORASECOM) for four years, from 2010 to 2013. The project budget is US\$6.3 million. The project coordination unit is hosted in the ORASECOM secretariat.

GEF International Waters has supported previous projects in southern Africa in the Okavango basin; two projects on large marine ecosystems, one of the west coast dealing with the Benguela current system, and one on the east coast dealing with the Agulhas-Somali current system; and a project on aquifers in the SADC region. All except the last of these projects followed a similar methodology to that used for the ORASECOM project.

## **United Nations Development Programme (UNDP)-GEF Orange-Senqu strategic action programme**

The Orange-Senqu is the most developed transboundary river basin in the southern Africa region, with a variety of water transfer schemes to supply water to municipalities, industries, mining and agriculture in and outside the basin. Extensive water utilisation for urban, industrial and agricultural purposes has significantly reduced natural flow, to the extent that the current flow reaching the river mouth is in the order of half of the natural flow. Future river basin management will therefore have to be sensitive to the maintenance of vital ecosystems and become a negotiated interaction process, which synthesises the differing positions and conflicting interests of the riparian states, various sectors and populations.

In this context, the UNDP-GEF project, 'Development and adaptation of a strategic action programme for balancing water uses and sustain natural resources management in the Orange-Senqu river basin' compiles a transboundary diagnostic analysis of the basin.

### *Analysis and planning methodology*

The project has two components, one analytical and one strategic. The analytical component involves transboundary diagnostic analysis (TDA), which is a technical analysis charting the main environmental threats to the basin and ascertaining their root causes. This analysis serves as the scientific basis for a strategic action programme (SAP) addressing transboundary environmental concerns at the basin level, and related national action plans in the riparian states. The projects that form part of the strategic action programme can be considered as the first step in implementation.

There is a package on institutional strengthening, and on public participation and communication. The research and demonstration projects in the strategic action plan involve grassroots input.

### *Institutional strengthening*

The institutional strengthening aspect of the project involves information and knowledge management through a water information system, the development of tools and capacity development.

The ORASECOM Water Information System ([wisp.orasecom.org](http://wisp.orasecom.org)) is a web-based data portal that allows users to access data and reports generated by donor-funded projects (currently approximately 30 000 files). A second phase will be to profile third-party data custodians of information that would be useful for planning at basin level. The data portal is operational, and feedback is invited.

As regards tools, an ORASECOM guide to the assessment of transboundary impacts is being developed, using strategic environmental assessment (SEA) and environmental impact assessments (EIA) tools. The intention is not to rewrite the already good environmental legislation of the four countries in the basin, but to determine how the consultation process on SEA or EIA reports can work across national boundaries, and how this process could be facilitated by a river basin organisation such as ORASECOM. The guide, the first of its kind in the world, is due to be published in 2013.

### *Public participation and communication*

Public participation and communication entail engagement in planning processes at four levels:

- Level 1: interaction of the public with ORASECOM on the running of the organisation
- Level 2: working groups and science communication (for example, the Orange-Senqu Infrastructure Catalogue, or the From Source to Sea brochure, which focuses on the impact of the river on the Benguela current large marine ecosystem)
- Level 3: programme strategy committee
- Level 4: ICP-supported projects.

### *Research and demonstration projects*

The research and demonstration projects show what can be done and may inform the planning process. There are community-based rangeland management projects in Botswana and Lesotho.

These projects work with the community, traditional leadership and government line agencies, particularly at district level.

Other projects include:

- Environmental flows, working on the Fish river in Namibia and the Orange river mouth.
- Water management in the irrigation sector, working on the lower Orange, both in Namibia and South Africa.

#### *Transboundary diagnostic analysis*

The preliminary Transboundary Diagnostic Analysis (TDA) was adopted in 2008. It makes recommendations in the four main areas of the hydrological regime, water quality, land degradation and alien invasive vegetation.

The causal chain analysis (CCA) started with observed impacts on the ground, identified underlying and root causes, and links the problem with causes and effects in order to indicate where the intervention should start.

The findings of the preliminary analyses are being updated. The information has largely been validated, and the analyses provide a good level of detail.

#### *Bringing science into a negotiated planning process*

The crux of the matter is to how to bring science into a negotiated planning process.

The focus of the Global Water Partnership on is integrated water resource management (IWRM), but this presents a challenge in the real world. The World Bank is more realistic in recognising that water resource management is intensely political and that reform requires the step-by-step articulation of prioritised, practical and patient interventions.

The planning of river basin organisations in Europe focuses more on environmental protection, whereas ORASECOM has a broader social development approach.

ORASECOM wishes to develop a plan for the basin based on IWRM principles, for which the TDA report will be one of the technical inputs. The SAP takes the planning into a strategic project at basin level, and the national action plans spell out what has to be done at national level, taking national priorities into account.

In developing the SAP and national action plans, the project has convened some 20 national and regional workshops and is working with national working groups. National stakeholder forums have been established in the four riparian states, and there is a regional SAP working group.

#### *Lessons learnt*

The question is whether to start with national action plans and build these up into an SAP for the basin. This approach would build country interest and buy-in.

An alternative approach would be to develop the SAP first and then national action plans. Such an approach would assist in developing a sense of regional solidarity and offer clearer guidance for countries regarding areas of focus.

The UNDP-GEF project opted to work on national action plans and the SAP concurrently, so that these processes influence each other.

Another important lesson is to 'keep it simple', but there are no authoritative guidelines for doing so.

The national action plans and SAP must be compatible with an array of international directives, treaties, regional and multinational agreements, national norms and sector objectives and plans, and competing ICP programmes, which could result in master planning fatigue.

A balance has to be struck between 'overarching authority', 'comprehensiveness' and 'practical operationality'. At the same time, the plans must be practical and operational.

The processes must allow for uneven experience and capacity across the countries and help to best identify and build on respective strengths while taking measures to address capacity weaknesses.

Consensus building is necessary through broad stakeholder, intersectoral and interministerial processes, under time and resource constraints.

**Mr Ele-Jan Saaf, SaafConsult, the Netherlands and Belynda Petrie (OneWorld Sustainable Investments) – Transboundary river basin management can contribute significantly to peace and prosperity (Ele-Jan Saaf and Belynda Petrie)**

Transboundary river basin management can contribute significantly as a tool for peace and prosperity. The presentation explores this notion with reference to rivers in Africa and elsewhere, namely the Jordan, Indus, Zambezi, Nile and Limpopo river basins.

The African continent has the highest number of shared river basins in the world (64), containing more than 93% of its surface water. Climate change is placing further stress on an already stressed resource, with widespread impacts on critical sectors.

A number of international agreements have been established to facilitate cooperative management of the resource and minimise inter-state conflict, but the effectiveness of these agreements is a concern. Establishing international agreements has been a core occupation, but is this ambition preventing us from cooperating in other ways? Once agreements are established, they often prove hard to alter (for example, Lake Victoria). There are examples of effective cooperative management in the absence of international agreements.

Transboundary river basin management makes use of modern insights into water resource management (virtual water, hydro-hegemony and the economic values of water ecosystems), and contributes significantly to peace and prosperity between rival countries or regions, partly also through increasing resilience to climate change.

The core strengths of transboundary river basin management include:

- The prerequisite for all riparians to sit at the same table and to share data on water resources within the river basin, which helps build trust
- The requirement for all riparians to share at least generic plans for development of the water resources for whatever services they have in mind (irrigation, water supply, hydropower, industry)
- Recognition of water rights and/or needs by all parties
- Development of joint management plans and institutions that bring all parties closer together and can foster a platform for further cooperation
- Explicit recognition of the positive attributes of transboundary/regional cooperation through benefit sharing while still safeguarding national interests.

**Strengths and weaknesses of various types of water agreements within river basins**

*Jordan river*

The Jordan river has five riparian states: Lebanon, Syria, Jordan, Israel and Palestine. There is only an agreement between Israel and Jordan and temporary agreements between Israel and Palestine through Oslo, which were not intended to last more than a few years, but are still being implemented.

The agreements depend on fixed quantitative allocations based on multi-year averages. This has caused problems due to reductions in flow of the Yarmouk (of almost 18%) and other Jordan river tributaries. There are no river basin organisations of any kind in any of the five riparian countries.

*Indus Water Treaty*

The Indus Water Treaty, which was concluded in the 1960s, is a strong agreement. Since agreement could not be reached between the parties at the time, the watershed was physically cut in half.

Three of the six rivers were given to India and were dammed and diverted so that they did not flow into Pakistan. There have been considerable environmental consequences from leaving three large river basins completely dry, affecting the groundwater table. One of these rivers used to flow through Lahore, a large city with a population of about ten million people. There were no fixed allocations. There was strong arbitration but no river basin organisations, as no further decisions on water sharing were needed.

There have been problems, with renewed interests in rivers 'given' to the other party (for example, the Baglihar and Kishanganga).

#### *Zambezi basin*

The Zambezi river basin is shared by eight countries. Zambia is the largest beneficiary.

Concluding the Zambezi Watercourse Commission (ZAMCOM) agreement has had a difficult history. To date, seven of the eight riparian countries have signed the agreement. The ZAMCOM interim secretariat has been established in Botswana.

There have been issues related to inequitable benefit-sharing and cooperation. There is no established data-sharing protocol, and inadequate understanding of the balance of power in the basin.

#### *Nile basin*

The Nile basin is very politicised and problematic. The basin is shared by ten countries, and Egypt is the main riparian state. Relationships in the basin have been characterised by little sharing of data and hydrological information.

Colonial treaties signed in 1929 and 1959 gave Egypt veto rights, which Egypt is not willing to relinquish, and it is difficult to renegotiate treaties. By early 2011, five countries had signed the Nile Basin Cooperative Framework Agreement of 2010, but seven signatures are required for it to come into operation.

There is high climatic variability in the Nile river basin, and frequent and intense floods and droughts. The history of unilateral action in the basin demonstrates that shared management is critical due to escalating tension, inequitable benefit-sharing and different development agendas. Political tensions are high.

The Nile basin initiative has been launched with a view to establishing the Nile Basin Commission as a river basin organisation. The Nile basin initiative has taken a number of technical decisions that are generating a level of cooperation.

#### *Limpopo basin*

The Limpopo has 'closed' basin status, in that there is no free water left to allocate, and high pollution levels. The basin is further stressed by climate change, inequitable benefit sharing and development at all costs. Allocations in the basin are fixed but inequitable. The Limpopo Water Course Commission (LIMCOM) interim secretariat was established in 2011 after all four riparian countries had signed and ratified the agreement.

### **Conclusions**

- Transboundary river basin organisations and agreements are not a source of ready-made solutions to the governance of transboundary basins, and may hamper the ability to find other ways to cooperate that are more purpose-focused around common objectives.
- More dynamic allocation models are required for greater flexibility in the system.
- Serious water resource management measures are mandatory.

- Technical level cooperation is more 'doable' in the immediate and medium term than political cooperation. Technical cooperation can provide a stronger foundation for reaching political cooperation, if very visible wins and solutions can be achieved.
- We need to treat basins as integral and integrated systems. It is critical to understand the balance of power in a basin and use this understanding in decision-making.
- We need to accelerate the pace of change substantially.

The pace of change needed is usually crisis driven. Crisis often catalyses the change that we need. Climate change poses particular threats to food security, with multiple socio-economic impacts. World food stocks are at an all-time low due to droughts, contributing to price rises of up to 20%. There are many crises to use to accelerate the pace, but how?

In an example from recent history, climate change-related drought in Russia led to global increases in wheat prices. The Mozambican government tried to regulate bread prices, sparking food riots in Maputo in 2010. Violence saw the restoration of water and electricity subsidies and the reversal of bread prices.

### **Dr Inga Jacobs, WRC – A community in the Orange: the development of a multi-level water governance framework in the Orange-Senqu river basin in southern Africa**

Based on the multiplicity of demands by many stakeholders, an ensemble of normative codes of conduct in the form of global, regional and domestic norms, principles of best practice, rules and laws have been developed over time, dictating appropriate behaviour in the governance of transboundary rivers in an attempt to eradicate or minimise real, perceived or predicted conflicts. However, there have been few attempts to conceptualise a multi-layered normative framework for transboundary water governance.

There is a tendency to give causal primacy to international prescriptions, which cascade down to lower levels and are incorporated into regional and national basin legislation. There is thus often a dichotomy between so-called 'global norms' and weaker regional or local norms.

The purpose of the paper is to examine the interlinked relationships between cooperative management norms and principles constructed at different levels of scale in the Orange-Senqu river basin, and the ways in which both norm and context are transformed as a result of the other; to examine the non-linear progression of norm diffusion from one level of scale to another; and to construct a multi-level governance framework for the Orange-Senqu river basin.

The rationale for the paper is that the first wave of normative change tends to give causal primacy to 'international prescriptions', but what about the agency that norms and actors exhibit at other levels of scale? The paper shifts from the prioritisation of the hydrological basin to the Orange-Senqu river basin as a 'lived in' social space that is the sum of social practices and discourses that exist within the biophysical space. In this process, there is a shift from single norm analysis to multi-norm analysis. There is a need for a more systemic and integrated interpretation of norm development.

There are four riparian countries in the Orange-Senqu river basin, namely Lesotho (3.4% of the river basin area), South Africa (64%), Botswana (7.9%) and Namibia (24.5%).

South Africa is the biggest user in the basin. Although Botswana does not contribute any surface flow to the Orange-Senqu river basin, it is considered a riparian state because of linkages with the Molopo and Nossob ephemeral rivers, and historical links with the river that are now blocked by the Kalahari sand dunes.

Namibia has a mean annual run-off of only 4%, but it is very dependent on the Orange-Senqu river, as all its perennial rivers are transboundary. Because of its vulnerability in this regard, transboundary water governance is elevated to a very strategic level for Namibia. There has been an on-going border dispute between South Africa and Namibia.

The colonial and apartheid legacies contributed to the relationships between countries and their culture that have emerged over time. Apartheid South Africa held a position of economic and military hegemony in the region, giving rise to subsequent apprehension among neighbouring states.

### **Institutional and legislative development contributing to the community**

With the exception of Botswana, there were water reforms in the other three riparian states throughout the 1990s:

- South Africa: Political transformation led to water policy reform in the 1990s and 2000s. The highlight was the pioneering National Water Act of 1998. The current legislative and institutional infrastructure ensures compliance with international and regional obligations, but implementation challenges continue.
- Botswana: Botswana has the oldest institutional and legal framework for water governance in the Orange-Senqu river basin; this is currently under revision.
- Namibia: There were water reforms after independence in 1990. This was a politically charged reform. The current legislative infrastructure ensures compliance with international and regional obligations, but there have been implementation challenges.
- Lesotho: The policy framework is under revision. There have been implementation challenges.

The Orange-Senqu is a very institutionalised river basin, with existing legislation and policy at every level of scale. For example, there is the multilateral commission, ORASECOM; bilateral project-based commissions; permanent commission and joint irrigation authorities

### **Other barriers and drivers to the development of the community**

The barriers to the development of the community in the Orange-Senqu river basin include the skills flight of those with experience and know-how with respect to transboundary water governance; lack of sustainable knowledge transfer; and lack of trust, both at the political and institutional levels. Political trust was not essential for technical cooperation, which was already well developed before political and water reforms in the basin.

The drivers include technical cooperation; norm entrepreneurs (influential individuals that have been able to convince a particular constituency of an appropriate behaviour) and the significance of personalised politics; and congruent norm sets.

### **Top-down global norm diffusion**

There was indirect compliance with global norms and principles by virtue of compliance with the revised SADC protocol. Norm congruence with domestic and regional norms developed as a result of political change and the water reforms in the 1990s.

Adherence to global principles and standards legitimises regimes and the sovereignty of states. Local actors display instrumental commitment to global norms.

### **Lateral norm convergence from state to state**

The nature of national legal frameworks has been transitional since the 1990s in South Africa, Namibia and Lesotho. There has been a shift in focus from bilateral arrangements to the creation of joint water commissions with multilateral basin-wide agreements, creating a multi-actor landscape.

### **Bottom-up (local to national) norm convergence**

Bottom-up norm convergence is seen in the degree to which local actors help further national agendas. Local norms may be repackaged in order to appeal to a wider national audience. Norms may face local resistance if they appear to contradict longstanding local norms.

### **Norm dynamism**

Multiple norms may originate at different levels of scale. Precursors of external norms have had their own history of domestic development that pre-date the arrival of the international norm.

The role of norm entrepreneurs is to push norm-based change through certain state channels. The actors conform to emerging standards of behaviour because it helps define them as members of the

region. While power and money drive normative agendas, so too does the desire by some local actors to form a regional community.

## **Conclusion**

This paper advocates holistic analysis of governance, including both the legal and institutional framework, as well as the way in which people, norms and cultural practices operate within that framework.

There has been a non-linear diffusion of global norms in the Orange-Senqu river basin. Norm congruence with pre-existing national norms facilitated faster diffusion of global norms. Commitment to regional norms by SADC member states helped to legitimise national policies and a sense of good neighbourliness. Resistance to some national norms has been experienced at the local level.

## **Discussion**

**Mr Andrew Tanner (Aurecon):** My comments are based on my experience of working on the Orange-Senqu river basin and others since 1983. Agreements are there to remind politicians what their predecessors agreed to. The cohesive forces in a basin are the sharing of benefits and best practices, and the trust built up between people, not between countries but between individuals. Mention was made of the loss of individual memory from institutions; we need to mitigate against this loss when individuals retire or resign so that the new generation builds on what has been inherited.

**Mr Ele-Jan Saaf (SaafConsult, the Netherlands):** My background is a public administration master's degree, and I do a lot of work on institutional development. On the question of the loss of institutional experience and memory, people tend to be too conservative. It is not a bad thing for young people, who are not burdened by history, to come in and 'reinvent the wheel'. There has to be an adequate handover from senior to more junior professional levels, and less fear of the consequences of the more experienced people leaving.

**Ms Belynda Petrie (OneWorld Sustainable Investments):** We need to find ways of passing on skills and knowledge. Without raising all the political arguments in this regard, this has been failing in the water sector in South Africa. I am hopeful that if we can get agreements on a data-sharing protocol, this might drive some of the institutionalisation of the knowledge. This has to be a priority that will serve many purposes.

**Ms Samantha Braid (Aurecon), to Dr Tjipangandjara:** In getting countries to implement the infrastructure that is needed, how can this be resolved in an equitable way, rather than leaving it to positioning and entitlement?

**Dr Kuiru Tjipangandjara (Namibia Water Corporation):** If a country decides to implement a hydroscheme as opposed to relying for its energy supply on another country, there must be a need and the resources must be available. It is also necessary to consider the costs and benefits. Sometimes a country may be better served by relying on its neighbour to supply water and power, but issues of politics and trust come into play, so that the dependent country feels assured that their position will not be exploited. In the case of the cooperation between Namibia and Angola, there is mutual political trust. Agreements are necessary so that future governments will continue to honour the arrangements. Technical personnel and engineers have to bear the political realities in mind in any transboundary decisions that are taken.

**Ms Nadia Sanchez (Leiden University, the Netherlands), to Mr Saaf and Ms Petrie:** The statement was made that agreements are not always necessary. In the case of the Nile, I believe that the 1959 agreement is the only one that applies and that the 1929 agreement is no longer applicable. The 1959 agreement is very inequitable, and simply divides the water between Egypt and Sudan. There are efforts in the cooperative framework agreement that is currently being negotiated to incorporate the principles included in the 1997 convention, such as equitable sharing, the no-harm principle and data-sharing. Would you argue that this new cooperative framework agreement, incorporating these principles, is also not necessary?

**Ms Belynda Petrie (OneWorld Sustainable Investments):** We are not proposing that agreements are not always necessary, but the history in Africa has been that striving for agreements has superseded any other kind of initiative that could serve as the small building blocks towards achieving those agreements.

The 1959 Nile basin agreement did supersede the 1929 agreement; it has given Egypt and Sudan inequitable status in the basin. It is very difficult to change it now, as the major beneficiaries do not want to. We made the point that it is hard to change agreements once they have been concluded. We need to put small building blocks in place and reach a level of technical cooperation that can build a foundation for trust. Working on agreements needs to take a very different form, and new agreements need to recognise that we face different contexts and situations (for example, development contexts and climate futures). It is a matter of concern that we are driving for agreements to the exclusion of anything else, and we are not moving on in the way we look at those agreements.

**Ms Joanna Fatch (University of the Western Cape):** Mention was made of the fixed and inequitable allocation in the Limpopo river basin, and the fact that once an agreement has been concluded, it is very difficult to change. I argue that it is possible, and that we can learn lessons, especially from the Lake Victoria basin, for example, where the agreement is being renegotiated. In moving forward on the Orange-Senqu and Limpopo river basins, we may need to take a few steps back in order to go forward. Re-negotiation of some of the agreements may be necessary.

#### **Panel discussion**

##### **Facilitator: Reggie Tekateka**

Panellists: Executive secretaries and CEOs of transboundary river basin organisations and authorities:

- Eben Chiunguica, OKAKOM
- Sergio Siteo, LIMCOM
- Michael Mutale, ZAMCOM
- Siphon Nkambule, KOBWA
- Lenka Thamae, ORASECOM

**Mr Michael Mutale (ZAMCOM):** Cooperation is a lengthy process. Agreements are necessary if the partners are to invest their time and financial resources.

**Mr Sergio Siteo (LIMCOM):** The agreements not cast in stone. The development of water resources in a river basin requires the parties to discuss many issues. LIMCOM has established an interim secretariat. One of the first actions that the commissioners took was to identify key challenges in the river basin, one of which was water allocation.

**Mr Siphon Nkambule (KOBWA):** In response to the comments made by Mr Tanner (Aurecon) on the erosion of institutional memory, the main way to mitigate this is for officials think seriously about succession planning while they are in office, and for them to make themselves available as a resource person after they retire or leave the organisation, even if they do so as a consultant.

**Mr Lenka Thamae (ORASECOM):** As regards stakeholder participation in the Orange-Senqu river basin, there are acute disparities in capacity among the various stakeholders, especially if ORASECOM were to follow the model that was used in the Okavango. The stakeholders include commercial farmers in both Lesotho and South Africa, but there are differences in their access to knowledge, information and facilities. The approach is to engage stakeholders through ORASECOM's various projects; for example, the transboundary diagnostic analysis (TDA) sub-project, which has its own stakeholder facilitation process. ORASECOM also encourages its delegations to bring all the relevant stakeholders into the framework of discussion at the national level, so that when the delegations of the four countries meet, the stakeholder views have already been incorporated. Delegations also provide feedback to their stakeholders.

**Mr Eben Chiunguica (OKAKOM):** Stakeholder engagement for its own sake does not generate the required results. I therefore favour issues-driven participation. Stakeholders should not be considered as a monolithic entity, but rather in terms of interest groups. Care should be taken to avoid becoming paternalistic towards stakeholders, particularly when dealing with communities. There are costs

associated with the involvement of stakeholders. Models need to be found to contribute to the costs to stakeholders from engagement. Too often, stakeholder participation serves only to promote the illusion of inclusion.

**Mr Reggie Tekateka (ANBO):** What did Ms Petrie mean with the statement, 'striving for agreements at the expense of everything else'? What does 'everything else' refer to?

**Ms Belynda Petrie (OneWorld Sustainable Investments):** Striving for agreements is ambitious and important. Examples from the case studies presented show the pros and cons of striving for agreements. Striving for agreements is a lengthy and important process, during which the parties are forced to communicate with one another, even if they do not reach agreement. However, there are a number of ways of cooperating that do not necessarily require an agreement to be in place. These forms of cooperation should be considered as a parallel processes, and should not be neglected through an exclusive focus on reaching an agreement. These smaller forms of cooperation are important in building trust, establishing common purpose, and understanding the interests of the other countries, so that we give some definition to the notion of 'sovereign'. The mechanisms include climate change adaptation projects that are transboundary, based on a common purpose and objective, and can attract investment; trade mechanisms; and transboundary road transport corridors. Cooperation is required at both the technical and political levels.

**Mr Phera Ramoeli (SADC Water Division):** This has been happening in the region over time. For example, ZACPLAN preceded ZAMCOM and involved projects that encouraged countries to start cooperating. Prior to the present dispensation, the southern African countries used to cooperate through the SADC protocol. Countries that would not have had an agreement at any level were actually working together, meeting and exchanging information. The Nile basin initiative is an example of executing projects on the ground that encourage the parties subsequently to move forward and 'oil the wheels of cooperation'. Such projects show the benefits that can be realised from cooperation.

**Mr Jeremiah Mutamba (TCTA):** If the political scenario changes in any of the basin countries, what happens, especially if the new political dispensation does not agree with agreements that have been signed previously, and what recourse is there in that event? Political lives are not very long, although it is acknowledged that they may be longer in Africa than anywhere else.

**Ms Fortune Nyatsanza (UNESCO-IHE), to Mr Mutale:** The creation of ZAMCOM took a very long time. There are some sentiments in the basin that it was not necessary to establish ZAMCOM. There are wider views that river basin organisations (RBOs) may not be necessary. How does ZAMCOM plan to reconcile those sentiments in order to encourage cooperation in the basin, and perhaps include Zambezi River Authority (ZRA), which is an RBO in its own right?

**Mr Michael Mutale (ZAMCOM):** With respect to the comment that the agreement on ZAMCOM took a long time to reach, which standard is this being measured against? For example, the agreement between South Africa and Portugal that was reached in 1966 was ratified in 1991, 35 years later. The Convention on the Law of Non-Navigational Uses of International Watercourses has still not been ratified. The issue is why the process has taken so long and what has prevented it from being concluded. In the process of developing an agreement, the countries are getting to know and trust one another. We must therefore appreciate the SADC Treaty as an umbrella for other agreements between countries in southern Africa.

ZAMCOM originated with cooperation that started in the early to mid-twentieth century, during the time of the Federation of Rhodesia and Nyasaland, on the issue of mutual consultation in managing the resource and avoiding confrontation. In the early 1980s, the Zambezi River Basin Action Plan (ZACPLAN) was launched with 19 projects, one of which was project 6.2, which considered the establishment of a legal and institutional framework to guide the development and management of the water resources. SADC intervened and pointed out the difficulties of having different legal and institutional frameworks for each river basin, as this would be difficult for countries with many shared river basins to implement (for example, Mozambique, which has nine transboundary river basins). ZAMCOM suffered a setback until the SADC Protocol on Shared Watercourse Systems came into being in 1995, and was revised in 2000. This protocol guides other agreements.

The ZRA is an authority, not a commission. The ZAMCOM agreement recognises existing agreements, both bilateral and multilateral. ZAMCOM is a coordinator of efforts; it recognises the importance of existing instruments, and harmonises and collaborates with these in order to take a basin-wide perspective. Recently ZAMCOM was invited to participate in a joint operators' technical meeting in Livingstone, Zambia. ZAMCOM used this opportunity to explain that it was not contradicting any existing efforts. The members of bilateral and multilateral agreements are also those members that constitute ZAMCOM.

**Dr Inga Jacobs (WRC):** We have to recognise the political process that must be followed in revising and amending legislation and agreements; these are not repealed when there is a change of politicians. The Namibian National Water Policy White Paper of 2000, for example, was converted into the Water Resources Management Act of 2004, which was only promulgated in 2011 after a very lengthy and politicised process, which had to be conducted in that way because of the national context. We should note the disparity between the political timeframe and the cooperative development timeframe in the transboundary context. Ministers will come and go; and national delegations will change over time, but transboundary governance timelines are far longer.

Many technical managers say that since multilateral commissions and RBOs have been put in place, the exchange of hydrological data, for instance, has become more difficult. Before these agreements, it was easy to phone one's counterparts in a partner country and exchange flood warning data, for example. Now, all communication has to go through formalised channels. What views are there on whether formalised communication channels help or hinder communication between countries?

**Mr Eben Chiunguica (OKAKOM):** I do not agree with the comment that RBOs are not necessary. The best way to address river basin management is to look at it holistically, with negotiation among all the affected countries. We may need fundamental institutional changes of mindset and changes in the ways in which government departments responsible for water and agriculture conduct their business in the basin in order to advance towards bilateral thinking rather than acting in the interests of national sovereignty. For example, Botswana developed its Vision 2016 without considering the implications for other countries. Going beyond the exchange of information, we need to consider how to conduct economic development in countries; what the best return on investment will be in terms of the best use of water; the implications for other countries; and the options for appropriate benefit-sharing. Countries need to see the added value of being part of a larger group. We do not always need to reach agreement; sometimes countries need to recognise their differences and to find ways of co-existing to the maximum benefit of the system as a whole.

**Mr Lenka Thamae (ORASECOM):** RBOs provide a platform for officials from the member countries to interact. They do not impede officials from obtaining data from counterparts in another country. Communication and data exchange does not have to be channelled through the RBO. In fact, the countries can instruct the RBO to generate the data that they require. ORASECOM encourages joint monitoring and other exercises in the field in order to promote common standards and methodologies.

**Mr Siphon Nkambule (KOBWA):** On the issue of changing political scenarios, water can be dealt with on at least two levels, namely political and technical. The latter tends to be universal. KOBWA is not a river basin organisation but an authority and implementing agent. When the agreement for the establishment of KOBWA was negotiated, South Africa, Mozambique and Swaziland had diverse political positions and political ideologies, but could cooperate on water by focusing on the technical level. Many of the issues agreed to at that time supersede changes in political ideologies.

With respect to the comment by Dr Jacobs that RBOs make it more difficult for partner countries to obtain information, in the Komati river basin there are formal channels of communication between governments, but also a forum where grassroots users from the different countries meet on a monthly basis to share information about what is happening at ground level. Within this advisory forum, there are representatives of the respective governments. The forum has proved very useful in sharing information faster than waiting for government departments to disseminate it.

**Mr Michael Mutale (ZAMCOM):** I would like to respond to the concern that information sharing has become more difficult since institutions have been developed. In the Zambezi river basin, one of the outputs of ZACPLAN 6.2, which preceded the establishment of ZAMCOM, was the integrated water resource management strategy and the Zambezi information system. Without even an agreement in

place, the member states were equipped to upload their hydrological information and to access information from other member states through a password. Information is power. Before these initiatives, it used to be impossible for downstream countries to obtain information about the upstream Zambezi because they were not party to any agreement. ZAMCOM has a website at [www.zambezicommission.org](http://www.zambezicommission.org) that is generally accessible, but access to the data is restricted.

**Prof. Larry Swatuk (University of Waterloo, Canada):** Why are RBOs a good idea?

**Ms Nadia Sanchez (Leiden University, the Netherlands):** In meetings such as these, we tend to forget the issue of sovereignty. One of the main reasons for the long processes for the signing of agreements is that they usually touch upon issues of sovereignty.

**Mr Lenka Thamae (ORASECOM), to Prof. Swatuk:** On the question of why RBOs are a good idea, the concept of common understanding, using the river basin as a management unit for water resources management, is worth much. Another issue is that of using water as a tool to generate a peace dividend. I believe that there is more peace in the Orange-Senqu river basin as a result of cooperation on water. The people of the riparian countries know a bit more about one another through their relationship over the river due to the publications that ORASECOM produces. The officials that participate in ORASECOM know much more about the river basin from its source to its mouth as a result of joint field studies.

**Unknown speaker:** RBOs can become a repository for information to mitigate against the loss of institutional memory, and this information can be made accessible to institutions in the partner countries.

**Mr Tiego Mpho (Okavango Research Institute):** Part of the problem of RBOs not functioning as they should is that governments do not care much about the local communities residing in the ecosystems. If governments were to focus on the needs of communities, there would immediately be projects to be implemented to address the livelihood requirements of the communities.

We need to view transboundary governance as a dynamic of decentralisation. In that sense, we cannot have effective transboundary governance if local institutions at the national level are not effective.

**Mr Phera Ramoeli (SADC Water Division):** Most river basin agreements are based on international law and practice. Governments that come into office in any country have to abide by the preceding rules and agreements that have been signed. If a government feels uncomfortable with any of the provisions, they can go through the process of proposing amendments, but they cannot simply disregard the agreements.

Most of the agreements at the river basin level cascade from the SADC Treaty, which is the main framework document on cooperation that SADC member states have subscribed to, adopted and agreed to. The protocol draws from the treaty, and all other agreements fall under the umbrella of cooperation to which SADC member states have agreed. Beyond that, there are international conventions and laws that guide countries. Over the last 15 years, we have been striving to establish and strengthen transboundary institutions, because our countries considered this to be a priority. The alternative to the current dispensation of river basin commissions would be a lack of peace, or even conflict. Because it takes a long time to see results from these kinds of arrangements, it might seem that RBOs have not made much difference. However, in fully committed river basins, issues of scarcity could easily lead to conflict, as the demands will outstrip the available resources. RBOs provide a platform for the parties to discuss issues that might be difficult at the national level. We have to recognise the importance of river basin organisations.

## **SESSION 12: GROUNDWATER GOVERNANCE**

**Chair: Dr Shafick Adams (WRC)**

**Ms Alice Aureli, Groundwater Systems Section, International Hydrological Programme, UNESCO – Keynote address: Results of the regional consultation for sub-Saharan Africa region of the ‘Groundwater governance: a global framework for country action’ project (A. Aureli, Y. Filali-Meknassi, E. Braune and S. Puri)**

Ms Aureli was not able to attend the conference. Her abstract is included for the sake of completeness.

### **Abstract**

2.5 billion people worldwide depend solely on groundwater resources to satisfy their daily needs for water and hundreds of millions of farmers rely on groundwater to sustain their livelihoods and contribute to food security for so many others. Yet, most if not all aquifers are not being sustainably or equitably managed to conserve and protect these vital freshwater resources. To address these emerging global concerns on groundwater resources management and to increase the awareness of the importance of sound groundwater resources management to tackle the global water crisis, a GEF funded 3-year initiative was launched in 2011, the “Groundwater Water Governance: a Global Framework for Country Action”. The project is jointly executed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Food and Agriculture Organization of the United Nations (FAO), the International Association of Hydrogeologists (IAH) and the World Bank. The project foresees the organization of five Regional Consultations. One of those was dedicated to the Sub-Saharan Africa region and took place in Nairobi, Kenya on 29-31 May 2012. On this occasion, over a hundred prominent African experts and key local stakeholders identified specific regional characteristics, priorities, gaps and challenges and contributed to a regional groundwater governance diagnostic aimed to inform a global “Framework of Action” consisting of a set of effective governance tools for policy-makers and stakeholders. This paper will give an overview of the main findings of the consultation.

**Mr Jude Cobbing, SLR Consulting – Groundwater governance of four productive aquifers in South Africa (KC Pietersen, HE Beekman, SA Adams and JE Cobbing)**

Mr Cobbing presented the results of a case study on groundwater governance in South Africa that formed part of the World Bank project ‘Too Big to Fail: The paradox of groundwater governance’. The study looked at groundwater governance in various countries (e.g. Kenya, India) in partnership with the WRC and DWA.

The project methodology was based on the World Bank Groundwater Management Advisory Team (GW MATE) framework for governance provisions for groundwater. The framework was chosen because it was considered to be pragmatic and fits with current South African governance documents such as the National Water Resource Strategy (NWRS) and the National Groundwater Strategy (NGS). The GW MATE framework includes four categories of benchmarking criteria that were considered to be suited to the project: technical; legal and institutional; cross-sector policy coordination and operational.

Four productive aquifer systems were analysed:

- Botleng Dolomite Aquifer (Delmas area)
- Gauteng Dolomites (Steenkoppies and Bapsfontein compartments)
- Houdenbrak Basement Aquifer (Mogwadi [Dendron]- Vivo area)
- Dinolkana-Lobatse Transboundary Dolomite Aquifer.

Mr Cobbing said that he would present the results from the Botleng Dolomite Aquifer, but the presentation conclusions applied to all four aquifers. He presented a map of the aquifer. The blue dots represented groundwater abstractions. Mr Cobbing presented a map that detailed the fluctuations and groundwater level decline from the late 1980s onwards in the Bapsfontein-Delmas compartment, which was significant.

The team identified three main risks to the aquifer: overexploitation (resource depletion, subsidence, sinkholes); pollution (sewage effluent, pit latrines; typhoid outbreaks); and inadequate management provisions.

The study identified the responsible parties in the area: the water services provider (WSP) is the Delmas local municipality; the Catchment Management Agency (CMA) is not yet formed (it will be part of the Olifants' Water Management Agency [WMA]); the CMA's responsibilities are taken up by the DWA regional office; the water services authority (WSA) and water quality monitoring are the responsibilities of the Nkangala district municipality under the National Health Act; and general assessment and management of the aquifer is directed by the DWA national office.

Mr Cobbing presented a table detailing an evaluation of governance provisions in the different aquifers using the World Bank framework. It contained ratings for provisions and institutional capacity in terms of the 20 benchmarking criteria in four thematic groups. The highest ranking group was technical provisions.

Governance provisions at a national level: technical, legal, institutional and operational governance provisions are reasonable, but the cross-sector policy coordination is weak. Institutional capacity is weak across all thematic areas except for the technical provisions.

Governance provisions at a local level: there is a similarity in results for aquifers across all thematic areas. The basic technical provisions are in place (e.g. hydrogeological maps). The effectiveness of other governance provisions is weak or non-existent. Groundwater monitoring is weak; assessment of groundwater resources is poor. Fair provisions are in place for water well drilling and groundwater use rights. There is inadequate control over groundwater abstraction and pollution (poor compliance monitoring and enforcement). Provisions for the establishment of aquifer management organisations are weak. Cross-sector policy coordination is weak. Only Botleng groundwater management has an action plan in place, but it has not been implemented. Institutional capacity across all thematic areas is weak or non-existent, except for the Steenkoppies dolomite aquifer.

The study recommends macro policy adjustments, such as: the integration of NGS into NWRS, Catchment Management Strategy (CMS), and other strategies; the inclusion of groundwater abstraction in the water pricing strategy; the harmonisation of water related legislation; and the integration of groundwater resource planning between different spheres of government.

The study recommends regulatory provisions, such as: the registration of new wells and boreholes; the review of general authorisations; the registration of drillers; the registration and verification of water use; the simplification of groundwater licensing (e.g. single license for DWA and Department of Environmental Affairs [DEA]); timely issuing of water use licences; compliance monitoring and enforcement; protection zoning around boreholes and pollution pathways; the establishment of regulations for borehole construction; and the implementation of compulsory licensing in stressed catchments.

The study recommends increased community participation; the acceleration of the establishment of CMAs and Water User Associations (WUAs); the establishment of Aquifer Management Committees; and increased stakeholder engagement in decision-making.

Mr Cobbing concluded by saying that there are technical products available such as hydrogeological maps. National government does have the skills and capacity to manage aquifers, but capacity seems to be limited at a local level. The institutional landscape is still in flux. Mr Cobbing said that the study results suggested a need for a more pragmatic and adaptive management approach in situations where aquifers are highly vulnerable.

"Further outbreaks [of typhoid] may occur if urgent and appropriate steps are not taken to ensure that inhabitants of Delmas have safe water" (Keddy et al, Epidemiol. Infect. 2010).

The study report is available from the WRC: WRC Report No. KV 273/11.

## **Discussion**

**Mr Johan Templehoff (North-West University):** Have you taken into consideration the potential contamination of the aquifer from acid mine drainage?

**Mr Jude Cobbing (SLR):** We have not done much research on acid mine drainage, but an advantageous feature of dolomite is that it buffers acid mine drainage.

**Dr Ilyas Masih (UNESCO-IHE):** You mentioned that some of the lessons and conclusions would be applicable to the other three aquifers. Are the technical, legal and institutional aspects strong in those cases?

**Mr Jude Cobbing (SLR):** Yes, they are at a national level, particularly in terms of the critical provisions. We feel that we understand the aquifers from a hydrogeological point of view, but we are struggling to implement some of the management actions that the technical understanding suggests, and that is common to all four aquifers.

**Dr Ilyas Masih (UNESCO-IHE):** International literature suggests that in general in Southern Africa, knowledge about ground water is poor. In your studies on the four aquifers, would you say that the yields and potential are good?

**Mr Jude Cobbing (SLR):** There is room for improvement, but it is good. The aquifers are high-yield aquifers that are used extensively for irrigation. They are close to large urban areas and in some cases contribute to public water supplies. The aquifers have been monitored for a long time, and there are hydrographs and water quality measurements in existence that span decades. DNA tests have been conducted on the different strains on typhoid. We feel that the knowledge we have on the aquifers is fairly comprehensive.

### **Ms Kathrin Knüppe, University of Osnabrück (Germany) – Requirements for adaptive governance of groundwater ecosystem services – insights from Sandveld (South Africa), Upper Guadiana (Spain) and Spree (Germany)**

The presentation was given by Ms Knüppe, who hoped to present a different perspective on groundwater governance - one that highlighted adaptive governance and not simply technical management.

Ms Knüppe began with a definition of groundwater governance: "The fulfillment of appropriate authority and promotion of responsible collective action to ensure sustainable and efficient utilisation of groundwater for the benefit of humans and dependent ecosystems." (Foster et al. 2009, p3)

Management refers to the activities of analysing, monitoring, developing and implementing measures to maintain natural resources in a state that is within desirable limits. Governance refers to the actors and networks that formulate and implement policy. Governance sets the overall rules under which management operates.

Water is the most important resource on the planet. What is less known, is that the bulk of fresh water used comes from groundwater. Groundwater management represents a paradox: despite the importance of groundwater there is an undervaluation of its significance. Ms Knüppe questioned why there is such an apparent lack of planning, consideration and management in so many countries. Groundwater brings both physical and ecological benefits, such as habitats for microorganisms, flora and fauna, and socioeconomic benefits such as sanitation, drinking, cooking and health aspects. Ms Knüppe describes the benefits of groundwater as 'ecosystem services'.

Ms Knüppe presented a systematic view of groundwater user conflicts. Ecosystem services provided benefits to both the ecological system and the socioeconomic system. The two systems have many different requirements, often resulting trade-offs. Ms Knüppe showed 'before and after' pictures of a wetland area in the Sandveld after intensive irrigation of the surrounding potato farms had taken place over many years. The wetland has dried up completely and will never recover. The situation had resulted from the trade-offs that occur when groundwater is not adaptively managed.

Groundwater has to be viewed from an integrated perspective, highlighted by two well-known concepts: ecosystem services and adaptive governance and management.

Ecosystem services:

- Example: De Groot 1987, Mooney u. Ehrlich 1997, Daily 1997, Costanza 2000, MA 2005, Brauman et al. 2007
- Definition: "The conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfil human life." (Daily 1997: 3).

Adaptive governance and management:

- Example: Holling 1978, Walters 1986, Pahl-Wostl 1995, Lee 1999, Gunderson and Holling 2001, Folke et al. 2005
- Definition: "A systematic process for improving management policies and practices by systemic learning from the outcomes of implemented management strategies [...]." (Pahl-Wostl et al. 2010: 573).

The requirements of an adaptive system are as follows:

- Vertical integration (VI): connectedness of various administrative levels and participation of state and non-state actors.
- Horizontal integration (HI): cross-sectoral integration.
- Institutional perspective: formal laws and regulations (legally binding) and informal norms, frameworks and projects.

The research was motivated by the lack of knowledge and exploration of groundwater ecosystem services, as well as the lack of empirical evidence and analytical frameworks. The main objectives were to understand the complexity and dynamics of groundwater governance and management systems, and to identify the linkages, transformations and impacts of groundwater ecosystem services by way of a comparative case study analysis.

The following research questions were posed:

- Does a high degree of VI and HI support an adaptive groundwater governance system and foster the sustainable management of Ecosystem Services?
- What is driving the perceived need for institutional response in order to adopt integrative perspectives of groundwater?

Three case studies were presented:

1. Spree basin on the Elbe river in Brandenburg, Germany:
  - Basin size: 10 100 km<sup>2</sup>
  - Characterised by intensive opencast coal mining, agriculture, tourism, forestry and fishery
  - Effect: major decrease of water quality and quantity.
2. Upper Guadiana basin in Castilla La Mancha, Spain:
  - Basin size: 16 000 km<sup>2</sup>
  - Characterised by intensive agriculture and illegal groundwater abstraction
  - Effect: Wetland dehydration.
3. Sandveld basin in Western Cape province, South Africa:
  - Basin size: 4 590 km<sup>2</sup>
  - Characterised by potato farming and rooibos tea cultivation and the increased use of ground water abstraction and fertiliser
  - Effect: >50% of natural habitat is transformed.

The methodological research design supports the scientific understanding of water governance and management processes and transitions towards adaptive systems (Pahl-Wostl et al. 2008 2010). The management and transition framework encompasses: multi-level systems; actor networks and behaviour of individual actors; the interactions between social and ecological systems and support for social learning and institutional change.

Ms Knüppe presented the framework diagram - a formalised representation of structural elements (classes) that shows the characteristics that impact the linkages (management dynamics) between different classes. An 'action situation' (AS) refers to structured social interactions. Ms Knüppe

provided an example of an AS: in the Sandveld region, a water plant has been implemented for groundwater protection. The outcome, or AS, could be that farmers will use more fertiliser and reduce water consumption, which in turn protects the environment. Over time that could result in a new AS where farmers are no longer happy with using less water and oppose the plant, thereby producing new outcomes.

Data collection and analysis:

1. Intensive literature research and document analysis:
  - Case studies, groundwater and ecosystem services, actors, institutions
  - Identification of management processes (sequence of AS).
2. Expert interviews:
  - Approximately 60 interviews (of between one and three hours each), heterogenic expert knowledge
  - Semi-structured questions.
3. Information entered into a database:
  - Standardised relational database (MS Access)
  - Systematic comparison of cases and their contexts
  - Management dynamics over time and space.
4. Database queries:
  - Operationalisation of VI and HI:
    - Interactions within and between one or more AS
    - Participation processes.
  - Framing institutional development and implementation.

The empirical key findings were as follows:

- Empirical key findings (VI): The intensity of an actor's involvement at different levels was studied by considering action situations at lower levels (informal meetings and discussions, implementation) and action situations at higher levels (formulation of strategic management goals, development of institutions). Actors at lower levels are hardly involved in action situations at higher levels. Goals, knowledge and experience are not circulated or considered at lower levels. There is a disconnect between the different levels of management.
- Empirical key findings (HI): Sectoral integration takes place at lower levels. Groundwater and Ecosystem Services are cross-sectoral; exclusion of sectors often causes trade-offs. The dominant sector of water consumption is continuously involved in management processes (agriculture in South Africa and Spain, and coalmining in Germany). Nature conservation is more active at lower levels, and is not empowered to make decisions.
- Empirical key findings (institutional response): All cases have well established water institutions (European Union [EU] directives, National Water Act [NWA]). Groundwater Ecosystem Services are not explicitly addressed in formal institutions. It is difficult to institutionalise informal institutions at lower levels; at lower levels there are contradictions between formal and informal and there is a lack of expertise and financial resources. There is a need for cross-sectoral integration in the institutional arena.

Case study similarities included central management systems and dominant state actors; formal institutions and groundwater management are characterised by lobbying; the exclusion of local actors generates mistrust and conflicts; there is a 'bottom-up' approach (informal meetings amongst lower level actors).

There were differences between the case studies in terms of implementation; control of formal institutions differed and at different stages; the degree of fulfilment of responsibilities was unequal across case studies; different technical and ecological standards were evident; and the awareness of the significance of groundwater Ecosystem Services varied greatly.

Socio-political and economic shifts bring about the rethinking of natural resources management; new challenges (e.g. land-use changes, actors); and an Increase in participation, integration and innovative institutions. Integrative groundwater management is weak and unpopular: there is a disregard for groundwater Ecosystem Services; there is a lack of expertise and data; and the central management structure lacks clear vision.

None of the case studies comprises an adaptive system in order to manage groundwater sustainably. However, higher degrees of VI and HI could open up the political arena to environmental perspectives; increase the quality of groundwater and conservation plans; accelerate the implementation of policies; mitigate conflicts between different groundwater users; and raise the awareness of different ecosystem services.

The development of institutional response to groundwater Ecosystem Services is still in the early stages of incorporating integrative perspectives of the different benefits that groundwater Ecosystem Services provide. The mere existence of well-crafted institutions is not sufficient to produce socially, ecologically or economically satisfactory results.

Ms Knüppe said that more work was required on the linkages between governance, management and ecosystems. Specifically there was a need for a combination of quantitative and qualitative methods; further interdisciplinary research; consideration of the Ecosystem Services concept; adaptation strategies for water managers (a political and institutional requirement); a dialogue or 'language' for an integrative approach for resources management:

Ms Knüppe announced a new project that would deal with the issues she had outlined: *"How to overcome the trade-offs between human and the environmental water needs in times of global change."* The project would attempt to identify and understand the links between the characteristics of a water governance and management system and its performance measures.

### Discussion

**Dr Ilyas Masih (UNESCO-IHE):** Is the lack of adaptive system management due to the fact that in these regions, people don't have alternative sources of water?

**Ms Kathrin Knüppe (University of Osnabrück):** In the case of the Sandveld and upper Guadiana, the regions are completely dependent on groundwater as for basin. The different in the case of upper Guadiana is that there is a massive aquifer system with a sizeable capacity for ground water. The problem is that the wetlands system is no longer coupled to the aquifers. The farmers can pump water for the next 100 years or so, but the wetlands are dry, and there is no adaptive capacity for the system to recover. In Germany, the surface water and the ground water are coupled and cannot be considered separately.

**Dr Ilyas Masih:** So in Germany, people can use surface and groundwater?

**Ms Kathrin Knüppe:** The situation in Germany is complicated. The opencast lignite mining has completely destroyed the water cycles - both in terms of groundwater and surface water. Intensive pumping took place over several decades to get the water out of the earth in order to access the coal. The mining has now stopped, and the ground water is returning, but it contains toxic minerals.

**Mr Teunis Vahrmeijer, University of Pretoria – Water users and government collaboration: a recipe for successful groundwater governance (Teunis Vahrmeijer, JG Annandale, JM Steyn, I van der Stoep and KL Bristow)**

The presentation was given by Mr Vahrmeijer. He introduced his study co-authors: JG Annandale, JM Steyn, I van der Stoep and KL Bristow.

The presentation reported on the results of studies that had been conducted and considered how the interaction between government and groundwater users could be used to develop improved management structures and a groundwater management plan for the sustainable use of water.

Mr Vahrmeijer said it is well known that groundwater is important in South Africa:

- 20% of agricultural water use is from groundwater.
- 78% of abstracted water is used for irrigation.
- Mining uses 3-4% of available water.
- 85% of mines use groundwater.
- Rural development and expansion of energy sector and large industries will increasingly become more dependent on groundwater (Pietersen et al. 2011).

Mr Vahrmeijer presented Jonker's conceptual framework for governance: "the process through which government, sometimes but not always in association with the private and civil society perform their functions" (Jonker et al. 2010).

Mr Vahrmeijer said that the Steenkoppies aquifer provided a classic example of the challenges that groundwater systems in South Africa may face. The main activity in the Steenkoppies aquifer is highly-intensive agriculture. Rural communities in the area depend on groundwater. Sewerage leakage into the aquifer is an issue. There is high competition for the fresh water, which is discharged via a spring (Maloney's Eye) into the Magalies river and then flows into the highly-polluted Hartebeespoort dam. There is also high competition for the water from a planned housing development on the aquifer. In the future, mining will also play a role. Serious water shortages have been reported over the last few years, as illustrated by a letter written to the department in 2007.

The Steenkoppies aquifer is bounded in the east by the Tarlton East dyke and in the west by the Eigendom dyke. The area is underlain by dolomitic limestone dipping to the northwest at 5-20 degrees. Black Reef quartzite formation forms the southern boundary and quartzite and shale forms from the Pretoria group forms the northern boundary. There is a total of 661 properties registered on the aquifer. 269 of these properties, with a total of 11 077 ha, have water rights for 3786 ha with a volumetric total of 22.4 million cub m per year

Steenkoppies aquifer statistics:

- Catchment of 311 km<sup>2</sup>
- Surface area of 213 km<sup>2</sup>
- Water rights: 3 786 ha (22.4 x10<sup>6</sup> m<sup>-3</sup> a<sup>-1</sup>)
- Turnover: R500 million
- Capital investment: R750 million
- Monthly salaries: R7.2 million
- Jobs: 4 200.

### **The problem**

The discharge at Maloney's Eye was evaluated with the Cumulative Rainfall Departure (CRD) method, where the natural groundwater level fluctuation is related to that of the departure of rainfall from the mean precipitation of the preceding period. If departure is positive then the water level will rise and vice versa, therefore the CRD method can be used to determine if external factors, such as abstraction influences equilibrium conditions. It is clear from the graph that the CRD mimics the spring discharge reasonably well with a short term average of nine months and a long term average of 60 months, except for the extremely high discharge obtained during the period 1976 to 1985. Since 1987, a clear discrepancy exists between expected discharge and precipitation, with the discharge being lower than the simulated discharge. This discrepancy can be explained by excessive abstraction from the aquifer, especially during the drought periods 1990–1994 and 2002–2005, 2007 when farmers relied heavily on groundwater for growing their crops.

To solve the problem, responsibilities needed to be identified and information needed to be collected.

Government's first task is to provide water for domestic use, and the second task is to ensure sustainability. Farmers want to optimise water use, minimise risk and want sustainability. The goal of sustainability and economic development is shared.

The information that was required: a good conceptual understanding of the aquifer and how the groundwater system works; the geometry, inflows and outflows of the aquifer (locally and regionally); and the influence of the aquifer on other water sources.

Equipment was obtained for flow and other measurements, and installed at five different places on the aquifer, and rain gauges were installed at fifteen different places. A weather station was obtained to aid modelling. A model was developed to simulate crop water use to ascertain how much water was used by the different crops grown on the aquifer. The model was run for a couple of years and revealed the water requirements of different crops and seasons in the area. More water is used for winter irrigation as the area is a summer rainfall area.

The benefits of collaboration:

- The validation of water use (partly sponsored by DWA, and also by the water users)
- The installation of rain gauges, flow meters, a weather station and equipment to measure groundwater levels
- The exchange of information that can be used to manage the groundwater and to develop policies and management rules
- The hydrogeology of the aquifer was characterised and the hydrological model developed.
- The farmers learned a great deal and changed their approach to more scientific irrigation scheduling methods and installed more efficient pipe lines and irrigation equipment.
- The shift of winter crop production away from the Steenkoppies aquifer
- The establishment of a WUA is underway.

Mr Vahrmeijer said that for the Steenkoppies aquifer going forward, it was important not to lose social capital due to inadequate communication between DWA and the water users. The process also need to be carried through and completed without several 'stops and starts'; otherwise there was the risk that the water users would lose trust in the governance process.

Mr Vahrmeijer said that the next step was the development of an adaptive water management plan to manage the groundwater system.

### **Discussion**

**Mr Jude Cobbing (SLR):** (To Mr Vahrmeijer) Is the water user association established yet?

**Mr Teunis Vahrmeijer (University of Pretoria):** The target completion date for establishment of the WUA is the end of January 2013.

**Dr Julius Ndambuki (Tshwane University of Technology):** How reliable is your hydraulic conductivity? Without that reliability, the results will be unpredictable and that would have a huge influence on the management strategy.

**Mr Teunis Vahrmeijer:** Firstly, we have many years of data of the outflow at Maloney's Eye. The hydraulic conductivity is quite good; without it we would not have those outflow figures. Secondly, the water-level measurement devices were installed at different places in the aquifer for that reason – the possibility that we need to develop subunits of management within the aquifer to accommodate that problem.

**Dr Ilyas Masih (UNESCO-IHE):** Which model is being used for groundwater modelling in this area?

**Mr Jude Cobbing (answers on behalf of Mr Vahrmeijer):** Several numerical models have been done. This presentation was relating the rainfall hydrograph and spring flow discharges together to see how well correlated they are, and having established a correlation, to show the effect of increasing abstractions on the last few years of data.

### **SESSION 13: TOOLS FOR IMPLEMENTATION**

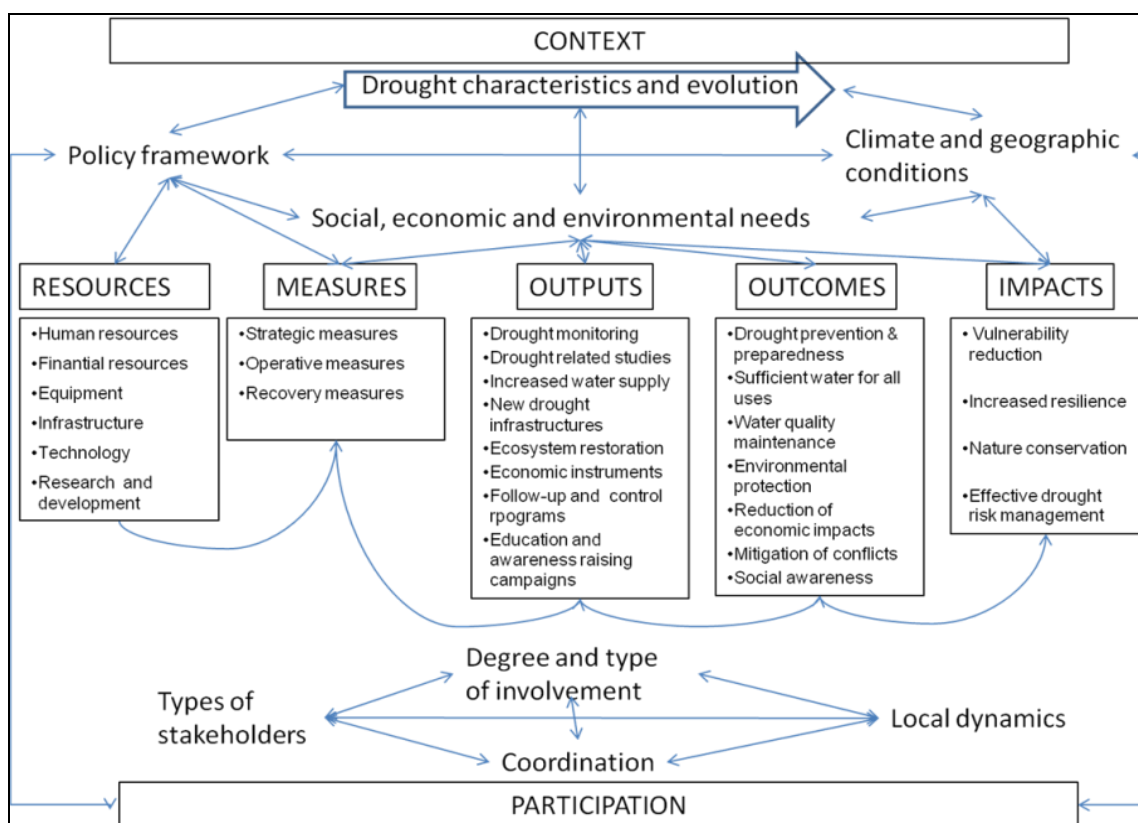
**Chair: Mrs Sabine Stuart-Hill, University of KwaZulu-Natal**

**Dr Lucia De Stefano, Complutense University of Madrid, Spain – Can we learn from the past? Evaluating past drought policies to better face the future (L De Stefano and J Urquijo)**

Droughts often lead to emergency situations that require crisis interventions. Two methodologies are presented that address different aspects of responses to drought.

#### **Theory-driven Evaluation Model (TEM)**

TEM enhances the understanding and knowledge of past drought responses in order to improve future responses and policy options for drought risk mitigation. The model describes how the policy is intended to be implemented and to function, so that it can be used as an instrument guiding the evaluation process.



**Figure 5: TEM Framework**

A TEM is created that guides the information needs of the evaluation, beginning with setting the context followed by assessing various aspects concerning five elements: resources, measures, outputs, outcomes and impacts and formulating questions of inquiry. The TEM should be designed in collaboration with stakeholders, or people who have a sound understanding of drought situations. Some of the existing responses to drought do not consider all the elements in a systematic manner thereby limiting the overall view and missing the linkages (Figure 5).

Evaluation questions are developed, based on available resources and how the results of the evaluation and criteria are defined, and measured through indicators. In order to develop a set of indicators it is necessary to select the appropriate tools, such as interviews with key stakeholders, stakeholder surveys, a literature review, group discussions and best practice forums.

The TEM was applied to six case studies and as part of a European Union (EU) funded project at country, river basin and local levels, each presenting a different scenario. Results were received for each of the case studies and several common points became evident.

Examples of findings were:

- There is a need for mechanisms that solve possible disputes among the involved authorities and to speed up decision-making processes during the drought emergency phase.
- A systematic and comprehensive evaluation of responses to drought should be undertaken at the end of each drought episode.
- It is advisable to have a clear definition of drought and a typology of droughts (such as meteorological, agricultural, hydrological and socio-economic droughts)
- There is a need for mechanisms to ensure a more even distribution of funds among the affected sectors
- There is a need to foster staff continuity.

### **Frame analysis: the Spanish case**

Frame analysis is an approach used to analyse how drought is defined and problematised in formal and informal documents, and how this links with the associated actions or calls for action. The study used nine emergency laws that were issued in Spain during the previous drought from 2005 to 2009 and attempted to analyse the relevant policy discourse. The hypothesis tested was that drought emergency laws are at times used to pursue goals that are not directly related to drought.

A textual analysis of the nine emergency laws looked at the construction of the discourse, how the drought is defined, how the problem is defined and which actors are affected by the problem and involved in the solution.

The hypothesis was verified through the following questions:

- Is there coherence between the problem and the objectives of the law?
- Is there coherence between the objectives and the measures?
- Are there drought-related issues (problems or solutions) that have not been addressed?

The policy framework is interpreted objectively on the basis of the socio-economic and political context.

Some of the criteria used were:

- Geographical distribution of the area where drought occurs
- Timeframe of the measures
- Level of detail
- Identification of contradicting measures
- Temporary versus permanent legal changes
- Budget allocated to the measures that would ensure implementation
- A match between the affected sectors and those targeted by the measures.

The results of the frame analysis showed that the geographical distribution of drought emergency measures was widespread in areas where there was no drought and fewer measures were in place in areas where drought was more serious. It was also found that no budget had been allocated for 35.5 per cent of the measures and in some cases there was a lack of detail concerning plans for desalination. In terms of the timeframe, over 60 per cent of the measures would be completed several years after the end of the drought. Some measures, such as the modernisation of irrigation systems and infrastructural developments, brought about by emergency laws would not be completed by the end of the drought.

There were various differences as well as commonalities between the two methodologies. TEM takes a diagnostic analysis of the entire response to drought as a system and aims to improve future quality of response to drought in terms of design, implementation and evaluation of emergency measures, using stakeholder involvement. The frame analysis only considers the content of documentary sources and makes assumptions about the logic behind decisions in respect of emergency measures. It focusses on the responses to real problems and enhances accountability of policy-makers with regard to the decisions they make. Both methodologies contribute to the evaluation of the response to drought.

### **Discussion**

**Mr Robert Sunday (United Nations Education, Scientific and Cultural Organisation (UNESCO)-Institute for Water Education, IHE):** I have experience in southern Spain where there is expanding greenhouse farming taking place and a depletion of ground water. How does the study relate to this part of Spain?

**Dr Lucia De Stefano (Complutense University of Madrid):** There are very few emergency measures in place in this part of Spain. The farmers have adapted to drought and measures have been put in place to ensure that there is a steady water supply. However, the emergency measures remain functional even in times when there is no drought.

**Mr Derek Hazelton (TSE Water Services):** During the last drought in South Africa in the 1990s, the well developed areas did not experience the impact of the drought whereas the poor and rural areas

were devastated by the drought. Infrastructure is important in terms of the effects of drought. Robustness of infrastructure does mitigate against the suffering that is caused by drought.

**Mrs Sabine Stuart-Hill (University of KwaZulu-Natal):** In the second case presented, many of the emergency laws did not relate directly to the case of a drought. Did this reflect weaknesses in the governance system that were revealed in the emergency case, or was it related to political pressure for example?

**Dr Lucia De Stefano (Complutense University of Madrid):** There is a sense of urgency when dealing with drought situations, opening the door to an increase in bad and rushed governance. So many bad decisions are taken when governments are faced with emergency situations, whether earthquakes, floods or droughts. Unfortunately, the consequences of these bad decisions linger for many years.

**Mr Masoom Hamdard, UNESCO-IHE Institute for Water Education – Role of spatial planning tools at meso level in the management of natural resources in Africa: Lessons learnt from African countries (M Hamdard, M Mul, W Douven and J Gupta)**

The study was conducted under the auspices of AfroMaison and comprised case studies in five countries: Uganda, South Africa, Mali, Tunisia and Ethiopia.

Africa is rich in natural resources and the population depends on these resources. However, the natural resources are being depleted, mainly due to population growth and poor management of the resources. The management of natural resources is a complex process as it involves different sectors functioning at different levels of jurisdiction as well as a variety of users, therefore necessitating an integrate approach. Although integration is desirable, it is difficult and impractical and in some countries, it is not well developed. The decentralisation trend in Africa has consequences for natural resource management and raises a question about the appropriateness of mesoscale management particularly as ecological and institutional boundaries seldom coincide. There is evidence of natural resource management at the local and national levels, but very little at provincial level.

For purposes of this project, the mesoscale is the intermediate scale where national policies and plans are translated for implementation at the local level. It is regarded as the appropriate scale for vertical and horizontal integration and combines spatial level interest, leading to spatial planning. Spatial planning at mesoscale is a public sector approach that incorporates different perspectives and has traditionally taken into account in urban development, economic interest and social services. Recently it has been suggested that natural resource management should take the spatial context into account. This could only be possible by using spatial planning tools, and not processes, that would help understand the multi-sectorial and multi- level processes.

Spatial planning is capable of:

- Analysing multi-scale impacts of current and future foreseen developments
- Analysing similarities and possible conflicts between national and local objectives and interests, sub- catchment and sectoral objectives
- Integrating strategies for national local objectives in a mesoscale plan
- Analysing trade-offs between multi-scale and multi-sectoral objectives.

Some examples of spatial planning tools are conceptual frameworks for mapping, conflict analysis, optimisation and multi-criteria analysis, and an integrated spatial decision support system. The use of spatial planning tools in an integrated natural resource management (INRM) process should result in a transparent decision-making processes, knowledge and awareness of stakeholders, more sustainable decisions and early warning and prevention of resource overuse and sectoral conflicts.

The research methodology involved the identification of problems with regard to natural resource management in each of the five countries, participation in stakeholder meetings to share the benefits of spatial planning tools in INRM, development of a web-based inventory of existing spatial planning tools, culminating in an analysis and recommendations.

The case study in South Africa is based around the uThukela watershed. Although South Africa's institutional framework is very supportive of INRM there is a lack of implementation of policies that

could prevent problems with natural resources. The study considered which tools should be used to avoid these problems, particularly soil erosion that is caused by overgrazing by livestock in the uThukela area. Instead of suggesting a new tool, existing tools would be used to assist the process towards the development of an environmental management framework that is already being undertaken by the uThukela District Municipality.

Although the work has not yet been completed, a few of the preliminary results of the study are:

- All the case studies show a growing recognition of mesoscale planning for natural resource management
- Several spatial tools already exist in all the case studies, but the integration of the tools generally does not occur
- Spatial planning tools are not accessible to local government and there is a lack of capacity in government institutions to operationalise the tools.
- The implementation gap between plans and policies and the link between government priority areas and natural resource management is unclear and needs to be strengthened.

### **Discussion**

**Unknown person:** I disagree with you that Africa is not managing its natural resources. INRM should be viewed in the context of the poverty in Africa. Scholars should become more lenient in their judgement of the mismanagement of natural resources in Africa. The conclusions of the study need to be located in the context of the economics of Africa.

**Unknown person:** What can be recommended from the case studies with regard to how poverty alleviation and sustainable development could be balanced in Africa?

**Mr M Hamdard (UNESCO-IHE):** I am not in a position to make recommendations as the study is not yet completed and information is still being collected from the case studies. The links between natural resource management and poverty alleviation do exist but need to be highlighted.

**Dr Raphaëlle Ducrot (University Eduardo Mondlane, Mozambique):** It is not a matter of researchers indicating what the trade-offs should be, but rather a decision by the people in the system about the trade-offs that they want to make. This is why we are trying to consider the socio-ecosystems as well as trying to find out what the people consider important and how they want to balance the ecosystems.

**Dr Junaid Memon (Pakistan Institute of Development Economics):** Often administrative boundaries do not comply with ecosystem boundaries. I cannot pinpoint exactly where the meso-level resides in the ecosystem boundaries and how it can be identified. Could you clarify this issue?

**Ms Anna Rubert (German Agency for International Cooperation (GIZ), Botswana):** Many countries are debating the possible cancellation of the meso-level because it is very expensive and not necessarily viable or sustainable. Is the introduction of a new scale really necessary?

**Mr M Hamdard (UNESCO-IHE):** The meso-level in natural resource management is unclear. The study works within the boundaries of countries and regards the meso-level as neither national nor local level, but the district level.

The introduction of a mesoscale would be very expensive. I think it would be good to have administrative scales applicable to specific resources and strengthen existing scales rather than introducing new scales.

**Mr John Owino, IUCN – Building water governance capacity in East Africa (Kenya, Tanzania and Uganda) (J Owino, K Cross, A Vishwanath, R Bagyenda and H Sanga)**

The International Union for Conservation of Nature (IUCN) defines water governance as a 'societal level of competence to implement effective water management, use and development through policies, laws, institutions, regulations and compliance mechanisms'. The East African region is experiencing declining fresh water resources mainly due to increased demand, population growth, industrial and agricultural expansion, catchment degradation, wetland encroachment and conversion.

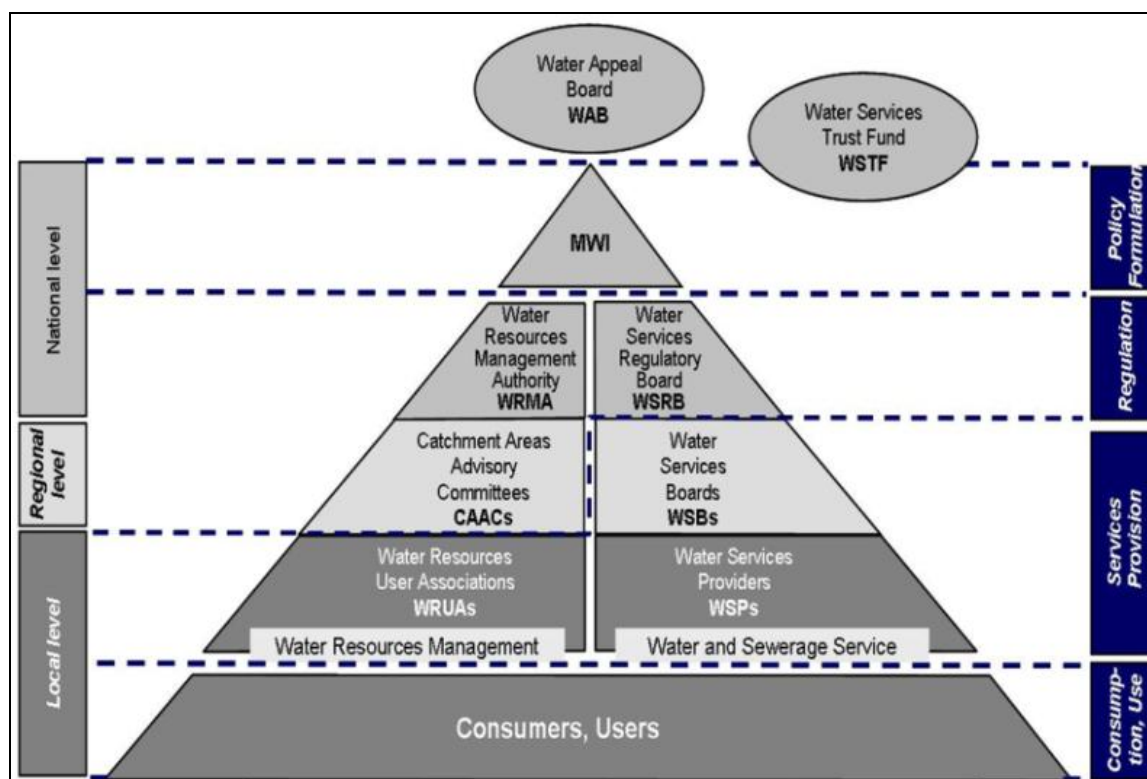
In addition there is uncertainty about the effects of climate change and variability. As a result it is necessary to improve water governance.

Across the three countries of East Africa, water reforms have been on-going and the principles of integrated water resource management (IWRM) and development are embraced. The water policy and legislation in the three countries have been revised based on the South African NWA, to make provision for an institutional framework for decentralised water governance institutions, which are called different names in each of the countries. Water governance institutions have been put in place and implementation is underway. The IUCN has assisted the development of the lower level water governance institutions such as water user associations (WUAs).

The institutional framework in Kenya is divided into water resource management (WRM) and water and sewage services at national, regional and local levels (Figure 6). Kenya is divided into six catchment areas and the institutions, except those at the lower level, have been established and are functional.

The institutional framework uses a similar architecture, providing for institutions at all levels, with Tanzania and Uganda including institutional engagement with district authorities. Establishment of lower level institutions whose function is to manage the water resources has been challenging, mainly due to limited resources and capacity. The three countries are being supported by the IUCN in this regard, working in the Pangani basin in Tanzania, one of the nine basins in that country, the Tana basin, the second largest basin in Kenya, and the Nile basin, one of four catchments in Uganda. The three projects included:

- Building the capacity of water basin boards, catchment management organisations and water management zones to enable them carry out their mandates effectively
- Supporting the establishment and strengthening the lower level or local organisations which bring together all the water users, riparian land owners or other stakeholders who are formally and voluntarily associated for the purposes of cooperatively sharing, managing and conserving a common water resource.



**Figure 6: Water sector institutional framework in Kenya**

The objectives of these local lower level organisations are to:

- Promote controlled and legal water use activities

- Promote catchment conservation measures to improve water quantities and quality
- Reduce conflict in use of the water resource
- Promote good management practices to make efficient and sustainable use of the water resource
- Ensure sufficient and sustainable water reserves to meet the demands of the environment, the wildlife, the livestock and all communities downstream/upstream who rely on the water resource.

In Tanzania and Uganda, the IUCN designed and implemented the process of establishing and strengthening WUAs. Kenya had already established a process for the establishment of that country's WUAs. The IUCN then supported exchange visits between WUAs and convened a regional workshop to share experiences and lessons learnt about the formation and operation of WUAs. In Kenya and Uganda, the established WUAs were supported to develop the catchment management plans and to implement actions in terms of ecosystem priority areas identified in the plan. The IUCN also produced various publications and multi-media technology was used to disseminate information to stakeholders.

Numerous lessons were learnt from the IUCN's experience in supporting the establishment of lower level water institutions in Kenya, Tanzania and Uganda. The Tanzanian government is trying to use the experience to develop guidelines for the establishment and operation of WUAs throughout the country, and the process of forming, strengthening and formalising WUAs has contributed towards effective involvement of local communities in WRM.

On the negative side, poverty is forcing water users to focus more on quick-wins than on sustainable development of water resources, and water users have high and often unrealistic expectations of WRM instead of engaging with it. The WUAs require time to fully understand their role in WRM, including the implementation of actions identified catchment management plans. The governments of the three countries are not offering sufficient support to the establishment of WUAs, a process that has been driven by the IUCN project and cannot be sustainable in the long-term unless sufficient appropriate resources are allocated to the implementation of IWRM.

## Discussion

**Unknown person (Swaziland):** You mentioned that one of the challenges is that this process is project driven. What is the degree of ownership and what do you regard as the sustainable levels of the groups formed by the IUCN? How do literacy levels affect the groups' understanding of their responsibility and their role in WRM and how has government supported the WUAs to ensure continuation of the groups after the end of the IUCN project?

**Mr John Owino (IUCN):** The support of the formation of the WUAs is part of the governments' strategies, but funding is inadequate. The IUCN collaborated with the governments and the catchment management agencies, and promoted ownership by the countries. The lack of funding remains a challenge and a constraint to the establishment of WUAs. The literacy levels are very high and specific efforts were made to train representative of local community to inform the communities, by translating the training manuals into local languages in order to reach the local people. Some of the WUAs that were supported by the IUCN have already mobilised their own funding to ensure continuity. In Kenya there is a financing mechanism, the Water Trust Fund, which is supposed to support WUAs in the implementation of the sub-catchment management plans. WUAs must already be in place in order to access funding. The other countries are not as well organised to generate funding and do not have these clear funding mechanisms.

**Ms Nora Hanke (University of Stellenbosch):** Is the IUCN involved in capacity building in local communities or in the implementation of the water legislation that is already in place?

**Mr John Owino (IUCN):** The IUCN is building the capacity of the local organisations to manage water resources. The water acts are in place and provides for the lower level water institutions, which had not been put in place. The IUCN is supporting the management agencies whose mandate is to establish WUAs, but do not have the necessary resources to do so.

**Mr Robert Sunday (UNESCO-IHE):** The process to establish WUAs must be demand driven, but the way they are being set up (by a water sector development programme) is conditional and unsustainable. There is a contradiction between the Acts and the policies of various departments – a stumbling block to the implementation of WUAs.

**Mr John Owino (IUCN):** The Acts are conflicting. In Kenya we are going through a rigorous process to highlight the gaps and align the natural resources management acts to the new constitution of 2010. At some stage the same process will have to take place in Tanzania and Uganda to ensure there are not contradictions between the acts and policies relating to natural resource management. The governments are responsible for the alignment process.

**Mr Erik van der Berg (Aurecon):** Are the WUAs' strategies and plans based on the larger basin plans and strategies that are in place? To what extent are these adapted for local conditions? How do you identify participants for the local processes and what was the approach followed?

**Mr John Owino (IUCN):** Specific strategic plans have been developed for each basin in each country. The lower level institutions are part of the larger system and activities, are identified that are specific to the local level. The process followed to establish WUAs is that one basin in each of the countries will be replicated in the all other basins. Stakeholder analysis was done to identify cross-cutting stakeholders from the specific basins. The sub-catchment delineation was done by the catchment management agencies. The IUCN did not work in isolation but together with the basin management agencies, within these parameters.

### **Mbangiseni Nepfumbada, Department of Water Affairs – The importance of information and knowledge flow in facilitating water governance**

Mr Nepfumbada was taken ill and was not able to deliver his paper. The abstract was not received.

### **SESSION 14: UNDERSTANDING AND MANAGING THE RESOURCE BASE**

**Chair: Dr Harrison Pienaar, CSIR**

**Mr Johan van Rooyen, Director: National Water Resource Planning, DWA – Increasing competition for finite water resources: options for the future (JA van Rooyen, MS Basson and DB Versfeld)**

There has always been competition for the water resource in South Africa and this is increasing. The rainfall and run-off in South Africa are very variable, geographically, over seasons and over years (with droughts and floods). This variability means that very little of our rainfall is usable without providing infrastructure. There are hundreds of dams supplying water for the larger systems, thousands of farm dams built by farmers for irrigation, and several million production boreholes to make groundwater more accessible. For a long time, we have used financial resources to 'create' usable water. South Africa shares four of its large basins between seven countries.

Water quality is extremely important for ensuring that water is available. Water should be of appropriate quality for the intended uses. Deteriorating water quality is potentially a major threat in South Africa and can render water unfit for use. The main impacts on water quality are the discharge of urban and industrial effluent to rivers; high salinity irrigation return flows; wash-off and leachate from mining operations; and wash-off from areas with insufficient sanitation. Water quality is a fundamental element of water resource management. Most water quality problems could and should be solved at source.

### **National Water Resource Strategy**

The first edition of the National Water Resource Strategy was published in September 2004. DWA is trying to manage the national water resources to ensure water security and to manage the competition among the various users for the water resource.

In 2000, there was slightly more water available in South Africa than was required, but this distribution is very skewed, because there is no inexpensive means of distributing water throughout the country. In 2000, there were already significant water shortages in some water management areas, where more water was required than was available. Many of those shortages were due to the introduction of the ecological reserve. The ecological competition for the reserve was formalised in the National Water Act (NWA) and brought into the calculations.

## **Water requirements**

Sixty per cent of the available water is used by irrigation, 25% in the urban and industrial areas, and the rest for rural industrial demand, for power generation and afforestation, and a small quantity is exported to other countries.

Growth is inevitable. The South African population is nudging 52 million, and the economic growth target is 6%, as reflected in the report of the National Planning Commission. This growth has to be translated into water requirements. It is clear that there will be competition over the water resource.

### *Rural water use*

Water to rural areas will not be neglected. Thriving rural livelihoods provide food security to growth centres and take the pressure off urban migration. Rural areas have historically been neglected; this situation is being redressed through improved water services (supply and sanitation) and livelihood opportunities. The rural needs can be met through local groundwater or other sources; and improved land management and rainwater harvesting for food gardens and food security. These approaches keep water affordable in an environment where the ability to pay for water is very low.

### *Agriculture*

DWA is close to pegging the use of water by its major consumer, namely agricultural irrigation. The age of major new irrigation schemes is over. Agricultural development can only come through increasing efficiencies; taking up of unused allocated water; and a few remaining potential projects, but at high cost.

Forestry is tightly managed, and overall use by this sector has, if anything, declined through the clearing of trees previously planted in riparian zones. There are some plans for the expansion of this sector.

### *Towns and cities*

Domestic water requirements have increased with increased population growth and demographic and social change that has led to more households with fewer people per household; increased urban incomes; and growing expectations. The bulk of South African industrial demand is also in cities and towns, which are important for economic growth. Losses and inefficient use in the cities are much too high and need to be addressed.

### *Mining*

Mining, despite the perturbations of the moment, remains the economic backbone of the country, and this situation is likely to persist for some time. The demands of the sector are relatively modest in relation to economic output, but a number of the mines are established in areas where water is very scarce. In some areas water is already 'flowing' from agriculture to mining. The biggest impact of mines is on water quality. The water situation in the country is exacerbated by the impact of the mining sector on water quality.

### *Energy*

South Africa is absolutely dependent on the reliable supply of electricity. This requires water. Water for energy use has therefore been declared the only strategic use of water in South Africa after basic human and ecological requirements. Efficiency is crucial; all new power-generation stations will therefore be dry-cooled. When the old wet stations are decommissioned, less water will be used in the energy sector. The same will apply to concentrated solar stations. South Africa cannot afford to grow biofuel crops under irrigation.

### *Ecological reserve*

The ecological reserve has been entrenched in law through the National Water Act (NWA) of 1998. The purpose of the reserve is to ensure viable ecosystems by providing the natural goods and

services that ecosystems offer. In terms of the reserve, sufficient water is required to remain in the system to retain ecological functionality, at varying levels, depending on the classification status of a river. Not all rivers can be 'pristine'. The value of rivers is not accorded to the rivers per se, but to the benefit that these rivers in turn provide to the society that uses them.

### NWRS 1 reconciliation strategies

The first edition of the National Water Resource Strategy (NWRS 1) in 2004 contained a list of reconciliation strategies, in order to reconcile water requirements with the available water. Water conservation and water demand management (WC/WDM) are required. Better surface water resource management (operation of dams) and conservation, as well as better management and use of groundwater are required. Other measures to reconcile water demand with available water include re-use of water; eradication of invading alien vegetation; re-allocation of water; development of further surface water resources (e.g. dams) where possible; and transfer of water.

Since NWRS 1, which was at a broad overview level and cannot be used as the basis for building infrastructure, DWA has developed more detailed reconciliation strategies. The large systems supplying the metropolitan areas of large economic importance have particularly been investigated; eight of these strategies have been completed, and four are in development. The rest of the towns in the country have also been investigated and are covered in the 814 'All town strategies' reports, which are available on the DWA website and indicate the sources of water for each town.

#### *Western Cape strategy*

Reference was made to the reconciliation strategy for the Western Cape in the event of a future climate change scenario. The strategy provides options for supplying the shortfall, including the implementation of water conservation and water demand management, as well as feasibility studies for surface water and groundwater schemes, a large re-use scheme, and the desalination of seawater. By mid-2013, the strategy steering committee will make recommendations about which of the options to take forward for the next augmentation, in order to supply water by 2019.

Table 6 shows the cost of future water supplies in terms of Rands per cubic metre. These are not tariffs, but are calculated on a social discount rate of 8% and take account of all capital and operational costs for projects. If the few remaining surface water and groundwater schemes with short transfers are built, the range could be between R2–4/m<sup>3</sup>. Large re-use projects would typically cost about R8/ m<sup>3</sup>; large surface schemes with long transfers (e.g. Vaal river) could range between R6–17/m<sup>3</sup>; small schemes, where the benefit of scale is lost, with long transfers (e.g. Olifants river system) could range between R18–45/m<sup>3</sup>; mine water treatment and desalination, R8/m<sup>3</sup>; seawater desalination at the coast, R12/m<sup>3</sup> taking account of the anticipated high energy cost in the future; large seawater desalination and long transfer, for example, from the coast to Gauteng, R25/m<sup>3</sup>; and a small desalination scheme with a long transfer (e.g. for the needs of the Olifants), R44/m<sup>3</sup>.

**Table 6: Cost of future supplies (unit reference value)**

Type	R/m <sup>3</sup>
Surface and groundwater (short transfer)	2–4
Re-use	8
Surface (large quantity, long transfer)	6–17
Surface (small quantity, long transfer)	18–45
Mine water treatment and desalination	8
Seawater desalination (at coast)	12
Seawater desalination (large, long transfer)	25
Seawater desalination (small, long transfer)	44

It is possible to invest more and build more infrastructure in order to make more water available, but many of these options would be very costly.

### **Key strategic messages from all strategies**

Through detailed work, the broad NWRS 1 strategies have been confirmed, and the option of desalination of seawater has been added as a strategy.

Strategic planning has been done and the solutions are available. The first of these is WC/WDM, which is extremely important in all areas. South Africa cannot afford to waste any water, anywhere, anymore. Groundwater will be an important part of the solution; it is currently under-valued and under-used. There is huge potential for increased re-use, particularly at the coast, but also in inland systems.

There is limited opportunity for more dams and transfer schemes; this solution will be inevitable in certain areas, but will be very expensive. Small-scale seawater desalination is already being done. Mine water desalination is important. Large-scale seawater desalination is imminent. Catchment rehabilitation, clearing of invasive alien plants and rainwater harvesting are important.

It is possible to make more water available anywhere in the country in the future, but at steeply rising costs. Additional water for increases in irrigation in South Africa are very limited. Moving some water from irrigation to other use must already be considered in certain areas. The debate about 'virtual water' and importing food from neighbouring countries with high food production potential must be broadened.

It is possible for South Africa to have water security, but water management is very complex and involves the whole water sector. Implementation will be the key and will require more financial resources, human resources and fully functional institutions.

### **Discussion**

**Unknown speaker:** The unit reference values for certain options were provided in the presentation. Are any estimations available for the implementation of WC/WDM measures?

**Mr Johan van Rooyen:** The unit reference values for WC/WDM measures can range from a few cents per cubic metre to very high numbers, depending on the measure. In most cases, WC/WDM is the cheapest option.

**Mr Kevan Zunckel (South African National Biodiversity Institute):** What is meant by the surface and groundwater option?

**Johan van Rooyen:** This option involves large projects, for instance, for Cape Town. This does not refer to borehole schemes, which would be far cheaper.

**Dr Gebhard Schüler (Research Institute for Forest Ecology and Forestry, Germany) – The impact of forests on water supply and flood prevention in a changing climate (Vu Thi Bich Hong, Steffen Schobel, Sabine Karl, Bernd Schultze and Kristina Wilkinson)**

The ForeStClim project in Europe deals with climate change impacts on forestry. One of the tasks of this project was to examine the impact of climate change on forests and water.

One of the members of the project was Ian Calder, author of the book *The Blue Revolution* about water. According to Calder, "The sciences of the causes of floods admits uncertainty and imprecision in the prediction of land use impacts on the flood regime. The interaction between forests and soils remains a particularly 'grey' area in our knowledge."

The ForeStClim project operates in north-western Europe. The presentation will focus on the impact of climate change in just one headwater catchment situated in the low mountain ranges of south-western Germany, namely the Frankelbach headwater catchment.

The area of the Frankelbach headwater catchment is about 8 km<sup>2</sup> in size. The height above sea level is between 210 and 430 metres and the annual precipitation is 700–800 mm/year with increasing storm rainfalls during summer in the last decade. The average temperature is 9° Celsius, and the average temperature during the vegetation period is 14° Celsius. Sediments were deposited during semiarid and subtropical conditions and later bulged by volcanism. The soils of the headwater catchment are brown earth/colluvia from sand-loam and silt-loam, partly relocated (and in the valleys, loamy floodplains).

Runoff and recharge of groundwater in the Frankelbach headwater catchment was investigated using an expert system based on slope, land use, parent rock material (geology), measured soil physics, and infiltration and sprinkling experiments. The second stage of the project involved irrigation experiments. It was found that soil conditions are more important than forests in influencing runoff. The expert system was then used to assess runoff types.

The next step was modelling with the aim of investigating the influence of climate change. Modelling is always an approach to reality ranging from a black-box system to a more or less process-related procedure. The degree of abstraction and simplification of real hydrological processes varies between different models. The goal to be achieved is to trace the measured discharge hydrograph of an outlet as well as possible. This rarely provides new insights, but a well-validated model enables scenario studies by varying the input parameters according to specific changes in climate or/and land use distribution, for example.

The modelling entailed the assessment of the water balance of differently structured study areas in response to a changing climate in the recent period 2005–2010, and comparison of two future projections for the periods 2021–2050 and 2071–2100 with two climate change signals, one for dry and warm conditions and the other for humid and cold conditions, in order to account for the large uncertainties associated with climate change.

The SWAT (Soil and Water Assessment Tool) was used; this tool is used for large-scale modelling around the world. Since the ForeStClim project headwater catchment modelling was not large scale, and the intention was to assess the best land uses options under conditions of climate change, the Apex tool (Agricultural Policy/Environmental eXtender model) was also used. APEX is a flexible tool for simulating a wide array of land-use management practices across a broad range of landscapes, including small watersheds. APEX requires the elevation model, land-use data, soil data and climate data as input data.

The results of this modelling show the behaviour of groundwater recharge and discharge for the two ForeStClim demonstration watersheds with different land use variations. It is also possible to evaluate best management practices of land use and to assess the role of forest services for water supply and flood mitigation. If climate change projections are included in the modelling, it is possible to show how the groundwater recharge and discharge may change in future, and what efforts in land use have to be taken to maintain the best possible services for water supply and flood and erosion mitigation.

The recent physical soil conditions seem to be the crucial factor for the plant-available soil water content, for mitigating fast runoff and reducing flow peaks, rather than the land-use type. The history of land use often teaches us that forests were left on soils with bad soil conditions (e.g. shallow or hydromorphic soils with less field capacity), whereas the better soils were allocated for agricultural land use. Thus, the less benefiting soil conditions under forests may have detrimental effects on the productivity, and on runoff behaviour.

APEX makes it possible to quantify the plant-available water, and the runoff from catchment areas in terms of a daily resolution. There are still difficulties in modelling delayed runoff (e.g. in areas with a high litter storage capacity such as peatland).

Integrating a bandwidth of regional climate projections makes it possible to derive recommendations for prospective best land-use practices with regard to future productivity, flood mitigation, forward-looking sustainable forest management, and considerate stewardship of water resources with regard for forest and water interactions

## **Discussion**

**Prof. Graham Jewitt (University of KwaZulu-Natal):** (1) In the climate change modelling, are there shifts in the rainfall pattern, or just annual rainfall and temperatures increases or decreases. (2) Is the assumption that there is no feedback between climate change and the forest; in other words, is the forest static under the climate change scenario.

**Dr Gebhard Schüler:** Climate change has different impacts on forests. The most important impact is on the productivity of forests, because evapotranspiration will be increased or decreased under different climate change conditions. Reducing or increasing the evapotranspiration means reducing or increasing the productivity of forests. In the dry and hot scenario, there are increasing numbers of water-stressed days. This will not mean that forests will die completely, but it may be necessary to change the forest types, and also that there will be less productivity in forests. In middle European conditions, if there is an increase in precipitation, the conditions for forestry would improve.

**Mr Krishna Naidoo (University of KwaZulu-Natal) – Towards sustainable livelihoods through water use security: insights from small-scale irrigation schemes in Limpopo province (KD Naidoo, JM Thamaga-Chitja and SH Shimelis)**

Water is integral to sustainable rural livelihoods and household food security due to its key role in household and small-scale and homestead framing. Water security is an emerging concept that has gained increasing attention over the past five years. The World Economic Forum describes water security as 'the gossamer' that links together the web of food, energy, climate, economic growth and human security challenges that the world economy faces.

Livelihoods in rural areas are at risk due to poor access and supply of water and resource degradation. A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is classified as sustainable when it can cope with and recover from stress and shocks to maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation. Livelihoods consists of four parts, namely, people and their livelihood capabilities; assets, including both the tangible (resources and stores) and intangible (claims and access), which provide the material and social means that are used to construct livelihoods; activities (i.e. what people do); and a living, which refers to the outcomes of what people do.

Agriculture is a large water user and can be relatively labour intensive and an important source of employment and livelihoods. However, limited access to clean and safe water associated with poor water supply, hygiene and sanitation at household level and significant demand for crop cultivation is widening the poverty gap and gender inequalities.

South Africa is classified as a water scarce country (Seckler and Amarasinghe 2000), which could have adverse effect on livelihoods. The objective of this study was to document the role of water in agriculture and livelihoods for smallholder irrigation schemes in Limpopo province, to assess water supply, water availability and associated challenges and to identify opportunities for their future development.

Most smallholder irrigation schemes are found in the former homelands of South Africa, where the incidence of poverty peaks. A sustainable livelihood analysis was conducted among three rural female farmer groups to elicit the role of water in agriculture and livelihoods. These three communities were located at Steelpoort Drift (Ga-Malekane), Mafefe (Mashushu) and Rambuda (Matshavhawe).

Complementary to the sustainable livelihood analysis, a household water audit was conducted to assess water supply, water availability and associated challenges. Face-to-face interviews were conducted with willing irrigation scheme members. Key informant interviews were conducted with officials from district municipalities, extension officers and the Department of Water Affairs. Water policy analysis was conducted to investigate water access, governance, organisational structures and institutional arrangements. Content analysis and sustainable livelihood analysis were adopted as the main data analysis tools.

Seventy-nine per cent of the participants in the study were women, and most were over the age of 50. The finding on the age of the participants is important, because the intention and incentive for production and involvement in irrigation agriculture may differ drastically with younger people. Older people are less likely to embrace new technology and modern demands for selling produce.

The study found that there was a lack of water storage infrastructure at the three study sites. Water was used mainly for drinking, cooking, washing clothes, cleaning and personal hygiene.

The water supply characteristics of the study sites were as follows:

- Mashushu: There is low natural water flow of the Mohlapiitse river (41.14 million cubic metres per annum), and low annual rainfall fluctuating between 480 mm and 875 mm.
- Rambuda: There is high natural flow of the Mutale river (126.99 million cubic metres per annum), and rainfall that ranges between 400 mm and 800 mm per annum.
- Steelpoort: Rainfall averages a low 440 mm per annum.

Smallholder farmers compete for water supply with mining, commercial farmers and the tourism sector.

A comprehensive water institutional reform programme was implemented in 1994. The institutional changes covered policy, legal issues and organisational dimensions of water allocation and management, and culminated in a new national water policy, the National Water Act and the National Water Resource Strategy.

Key findings of the study indicate gaps with respect to policy and implementation, lack of understanding of policy and recommended water management structures, and discourse between the transformational agenda of water reform and rural people's way of life, thus eliciting gender tensions among study participants.

The complexity of these issues resulted in poor livelihoods for participants who experience poor water access for current and future water use. Competition over the water supply, coupled with climate change, was also identified and a serious threat due to expanding mining operations in Limpopo. The study concluded that water use management and water policy reform intentions require serious and robust investments in capacity building of small farmers in rural areas in order for access to water and its management to improve.

## **Discussion**

**Prof. Maitland Seaman (University of the Free State):** What kind of irrigation did the study participants use? Were they just cultivating home gardens, or were they engaged in any form of commercial agricultural activity?

**Mr Krishna Naidoo:** These were small-scale irrigation farmers cultivating mainly for subsistence purposes. The study also shows that members of the all three irrigation schemes, particularly those at Rambuda, also take their produce to market, but markets are not readily available to them.

**Prof. Maitland Seaman (University of the Free State):** The fact that most of the farmers are women suggests that this is not a closed system, in that the men are earning money elsewhere. The fact that the study sites are thus open economies has to be taken into account.

**Mr Kevan Zunckel (South African National Biodiversity Institute):** I would like to enquire about water-use efficiencies on the ground. Did these smallholder farmers implement techniques such as deep-trench farming, mulching or rainwater harvesting?

**Mr Krishna Naidoo:** At household level, we found that some households practised rainwater harvesting, but in the fields there were mainly canal irrigation systems; flood and furrow irrigation was used to irrigate the fields. The smallholder farmers also depend on rainfall.

**Dr Chris Dickens (Institute of Natural Resources) – Integration of biophysical, economic and spatial tools in the governance of resources demonstrated in the Drakensberg mountains, South Africa (Chris Dickens, Dave Cox, Robyn Johnston, Masoom Hamdard, Fonda Lewis, Dirk Vrebos and Tom D'Haeyer)**

The AfroMaison project is funded by the European Union and looks at the integration of natural resource management in five case studies across Africa. The case study in which the Institute of Natural Resources is involved is located in the Upper uThukela district municipal area, stretching from the top of the Drakensberg escarpment down to and including Escourt, Ladysmith and neighbouring towns. This area has many natural assets. The Drakensberg mountains are a World Heritage site. In

many areas, the resources are being seriously degraded by the actions that are taking place on the land.

The project has consulted with stakeholders to ascertain their views on what is going wrong in the area. In order of priority, the following issues were identified: the need for good management and governance of natural resources and the enforcement of natural resource management and planning legislation; the need for environmental integrated natural resource management education and awareness; threats to the environment and loss of biodiversity; the need for appropriate economic development; land degradation; uncontrolled development activities; pollution; poor land-use practices; making financial and human resources available for integrated natural resource management; uncertainty associated with land reform; and illegal activities (i.e. crime as opposed to the enforcement of natural resource management legislation). The primary problems were the lack of governance of natural resources, and lack of implementation of good policies.

There has been a shift in the area from the traditional authority system to a democratic structure, with an associated loss of many of the functions that were being carried out by the traditional authorities. This has resulted in over-utilisation and lack of management of practices on the land. There is considerable conflict between the conservation of grasslands and the keeping of cattle, which are generally used for cultural purposes. Because of the loss of authority of the traditional authorities, there is now rampant stock theft. This is proving positive for the area, because stock theft is so rife that people are becoming reluctant to own cattle.

The politicisation of the authorities in the area has led to a substantial decline in the ability of the municipality to function properly. One of the stakeholders referred to an "ethos of non-functionality" in the district municipality. There have been 26 political assassinations in the area over the past few years. There is much grappling for position and fighting for power, which tends to dominate, and the management of resources is therefore neglected.

There have been many attempts to manage the natural resources in the area better, including land-care projects and many smaller projects. However, these projects tend to suffer from a loss of momentum and eventually collapse.

At present, there are some very positive management initiatives under way, often driven by KwaZulu-Natal Wildlife. One such initiative involves local people in contributing a large pristine area to the World Heritage site, to become part of the wilderness area. There is promising participation in this community wilderness area and stewardship programme.

We would like to base the management of the resources on the resources themselves. The first idea is to determine what ecosystem services are available in the area. These are essentially the raw materials around which all other activities in the area take place. The health and spatial distribution of the ecosystem services is also important issues.

Using the different land cover types in the landcover database, the approach is to evaluate the kinds of services produced by each landcover type, and how much of each. In this way, it is possible to generate an idea of the spatial distribution of those services.

Using such data as the baseline, the AfroMaison project is investigating the kinds of sustainable land management interventions that could be implemented in the area, the economic instruments and financial incentives that could be used to make this happen (which has too often been missing in initiatives), and spatial planning tools for management across the landscape. A strategy is then needed for drawing an initiative together.

Strategic adaptive management principles are being used to bring the elements together. The Wat-a-Game (as demonstrated elsewhere at this conference) is used as a simulation exercise to test the strategy, educate people and get them to participate in the decision-making process. The ultimate intention is for the governance of the natural resources to take place via the environmental management framework.

### Sustainable land management interventions

The area has been divided into the pristine World Heritage site area, a buffer zone where land activities are regulated to some extent, and an outside zone, as shown in Table 7, to ensure that optimal ecosystem services are available.

**Table 7: Sustainable land management interventions**

	<b>World Heritage site</b>	<b>Buffer zone</b>	<b>Outside zone</b>
<b>Short-term interventions</b>	Prevention of erosion	Erosion control and rehabilitation	Erosion control and rehabilitation
	Fire management	Fire and grazing management	
			Water quality management
	Invasive species control	Invasive species control	Conservation agriculture
	Biodiversity management	Alternative livelihoods	Conservation agriculture
		Wetland rehabilitation	Wetland rehabilitation
<b>Medium-term interventions</b>		Fire wood production	Agro-industries and forestry
		Agro-forestry	Intensification of agriculture

### Economic instruments

The fundamental principle is that ultimately users should pay for the resources that they use. There should be incentives to make the utilisation of resources efficient and optimal. The types of economic instruments that can be used to provide an incentive for better ecosystem or resource management are shown in Table 8.

**Table 8: Types of economic instruments that can be used for ecosystem management**

<b>Types of instruments</b>	<b>Examples</b>
Property rights based instruments	Ownership rights Use rights
Price-based instruments	Tradable permits Tax differentiation Pollution charges Subsidies Payment for ecosystem services
Legal, voluntary and information based instruments	Legal liability Non-compliance charges Environmental certification

### Spatial tools

Spatial tools operate across a spatial dimension and help with the management of resources. The project proposes to use the following tools:

- ACRU (Agricultural Catchments Research Unit), which is well established locally, to measure and predict with respect to the hydrological cycle and the impact of different land-use conditions
- SITE (Simulation of Terrestrial Environments), which is a new model that the project is proposing to use in the area in order to bring together socio-economic and biophysical issues in a GIS-based system in order to predict changes to the land under certain circumstances
- Ecosystem services distribution map.

These tools are drawn together in a GIS framework in order to provide the spatial data sets that are used for management of the natural resources and to make it possible to assess the impacts of different land-use scenarios.

### **Why the meso-scale?**

AfroMaison promotes the use of a meso-scale. This is the level at which national and provincial policy is turned into action and applied on the ground. The catchment management agency is an institution at the meso-scale level, and this is the spatial scale at which water resource management is most effective, particularly if it is truly catchment based.

The meso-scale is also the level at which planning and development decisions directly impact on land and natural resources, and where there is direct interaction between government and the local people, which provides an opportunity to influence people's behaviour and actions.

There are many mechanisms that can be used to facilitate integrated planning and action, including the integrated development planning process run by district municipalities, the environmental management framework and local economic development. In South Africa, the perfect meso-scale is local government at district municipality level. District municipalities have the legal responsibility to manage natural resources.

### **Environmental management framework**

It is coincidental that the district municipality that is the focus of the AfroMaison project is engaged in compiling an environmental management framework (EMF). The EMF is the compilation of information and maps specifying the attributes of the environment in a particular geographical area in a format that can be used to inform environmental management, and for the consideration of applications for environmental authorisations.

The EMF has legal standing, as the EMF regulations are promulgated in terms of the National Environmental Management Act (NEMA). The EMF is designed to promote cooperative environmental governance. Integrated stakeholder participation is required in the development of a vision, the desired future state. This is not a top-down decision-making process but a participatory one. If local stakeholders can buy into the vision for an area, they will not contest it and will be committed to achieving it.

The outputs of the EMF have a strong spatial focus, related to different interventions for different parts of the district municipality. The outputs include a strategic management plan detailing budgets, actions and assignment of responsibilities. The EMF therefore offers a good possibility of transforming ideas into actual practice on the ground. The EMF is updated approximately every five years. The EMF is importantly required to integrate all sector plans.

The AfroMaison project starts by documenting the status quo (including ecosystem services maps); then determines the desired state (including detailed stakeholder consultation) and finally develops a strategic environmental management plan, including tasks and action plans. The whole area is divided into environmental zones that are appropriate for different types of development and land use.

### **Discussion**

**Mr Johan van Rooyen (DWA):** The water management areas that will be used as the basis for the establishment of the catchment management agencies are still catchment based. It is coincidental that nine CMAs are to be established (the same number as the number of provinces in South Africa), as they will not be provincially based.

**Prof. Fred Otieno (Durban University of Technology):** Is the software that will be used in the AfroMaison project freely available?

**Dr Chris Dickens:** It is open source software.

**Prof. Maitland Seaman (University of the Free State), to Mr Naidoo:** I am concerned about the study, as it is much like a snapshot of what people are doing on that piece of land. The high density of the people on that land is a function of joining the market economy. There would have been far fewer people when it was part of the subsistence economy. As a result of people working elsewhere and earning more money, but still retaining their home in the rural area, increasing numbers of people are

living there as the descendants of the people that previously occupied the land. The land use described by the project is not subsistence but people's gardens. The people are not using the land as efficient producers of crops in order to earn money. As the size of the piece of land available gets smaller, it is cheaper to buy from the supermarket than to produce crops, and the land starts to lose functionality. The role of the men in the community cannot be excluded. The fact that most of the farmers in the study were women suggests that the men are working elsewhere, and are part of the economy of the area.

**Mr Musa Masilela (Swaziland Water and Agricultural Development Enterprise), to Mr van Naidoo:** The presentation pointed out a number of issues but made only one recommendation. Is this recommendation comprehensive, and are you comfortable with it? What do you want to achieve with the study, and what value can the study add?

There have been many discussions at the conference on the multiple uses of water. Your research shows that many people are using the water in canals and perhaps sometimes polluting it. The question was raised in a previous session whether people should continue to be allowed to draw primary water, or whether this activity needs to be licensed. What is your view on these challenges?

**Mr Krishna Naidoo:** The study did raise many issues, but for the purposes of this presentation, I thought it was important to highlight the recommendation on increasing the capacity of institutional arrangements, because this is currently lacking in government structures. We need to capacitate small-scale farmers and facilitate more interaction with government on how to make water accessible and available to small-scale farmers.

In terms of the anticipated achievements of the study, I would like to see it result in improvements in the livelihoods of these small-scale farmers from disadvantaged communities, who do not have sufficient access to water, and who have to compete with mining for access to water. We would like to try to mitigate those factors through the proper provision of water and ensuring that the water that is allocated to them is used for them. We would like to improve the livelihoods of these small-scale farmers and perhaps later try to provide market access for them, as we do see some entrepreneurial spirit among them, especially at Rambuda. Because of the lack of certain resources, they are unable to market their produce. We would also like to influence policy and the way in which issues relating to small-scale farmers are regulated.

I agree with the points made about the role of men in the study community. There were men involved in the study, but 90% of the small-scale farmers in the study were women. Most of the men work on the mines, and the study will investigate their role in this smallholder irrigation agriculture system.

**Mr Musa Masilela (Swaziland Water and Agricultural Development Enterprise), to Mr van Rooyen:** With respect to the shortages in the ecological reserve mentioned in Mpumalanga, is this because people were using the resource, or was there infrastructure for people to use the water?

**Mr Johan van Rooyen:** In terms of the ecological reserve, in the Komati, water was allocated from the yield of the dams. In 1998, the concept of the ecological reserve was introduced, which means that there is a shortage when allowance must be made for the ecological reserve. The ecological reserve therefore suffers due to the shortage. Water for the ecological reserve will have to be allocated in future; there are mechanisms that can be implemented in order to do so.

**Mr John Harrison (eThekweni Municipality Water and Sanitation), to Mr van Rooyen:** In your presentation, you talked of rainwater harvesting and groundwater harvesting. However, runoff water, and rainwater and groundwater harvesting come from the same resource. What is intercepted in rainwater tanks will not end up in surface runoff; and if too much water is drawn from groundwater, this will negatively affect the base flow of the river. I assume that the modelling must take return flow into account. What assumptions have you made in this regard, and how did you arrive at them?

**Mr Johan van Rooyen:** As regards rainwater harvesting, the WRC has investigated the impact of small-scale rainwater harvesting by collecting roof water and found that it has a minimal impact on the yield of large systems, and will have no impact at the coast, as the runoff water would have ended up in the sea. The relationship between groundwater and surface water is taken into account, but a huge

amount of groundwater never reaches the streams as base flow. The utilisation of that groundwater is very important.

**Mr Jonathan Denison (Umhlaba Consulting Group), to Mr van Rooyen:** The National Planning Commissioner provided a diametrically opposite prediction of where agricultural water needs to be going. Mr van Rooyen suggested that agricultural water would need to be limited, and that there is very little opportunity for expansion of irrigation. However, the National Planning Commission (NPC) proposed that agricultural water be expanded by 30% above the present level, with a potential 20% increase in national water demand. Which direction should practitioners follow – that of the NPC, with the expansion of smallholder irrigation, or the National Water Resource Strategy, with limited irrigation water for expansion?

**Mr Johan van Rooyen:** Mr Mike Muller indicated that much of the additional irrigation water must come from efficiency in existing irrigation. He also mentioned the building of new schemes and some infrastructure, but emphasised that this would be at a high cost. There is limited opportunity to build more dams. More dams could be built in the Umzimvubu catchment, and DWA is currently investigating one of these dams. One might question whether that is the right thing to do. Dryland cultivation in that area may require more investment. Another issue is the take-up of water that is allocated for irrigation. The water allocated to dysfunctional irrigation schemes is still available for irrigation and forms part of the figure that Mr Muller mentioned.

## **SESSION 15: GROUNDWATER GOVERNANCE**

**Chair: Dr Shafick Adams (WRC)**

**Ms Fortune Nyatsanza, UNESCO-IHE (the Netherlands) – Reservoir operating policies for environmental flows in large dams in the Zambezi River Basin (F Nyatsanza, S Graas and P van der Zaag)**

The Zambezi basin is important to its riparian countries for food energy and ecological diversity, with the Marrromeu Complex and the Kafue Flats recognised as wetlands of world importance, and the Mana Pools as a World Heritage Site. The Zambezi basin is 390 000 km<sup>2</sup> and 2750km long, and encompasses four major reservoirs: Kariba, Cahora Bassa, Kafue and Itezhi Tezhi. The main operation objectives in the Zambezi basin are the maximisation of hydropower production; ensuring dam safety and ensuring sufficient storage for flood water for flood protection (Kariba and Cahora Bassa).

The interference of large scale hydropower schemes in the Zambezi basin has disrupted the environment, especially in the lower Zambezi (Beilfuss 1999). The alteration of flow to the lower Zambezi by the dams has resulted in ecosystem degradation in the delta and affected the fisheries (Hogwane 2000).

The study analyses current reservoir operating policies with the aim of proposing alternatives without causing significant adverse effects on the production of energy. It investigates the possible effects of reoperation of the reservoirs by forcing Cahora Bassa and Kariba to release artificial floods in February and March annually.

Problem statement:

- Despite environmental flow (e-flow) studies in the basin, e-flows have not been implemented due to fear of opportunity costs (i.e. hydropower foregone) (Chen 2010).
- The floods of 1978, though taking a toll on human life and property, had unplanned benefits for the environment. The same is true of the emergency flood releases of 1997 (Beilfuss 1999).

The following research questions were posed:

- What are the current reservoir operating policies for Kariba, Itezhi Tezhi, Kafue and Cahora Bassa reservoirs?
- What is the impact of re-operating the reservoirs for environmental flows on hydropower production?

Data for the study was obtained through field visits in the basin in 2011 and an analysis of current reservoir operating policies using historical data (1980-2010). Reservoir simulation was conducted on

a monthly time step using Waflex, which is a simple spread sheet model (Savenije 1995). Scenarios were developed to assess the impact on hydropower production (as shown in Table 9). Reductions in hydropower produced for Kariba were measured against historical production, and not actual demand. For Cahora Bassa Hydro Electric (HCB), they were measured against modelled production over the modelled period. This is because Cahora Bassa has only been fully operational since the late 1990s.

The reservoirs operate based on 'rule curves'. Cahora Bassa and Kariba have maximum rule curves, and Itezhi Tezhi/Kafue Gorge Reservoir (ITT) and Kafue have minimum rule curves. Current operating policies were analysed and described by comparing historic dam levels with the prescribed rule curves.

**Table 9: Study scenarios**

Scenario	Description
Business as usual (BAU)	Current operating conditions with hydropower driving dam operation (BAU at full capacity for Cahora Bassa)
1	Recover the natural flows in February and March by 50% at Cahora Bassa
2	Recover the natural flows in February and March by 50% at Cahora Bassa and Kariba
3	Recover the natural flows in February and March at Cahora Bassa
4	Recover the natural flows in February and March at Cahora Bassa and Kariba

For Kariba, the results indicated that hydropower shortages were unlikely in normal years for scenario 2. Hydropower shortages of up to 36% could occur in dry years for both scenarios 2 and 4, and hydropower shortages of up to 24% in normal years for scenario 4.

For Cahora Bassa, the results indicated that Cahora Bassa would be able to produce full power in normal years, but not in dry years which would have shortages of up to 36%. That would be reduced to 27% when Kariba releases for e-flows too (scenario 2). In the event that Kariba failed, the shortages would increase (2005/06 & 2006/07).

Cahora Bassa can release e-flows to recover the hydrograph by 50% or 100% in normal to wet years, without a large negative impact on hydropower production. However, fewer shortages are experienced when Kariba also releases for environmental flow requirement (EFR). Therefore flood releases in February and March in the Zambezi are possible in normal to wet years without significantly affecting hydropower production (depends on the magnitude of EFR). However, the frequency and magnitude of very large floods is reduced by imposing these regular EFR flood releases.

Further studies are needed to determine the environmental flow requirements and dynamics, especially inter-annual variations. Environmental flow requirements should be compared at more locations in the basin, and synergies identified between the operations of reservoirs. The low flow requirements and possible trade-offs in dry years need to be further analysed. A study of the economics of environmental flows in the Zambezi for tradeoff analysis and cost/benefit sharing policies between hydropower and the environment in the basin could be beneficial. The study also recommends further studies for Kafue Gorge, as the system is complex due to the presence of the Kafue flats between the two dams of Itezhi Tezhi and Kafue.

## Discussion

**Mr Godfrey Pazvakawambwa (Namibia Water Corporation):** With regard to the environmental flows which you worked with, is the idea to assimilate the maximum flows or the minimum flows into the river system? I am concerned that it could further compromise the power potential in the Zambezi River if one was to assimilate the maximum flows between February and March. Did your model take that into consideration?

**Ms Fortune Nyatsanza (UNESCO-IHE):** The study looked whether it is possible to recover the flood in February and March, but if you look at the graphs for Kariba, the peak occurs in December and January and for Cahora Bassa the peak is in January and February. I used February and March for

both, because of the way Waflex works (it releases in the same time step). This model was not looking at minimum flow in the river or a minimum requirement; it was looking at trying to recover the natural flood and how far we can go in that regard, and how much hydropower we can forgo by recovering that natural flood.

**Mr Johnny Beumer (Aurecon):** If you create an artificial flood, could it result in claims from downstream owners and users if they suffered flood damages which would not have occurred if the releases had not taken place? I am talking about a purely artificial flood; not a combined artificial and natural flood.

**Ms Fortune Nyatsanza:** An 'artificial' flood in this case means that we are deliberately releasing water from the dams to mimic a natural flood, so it only makes sense to do it at the same time that a natural flood would occur.

**Prof. Julius Ndambuki (Tshwane University of Technology):** During the design of these dams, the effect of natural floods was not considered. Therefore the notion of the 'restoration' of natural floods does not make sense.

**Ms Fortune Nyatsanza:** I read a report by the world commission on dams for Cahora Bassa. Apparently an Environmental Impact Assessment (EIA) was conducted for Cahora Bassa, but it was ignored. The scientist involved spoke about the ecological impacts that the dam would have, but the design of the dam completely ignored the EIA warnings. My rationale is if we plan for these floods, and manage them by determining the size of the flood, it is preferable to performing emergency releases.

**Panel discussion – Regulation of interception of forestry in water allocation plans in Australia**  
Organised by Prof. Jennifer McKay, University of South Australia (Australia) and Dr Shafick Adams, WRC/UNESCO

A presentation was given by Prof. McKay entitled, 'Incorporating plantation forestry as a water affecting activity into the water allocation plan in a trans-boundary aquifer in south eastern Australia'.

Prof. McKay used an aquifer in South Australia as an example. The aquifer is on the border between South Australia and Victoria (a trans-boundary aquifer). The example was selected as it incorporates elements of learning for international countries as well.

The aquifer area includes diverse elements. There pine trees and gum trees grown for taxation incentives. The forests conflict with the needs of the farmers in the area, which is one of the major wine growing areas in Australia. Sheep, dairy and wheat are also farmed in the area, and there are also orchards and Lucerne. There are two aquifers, and a situation arose in both Victoria and South Australia, where the increase in the plantation forestry, particularly gum trees, was so rapid that the water table was lowered, which impacted negatively on the farmers.

The farmers united to compete with forestry as a group. Prior to the plantations, the agricultural sectors in the region had organised around commodity groups. The impact of the regional water planning process brought the farmers together who insisted, through the planning process, that forestry be considered a water-affecting activity in the region and therefore required a water licence. To date this is the only region in Australia that has administered this stipulation.

Australia has insisted that state governments insert a sustainability objective into the laws and processes. There have been three innovative adoptions of policy between 1985 and 2007 that apply to groundwater. The aim of Australia's policy is to arrive at a fully-specified system, first for the environment, and then for critical human needs.

Groundwater is the 'Cinderella' of water regulation in Australia, in that it was regulated under state laws which came in only after attention had been paid to surface water. However, there are now several administrative licensing systems. There has been near universal metering since 1980s.

In 1997, South Australia enacted the Water Resources Act 1997, with a view to facilitating the privatisation of water delivery services and setting up rural farmer cooperatives to manage irrigation.

Previously, Natural Resource Management (NRM) boards had been set up to manage water and this was enhanced due to national government funding.

The key feature of the Act with respect to groundwater is that it expressly abolishes common law rights to groundwater. It introduces a series of statutory rights and ensures that the Crown has primary access rights to groundwater and it does not expressly vest any rights to groundwater in the Crown.

The area 20 km either side of the South Australian–Victorian border has been managed under a cooperative agreement since 1985 under legislation called Victoria - South Australia groundwater (Border Agreement Act 1985 Vic 1985 SA 1985).

The Agreement of 1985 between the premiers of South Australia and Victoria had the aim of making provision to protect the groundwater resources adjacent to the border between the State of South Australia and the State of Victoria, to provide for the cooperative management and equitable sharing of those resources and to guard against the undue depletion or degradation thereof.

The Act set up a committee to determine permissible annual volume (PAV). PAV refers to the permissible annual volume of extraction specified for each zone in the Second Schedule, or in relation to a particular zone, such other volume as has been determined by the Committee under clause 28(2).

PAV changed to reflect ecologically sustainable development (ESD). The committee consists of four members; two appointed by each State. In the designated area, a management plan was created under relevant state laws. The management plan for the designated area has the power to proscribe the enlarging of any bores in the area.

After the 2006 National Water Initiative (NWI), the national government praised South Australia and inserted forestry as a water affecting activity into its water allocation strategy for the states.

Forestry policy In South Australia required commercial forestry (planted for paper and pulp and for carbon credits) to account for its water use. Two policies have been proposed, accounting for rainfall interception of forests which reduced recharge, and direct extraction of water from shallow aquifers (less than six meters).

On the 17 February 2004, the Minister for Environment and Conservation announced that the South Australian state government would adopt a management proposal prescribing commercial forestry in the lower South East of the State as a 'water affecting activity', requiring a permit under the repealed Water Resources Act 1994.

This innovation in South Australia has not been matched (as yet) in Victoria, so despite this agreement, there is a major difference between the two states. Implementation of the incorporation of forestry as a water affecting activity has been slow. Leadership in the region has been at a high level, with government and the private sector looking for a long term solution. There has been weak accountability at a national Government level, despite water allocation for forestry being a national objective.

### **Panel discussion**

Panellists:

- Prof. Jennifer McKay (University of South Australia)
- Dr Ilyas Masih (UNESCO-IHE)
- Dr Eddie Riddell (University of KwaZulu-Natal : Centre for Water Resources, CWR)
- Prof. Graham Jewitt (University of KwaZulu-Natal : CWR)

**Mr Jude Cobbing (SLR):** Something you said at the beginning of your talk really surprised me – that there has been near universal metering of groundwater extractions since the 1980s. I'd like to know more about that system. What makes people monitor their groundwater extractions and who do they report that data to? What prevents people from disconnecting the meters and who checks up on them?

**Prof. Jennifer McKay (University of South Australia):** Initially we had the riparian system, but it was largely abolished for surface water around 1820. The states had powers to pass laws and attempted to do away with the riparian system, and most succeeded. The states then implemented an administrative system and built canals. In that context, people had to provide their own pumps, so people did not have to pay for water in Australia, but they did have to pay for the infrastructure. That all pertains to surface water; common law applied to groundwater i.e. if you owned the land, you owned the water, and could pump out as much as you liked. Eventually that law was also abolished, and metering was the logical next step. A water allocation system was created that was based on megalitres and people used meters such as the Dethridge wheel. The Dethridge wheel has now been abolished, as it was found to be up to 30% inaccurate. Chinese meters are now used. The police in every state have the authority to inspect the meters. It is an offence to disconnect your meter, but no doubt it does happen. However, if your paddock is far greener than your neighbours, you could fall under suspicion and be caught out that way. With the canal systems, neighbours police one another, as each has a slot during which they can pump water. There is water theft in Australia, in both the rural and urban environment, and people have been prosecuted for water theft. However, metering is supported by an administrative system, and the cost of the meters is low. The states have administered the system and collected the data. Lately there has been a change to a system of allocating shares of the consumptive pool; people will be told what their allowed allocation is. There had been little coordination between the various state systems and the platforms weren't comparable, so the bureau of meteorology has been tasked with changing and coordinating the state systems.

**Prof. Graham Jewitt (University of KwaZulu-Natal: CWR):** It is useful to understand the background of the legislation of the South African forestry stream-flow reduction activity. The major difference between South Africa and Australia in this regard, is that the South African forestry stream-flow reduction activity licensing process is focused on surface water and exotic commercial plantations. The process also took a long time in South Africa. The issue was first raised in 1935 (the Empire forestry plantings). Only in 1948 was experimentation undertaken on a paired catchment basis to assess the impact of exotic forestry on stream flow compared to that of indigenous forest. The experiments went on for several years. In 1968, a proposal made by the water matters committee to legislate forestry. In 1971 or 1972, it became law that forestry had to have a permit. The permits were restricted according to catchment types, largely based on the work that was done on the paired-catchments experiments. It was quite controversial at the time. Over the next few years, the process by which the forestry impact was quantified was refined through various other experiments to differentiate between the forestry types. In 1998, the new Water Act came into being, and all existing permits were converted. Forestry is now considered a stream-flow reduction activity, and a licence is required. There are a number of tools in place to quantify the impact of forestry, and clear legislation in place to monitor it. A sub-directorate of the DWA deals with the licensing process and the applications for new licences.

**Prof. Jennifer McKay:** The CSIR did the science in the South East and there are impact differences: gums take up water at a faster rate than the pines and the interception is different.

**Dr Ilyas Masih (UNESCO-IHE):** In Pakistan, we mainly have mountainous forest areas. There are different rules and regulations for deforestation and reforestation, but none of them are really linked to water, as it is not yet a big issue in the Pakistani context.

**Dr Eddie Riddell (University of KwaZulu-Natal, CWR):** I have a comment from a catchment-management perspective. The Australian situation is quite different to ours – you don't manage the water resources on a catchment basis or water-shed unit basis, as shown in your example of the natural resource management boards that are divided by state boundaries. To me that is something that needs to be changed in South Africa with urgency. If you have a surface water shed that is delineated quite well, and the management is intrinsic to that water shed unit, you still don't understand the aquifer or ground water boundaries and how that overlays with the surface water shed. That is the first thing we need to address in South Africa, especially when we talk about stream-flow reduction activities.

**Prof. Graham Jewitt:** I have a comment on the groundwater considerations in South Africa. When assessing the impact of forestry, the focus is on low flows. It is understood that the low flows have arrived from groundwater, in some cases, or the shallow groundwater on hill slopes. So the real

impact of commercial forestry is on the recharge to groundwater tables, shallow or deep. What we have seen in several catchments is that the trees root very deeply. They abstract water – not from the aquifers (South African trees die if they are waterlogged) – but from the soil through transpiration. So it is really in the low flows that we see a major impact, particular with the eucalyptus species.

**Dr Ilyas Masih:** I have a comment on groundwater regulation. In Asia, for example, in India and Pakistan, millions of farmers pump groundwater. People might advocate metering, but it would be unfeasible, as the cost of the metering and monitoring would be too high. Before applying regulations, it is important to consider the local context.

**Prof. Jennifer McKay:** Yes, the farms in Australia are on the same scale as in South Africa – they are generally very big.

**Mr Nigel Adams (DWA):** I am responsible for compliance monitoring and enforcement with the DWA. I hear speakers saying that groundwater monitoring is administratively expensive, but groundwater is a scarce water resource. Wouldn't you rather put effort into monitoring in order to reduce unlawful water use, as you can then reallocate the water that is being stolen for other use?

**Dr Ilyas Masih:** I agree, and there is monitoring in place in southern Asia. There are wells that are monitored by the government. There are some areas where the drawdowns are very high, and in water scarce areas there are some policies in place to regulate the use of groundwater through a permits system and limiting abstractions. I agree that it is important and there should be more focus on monitoring. I was talking in the context of the implementation of the permits and monitoring systems when there are too many users, but the monitoring of aquifers is in place.

**Prof. Jennifer McKay:** In Australia, the state Government sinks wells which it protects and monitors. That is all paid for by consolidated revenue, because the farmers pay for water licences and not raw water. So the state has made it a priority to monitor both surface and groundwater systems at their own expense. So there are a number of people who visit the wells, take readings and check drawdowns.

**Ms Ilse Viljoen (DWA, EC):** In South Africa, water services authorities and municipalities are reluctant to make use of groundwater and see it as an elaborate, unreliable and unsustainable system with high maintenance costs. In the Eastern Cape, this is one of our biggest concerns. Does Australia have similar issues? I also have a concern about political influence, where bulk surface-water schemes are being proposed. The management of these schemes will go over to the water boards, which has financial implications.

**Prof. Jennifer McKay:** In Australia, for potable supplies, we used to use groundwater, but we overdrew it. A good example is Perth, where we then put in two desalination plants. No state government in Australia suggests using anything other than treated water. There are some Managed Aquifer Recharge (MAR) proposals in Australia on both a large and small scale, but all would involve a treatment plant. There is generally a reluctance to rely on untreated water. However, a fitness-for-purpose approach is currently under consideration where, for example, lesser quality water could be used for flushing toilets in urban areas.

**Dr Ilyas Masih:** (To Ms Viljoen) The problem is not just political, but also technical and hydrogeological. I think that that is partly why there has been more emphasis on prioritising surface water for domestic use in South Africa.

**Dr Shafick Adams (WRC):** Often it is not to do with the physical resource but the management, operations and maintenance in charge of that resource. Why install desalination plants when the ground can ensure the same supply three to five times more cheaply?

**Mr Nigel Adams:** How do you deal with groundwater in terms of acid mine drainage and liability? In South Africa, there are plans to perform fracking in the Karroo, where there is no surface water, and groundwater is scarce. We will need to develop regulations and compliance monitoring. Do the panellists have any guidelines in this regard?

**Dr Shafick Adams:** As far as fracking is concerned, the answer is that we do not know enough. There are two polarised camps with regard to fracking, but there is insufficient information available. Studies that we have conducted have shown that in certain parts of the Karoo, we do have enough water, but we need to locate those sources, drill in the right places, and understand how to pump and manage those schemes. The Karoo is a stressed system. You say that groundwater is a scarce resource. I disagree and feel that surface water is a scarce resource. We should be increasing groundwater use. The science behind that assertion is sound, but the soft skills are lacking and there are no plans and budgets in place for increased groundwater use.

In terms of acid mine drainage, that is a continuing debate. Groundwater does not respect fences. It is a collective issue that needs to be solved collectively. Some mines have no owners, so who is then responsible? These are issues that we need to deal with.

**Dr Ilyas Masih:** The question of responsibility is a difficult one, and has to be seen from a hydrogeological perspective. If you want to put a mine somewhere, a thorough hydrological study has to be conducted and decisions made as to where waste will be dumped. Site specific solutions should then be suggested. There can't be hard and fast rules. Somewhere an aquifer could be unconfined or confined by a low porosity medium. There is no one-size-fits-all rule.

## **SESSION 16: ECOSYSTEM SERVICES**

**Chair: Dr Stanley Liphadzi (WRC)**

### **Ms Sita Vulto, CarboWet Foundation (The Netherlands) and Mr Ele Jan Saaf (Germany) – Storage of carbon in wetlands, methodology and certification**

Ms Vulto and Mr Saaf presented on the CarboWet foundation. CarboWet is a Dutch non-profit organisation that was started in 2009. The main aim of the work of CarboWet is to develop a methodology to assess storage (sequestration) of greenhouse gases in wetlands.

Ms Vulto said that wetlands are commonly perceived to be useless areas, but once the wetlands are gone, they are gone forever. Recent studies show that wetlands are unique ecosystems that are highly adept at carbon storage. However this also often implies that the degradation of wetlands results in the release of large amounts of methane. Therefore, the restoration and preservation of wetlands serves multiple purposes, including improved biodiversity, conservation and ecological functioning, and the enhancement of the much needed existing benefits.

There is an opportunity for the management of wetland systems to be self-financing through the sale of carbon credits, thereby ensuring long term sustainability. CarboWet is trying to determine a value for the sequestration of carbon, so that we can trade the credits to obtain continued funding for the conservation and rehabilitation of wetlands in the Mediterranean region. This objective falls within the emerging trend of calculating ecosystem values to allow balanced socio-economic decision-making for conservation and development.

Ms Vulto outlined related work that had been done to date, which includes: an investigation into the storage of greenhouse gasses in the Azraq wetland of Jordan; the development of community pages on Facebook and LinkedIn; and contact with various universities and organisations, including Utrecht in Netherlands, the University of Cape Town, Istanbul, Jordan; non-governmental organisations (NGOs); and Friends of the earth - Middle East.

Mr Saaf said that the research portion of their work is the most important part. Many things are 'known' but not proven. Much more needs to be done, including a scientific investigation into the storage of carbon in wetlands; the development of a methodology to determine the amount of carbon stored and a means to link this to carbon credits. It is essential to certify the methodology. When investments have been recouped, the methodology developed by CarboWet will be made available to all interested parties through a licensing system. Mr Saaf welcomed suggestions from the listeners on how to move forward with the research. He believed that wetlands can be really important forms of generating revenue that needs to then flow back to those wetlands for conservation.

Mr Saaf posed some questions to the audience to think about and discuss:

- Do you think this is the right approach?

- Will you support us?
- Do you think that CarboWet is necessary?
- Do you think that CarboWet will make a difference?

Ms Vulto and Mr Saaf strongly believe that an economic allocation of water resources can greatly enhance water use efficiency in water scarce regions.

### **Discussion**

**Mr Kevan Zunckel (South African National Biodiversity Institute, SANBI):** Your research will prove the carbon storage value of wetlands i.e. that it is valuable. In terms of the market's willingness to engage with you, the general mind-set is around carbon sequestration and not storage, so from a training perspective, I think you have a long way to go to get people to understand that there is value in storage and also in preventing degradation. Perhaps you should consider looking at the water services that are provided by wetlands (while still pursuing the carbon option), as they are more obvious and more relevant to society in an immediate sense. My advice is not to focus just on carbon.

**Mr Ele Jan Saaf (CarboWet Foundation):** In terms of the markets, I agree that there is definitely a long way to go, but we are confident that we can at least enter into a dialog with certifiers to see if we can get to market.

**Mr Charles Breen (University of KwaZulu-Natal: SAAES):** It is an intriguing concept. From the Southern African perspective, wetlands tend to be small and scattered across the landscape. So perhaps the study should take scale into account; in some cases the carbon credit might be too small to make a difference.

**Mr Ele Jan Saaf:** That is very true, not only in terms of the size of the wetland, but the vegetation as well. For example, in more tropical regions, reed beds are likely to store the most carbon.

**Mr Charles Breen:** Do you envisage certification at a landscape level i.e. all the wetlands in a particular landscape?

**Mr Ele Jan Saaf:** I guess that that is possible. We are not at the stage where we can determine whether the scale is an issue or not. We hope that the methodology that we develop will be such that we can move from wetland to wetland to perform rough assessments, and then determine whether it is worthwhile to do further research and apply for certification.

### **Mr Kevan Zunckel, SANBI – The feasibility of market-based payment for ecosystem services (PES): agreements in the KwaZulu-Natal and Eastern Cape Drakensberg**

The presentation was given by Mr Zunckel, who is currently contracted to SANBI to assist them with brokering the Payment for Ecosystem Services (PES) agreements in the Drakensberg.

The Drakensberg mountain range represents one of the few areas of South Africa with a positive water balance, i.e. where long-term annual average precipitation exceeds evaporation. As such, it is recognised as one of the country's water factories with the Tugela/Vaal inter-basin transfer scheme being a clear demonstration of this realisation. What is less recognised is the role that the integrity of the catchment's ecological infrastructure plays in the viability and longevity of such development projects, and the fact that investments in the restoration and management of ecological infrastructure can prove to be an efficient contribution to water provision scenarios.

The Maloti Drakensberg Transfrontier project is on-going and aims to link Lesotho and South Africa round the Maloti Drakensberg bioregion. Mr Zunckel was involved in the project from 2002 to 2008. The project also focused on biodiversity conservation and socioeconomic development, and the World Bank decision-makers within the project came to understand that the region is incredibly important from a water generation perspective.

A study was commissioned for the Maloti Drakensberg Transfrontier project that looked at the feasibility of PES within the Drakensberg. The work was completed in 2007 showed that it was financially viable to invest in the restoration and management of ecological infrastructure in the upper

uThukela and Umzimvubu river catchments. The results of the Maloti Drakensberg Transfrontier Project (2007) feasibility study for PES in the Drakensberg are detailed in Table 10.

**Table 10: Feasibility for PES in the Drakensberg**

	Upper Thukela	Upper Umzimvubu
Total benefits, no restoration costs (unit reference values)	0.21	0.19
Total benefits, total cost (unit reference values)	0.31	0.48
Total additional base flow: m <sup>3</sup>	12 869 204	3 936 842
Sediment reduction: tons/year	1 884 379	7 381 437
Sediment reduction: m <sup>3</sup>	1 256 252	4 920 958
Total management costs: Rand/year	R3 795 061	R9 202 899
Total restoration costs over seven years Rand/year	R31 945 410	R260 652 840

The results of the feasibility study showed that applying PES is feasible in both upper Thukela and upper Umzimvubu: the value would be more than the costs, as indicated by the unit reference values of less than one. In the Upper Thukela it was shown that almost 13 million additional cubic meters of water would be generated through increased winter base flows. From a water resources planning perspective, the important figure in the table is the sediment reduction, which is reduced by almost 1.3 million cubic meters per annum for upper Thukela and by almost 5 million cubic meters for Umzimvubu.

On the basis of this work SANBI recognised the link between their efforts to conserve the country's grasslands, and the need for water for growth, and commissioned further studies into seeing how the concept would be implemented within the grassland biome. SANBI put forward a tender for someone to act as a broker for the PES system service agreements within the two areas, and Mr Zunckel won the contract.

Mr Zunckel spoke about the use of 'jargon' and said that the way that the concept of PES is packaged can make a big difference. A recent nature conservancy poll showed that out of 16 terms used to describe the benefits of nature, 'ecosystem services' ranked 13th, and 'natural capital' ranked 15th.. It is important to understand what the audience would respond to. The number one ranked term was 'nature's value'.

Ecosystem services refer to what nature gives us 'for free', and can be categorised into supporting services, provisioning services, regulating services and cultural services (Millennium Ecosystem Assessment). Ecosystem services link to the constituents of wellbeing in the form of freedom of choice and action over security, basic material for a good life, health and good social relations.

Amongst the lessons learned during the PES brokerage in the upper uThukela and Umzimvubu, was that you have to have a buyer/s and you have to have something to sell. In Umzimvubu, a very small percentage of land cover is commercial agriculture; otherwise it is subsistence/communal land tenure with local government being the primary buyer.

Mr Zunckel said that the next area that will be focused on for PES brokerage is the greater Umgeni river catchment. Mr Zunckel showed a photograph that he had taken of the Spring Grove dam that is under construction and is projected to augment supply until 2017. He mentioned the Smithfield dam on the Umkomaas River that will also augment supply. He said that all the solutions in place in the catchment are engineering solutions; ecological infrastructure does not feature.

SANBI had presented their case to EThekwini Municipality, suggesting that they could enhance their efficiencies of the engineering solutions if they considered the value and contribution that ecological infrastructure can make. EThekwini accepted the proposals, and further engagements are taking place. The goal is the establishment of a greater Umgeni catchment partnership. SANBI will be looking actively at where investments can be made in terms of restoring and managing ecological infrastructure.

Mr Zunckel concluded by saying that when natural capital or ecological infrastructure is maintained and well managed, it will deliver strategically valuable goods and services. But when mismanaged and degraded, goods will be lost and dis-services will be delivered with significant costs to society.

### **Discussion**

**Dr Mark Graham (GroundTruth):** I am interested in your Mooi river example (Spring Grove Dam). The Umgeni and Midmar catchments are similar. Are we seeing the massive sedimentation loads and land use in that system that we are expecting in the Spring Grove dam?

**Mr Kevan Zunckel (SANBI):** Yes, the upper Umgeni and upper Mooi are very similar in terms in terms of the spread of those land uses.

**Dr Mark Graham:** Are we finding significant capacity losses in Midmar, for example, that we anticipate are likely to occur in Spring Grove as well?

**Mr Kevan Zunckel:** The figures are not known. We don't know what those sediment loads are, but when one looks at the land cover, I think one can fairly safely predict that there is that risk. Restoration, as well as the integration of sustainable land-use initiatives, such as reinstating buffers between agricultural lands and the water systems, needs to be looked at urgently. When I took the photograph of the Spring Grove dam, we flew over the Mooi River, and we expected to find a particular point in the system where that turbidity was coming from, but it was a general accumulation up the catchment.

**Ms Adri Venter (Eon Consulting):** What methodology did you use to assess the sediment in the catchment?

**Mr Kevan Zunckel:** I commissioned the study, but did not conduct it. It was a complex study, and I don't know the details in terms of what models were used.

**Mr Derek Hazelton (TSE Water Services):** In connection with your proposals for the upper Thukela, many municipalities charge an assurance of supply to people that live in places where you can tap your domestic water supply, even though the potential customer is not using water at all. So people in Gauteng, myself included, pay for the assurance of supply, even when the Sterkfontein dam is not physically delivering water at the moment.

**Mr Kevan Zunckel:** SANBI is involved at a national level in trying to influence the water pricing strategy and the way that funding resources are allocated to natural resource management, so those dynamics are underway at a national level. The water user is paying for Spring Grove dam through tariffs. If we can pay for engineering infrastructure, there is no reason why we can't pay for ecological infrastructure, but we need to get the institutional arrangements right to make that work.

### **Dr Suvarna Chandrappagari, Government of Andhra Pradesh (India) – Drought vulnerability assessment and institution building for effective watershed management in arid and semi-arid regions of Andhra Pradesh, India**

The government of Andhra Pradesh has been implementing watershed projects from 1994 onwards, with the objective of enhancing agricultural and livestock productivity through better water management in arid and semi-arid areas. Integrated watershed management projects were launched from 2009 onwards, with a clear policy of participatory watershed management, with a focus on livelihoods and production system enhancement, along with regular natural resource management activities.

The programmes that were implemented through the rural development department include: the drought prone areas programme of 1973 (watershed approach from 1987); regular projects from 1994-1995; the desert development programme of 1994-95; the integrated wasteland development project (watershed approach from 1989); the Andhra Pradesh rural livelihoods project; and the integrated watershed management programme (IWMP).

An issue of scale exists in terms of planning and managing watershed development in hydrological basins. There is a need for strong institution building in order to address equity and sustainability issues. There is also a need for an integrated approach to the evaluation of watershed development where comprehensive analysis of social aspects (including livelihoods and farm typology) are interpreted in terms of the hydrological realities, and for tools to evaluate how the watershed development programme can be assessed in relation to other policies.

Examples of Australian Centre for International Agricultural Research (ACIAR) programmes that have been commissioned for watershed development in Andhra Pradesh include: the impact of meso-scale watershed development in Andhra Pradesh; the implications for designing and implementing improved watershed development policies and programmes; enhancing institutional performance in watershed management in Andhra Pradesh; the impacts of climate change and watershed development on whole-of-Basin agricultural water security in the Krishna and Murray-Darling Basins; and the development of multi-scale adaptation strategies for farming communities. Third party evaluations tried to assess the impact of the programmes, which were deemed to be positive as well as negative.

The programme covers 552 IWMP projects covering 2.4 million hectares, with a financial outlay of approximately \$550 million. There is some convergence with line agencies and relevant schemes in all of the villages as well as capacity building activities. The programme makes use of remote sensing data; a geographic information system (GIS); natural resource management activities; production systems enhancement and livelihoods for the asset-less as key components; social audit systems; transaction-based software and electronic fund management for transparency and accountability; and NGO involvement as partners in implementation, training and capacity building.

The institution building strategy for watershed development fund management includes the promotion of area-based user groups with land-holding households, links to stakeholder groups, watershed committees as subcommittees of local government, and village organisations as implementing channels for productivity enhancement and livelihood interventions. It also promotes drought adaptation initiatives, such as appropriate land development, water use, and sound agronomic practices and livelihoods plans, along with the proper monitoring of natural resource-management works.

The measures have been found to be very useful in launching and implementing participatory watershed projects in an extremely effective way in arid and semi-arid areas of Andhra Pradesh.

**Prof. Bimo Nkhata, Monash South Africa – A property rights approach to fresh water governance: insights from southern African case studies (Prof. B Nkhata, CM Breen and DG Hay)**

The purpose of the presentation was to provide insights into a property rights approach to freshwater governance and to highlight the central role of property rights in mediating the relationship between freshwater governance and sustainable development.

The presentation drew on the Pongola River floodplain to illustrate the relationship between freshwater governance and sustainable development, and was based on a research project commissioned by the Water Research Commission.

There are many types of freshwater ecosystems, but all deliver multiple services in unique and varying proportions. While some beneficiaries of the services are known, there are still many that go unrecognised. Because every use has implications for the supply of the services, progress towards sustainability requires that relationships amongst users are effectively governed. It is generally acknowledged in South Africa that freshwater ecosystems need to be understood and governed as common pool resources. This acknowledgement has seen a shift from the notion of pure 'ownership' to bundles of 'property rights'.

Property rights embody the claims, entitlements and obligations people hold regarding the use and disposition of scarce resources. Withdrawing water from a stream, fishing from a river, grazing cattle on a floodplain, using a river as a means of transport, enjoying the scenery of a water body, and dumping waste into a river are all expressions of the exercise of property rights to freshwater ecosystem

services. A property right is an enforceable authority that permits an actor to make specific decisions and carry out actions related to a resource. The institutionalisation of property rights results in what is called a regime or a body of fundamental rules and norms. Rights cannot exist without recognition by others in the form of relationships involving the individual rights-holder.

Given the variability of freshwater ecosystem services, property rights can be flexible and fluid, changing by season and year. Property rights change in tandem with societal expectations and the context in which they are applied. Property rights exist as bundles of distinct rights including the rights of access, withdrawal, management, exclusion and alienation. Property rights regimes can be one of the four types: private, public, common or open-access. Defining property rights in terms of their dynamics and multiplicity allows for a better understanding of allocations systems for ecosystem services.

Property rights are a key driver of ecosystem changes and a major determinant of human reactions to those changes. They influence the choices available to users of ecosystem services and the extent to which the impacts of use on third parties have to be taken into account. They govern who can do what, when and how with freshwater ecosystems. Property rights can be viewed as an important governance mechanism for addressing problems of sustainability of freshwater ecosystems as common pool resources. Property rights influence the nature of governance: vertical vs. horizontal governance (or unstructured). Vertical governance relates to governance characterised by power differentials, whereas horizontal governance concerns governance among individuals and groups at the same level.

The study identified seven important principles for the establishment of effective property rights regimes for the governance of common pool freshwater ecosystems. These relate to boundaries, rules for benefits and cost-sharing, collective-choice arrangements, monitoring, sanctions, conflict resolution and self-organisation. The principles were initially developed by Ostrom as design principles for common-pool resource institutions. The principles are based on extensive field work and extensive reviews of case-study literature. The study used the principles as part of the analytic framework to analyse the case study of the Pongola floodplain.

### **The case of the Pongola floodplain**

The major thrust of the case study is that the nature and context of property rights are important in determining the outcomes of governance and sustainability. The case study illustrates that there are many combinations of rights over the control of the flow of freshwater ecosystem services such as flood releases. By examining the institutions and actors that have governed the Pongola floodplain, we are able to illustrate the importance of explicitly defining and categorising a range of rights. The case study helps in understanding the main concepts, definitions and principles related to property rights.

The Pongola River is a catchment of 7000 km<sup>2</sup> at the eastern extent of South Africa. The river descends steeply from its source at 2200 metres above mean sea level and passes through a narrow gorge between the Lebombo and Ubombo mountains, where the Pongolapoort dam is now situated. Below the dam the river meanders across a gently sloping floodplain with numerous pans which are dependent upon periodic flooding by the river. For thousands of years, the Thonga people, who have made the floodplain their home, have had rights to benefit from the flooding regime.

### **Pre-impoundment era: Findings**

The pre-impoundment era dates from the pre-colonial period (1650's) to impoundment period (1963), when construction of the dam started. The primary purpose of the dam was to provide an assured supply of water for a single use (irrigation to approximately 40,000 ha of land adjacent to the floodplain) through a floods control mechanism. Prior to the building of the Dam, the natural flooding regime governed many of the characteristics of the floodplain, as well as the property rights regime. Local communities were highly dependent on the flooding and subsistence agriculture remained an important use of the floodplain. The right to exploit the flood benefits was controlled on behalf of the traditional authorities by the local *izinduna* (headman). The Pongola region formed part of the former KwaZulu-Natal homeland and the land surrounding the floodplain area was governed through communal tenure.

### **Pre-impoundment era: Analysis**

Prior to the impoundment era, the floodplain had clearly defined boundaries under traditional authorities, and the individuals or households who had rights to the flood benefits were clearly identifiable through the same local authorities. The local users groups who were affected by communal tenure rules were included in the decision processes of the traditional authorities (collective-level rights). The users of ecosystem services were also involved in monitoring the biophysical conditions of the floodplain as well as user behaviour and were accountable to themselves as users (operational-level). Appropriate sanctions were effected by traditional authorities, who ensured access to local low-cost conflict resolution mechanisms. The communal tenure system recognised the rights of users to devise their own rules to secure tenure.

The study concluded that the pre-impoundment era was strongly associated with strong horizontal governance and sustainable outcomes that were underpinned by a common property rights regime.

### **Post-impoundment phase 1 era: Findings**

The post-impoundment phase 1 era dates from 1973, when the construction was completed, to around 1986 when the first local management committees were established. During this era, the DWA (formerly the Department of Water Affairs and Forestry) operated the dam without any consultation of stakeholders. Governance was based on an unstructured process of flood releases whose timing proved to be fairly sporadic and entirely unpredictable. With this lack of certainty about flood releases, conflicts developed between agriculturists, grazers and fishermen who no longer knew how to protect their access to respective resources.

### **Post-impoundment phase 1 era: Analysis**

The introduction of government control saw the breakdown of traditional boundaries and the de facto system of rights to flood benefits transformed into a de jure system. The relationship between the benefits and costs associated with the flood releases become entirely distorted; the amount of benefits allocated were largely disproportional to the inputs/risks (among agriculturists, grazers and fishermen; on-floodplains vs. off-floodplains users). The local users groups who were affected by flood release rules were no longer included in the decision processes, which were largely dominated by government. The local users of ecosystem services were never involved in monitoring the biophysical conditions of the floodplain and user behaviour.

The study concluded that the post-impoundment phase 1 era was strongly associated with weak unstructured governance and unsustainable outcomes that were underpinned by a public property rights regime, which was in essence a de facto open-access property rights regime.

### **Post-impoundment phase 2 era: Findings**

With growing discontent amongst the local community, a small number of articulate persons of some standing tried to mobilise popular support in order to establish some local bodies that would take a more proactive approach in improving matters. This begun the establishment of a number of water committees on the floodplain with representation from a range of water users such as stock owners, women and traditional healers. These committees were supported by local development initiatives and NGOs who championed the process; and in some cases money was raised from overseas aid organisations to support the committees. However, these committees were active only from 1986 to 1996. The late 1990's saw the emergence of a power group of cotton farmers on the floodplain, resulting in unproductive power struggles within the community and the water committees. At the same time, funding to the NGOs dried up as international donors channelled their funding to the new government.

### **Post-impoundment phase 2 era: Analysis**

The introduction of water committees began the process of reconstructing some form of boundaries, but the individuals or households who had rights to flood benefits were not clearly identifiable. The relationship between the benefits and costs associated with access to flood releases continued to be

distorted; the amount of benefits allocated were still largely disproportional, with certain groupings getting unfair shares. The local water committees did not ensure that the local users groups who were affected by flood release rules were included in the decision processes, still largely dominated by government. While local monitoring had improved to some extent, the monitoring of biophysical conditions of the floodplain as well as user behaviour continued to be largely government driven.

The study concluded that the post-impoundment phase 2 era was strongly associated with weak vertical governance and unsustainable outcomes that were still underpinned by a public property rights regime.

### **Current situation: Towards horizontal governance**

Currently, the property rights arrangements for the coordination of flood releases from the Pongola Dam are centred around a Water Users' Association (WUA) called the Imfunda Yopongola WUA. The WUA was established through the National Water Act of 1998 with the intention of decentralizing powers and responsibility for stakeholder coordination pertaining to the Pongola Dam. There is a strong expectation of democratic representation through the WUA, and the intention is to have various stakeholder groups democratically nominate their representatives.

But there remain serious challenges to realising the full potential of the WUA. The most immediate challenge relates to the need to harmonise the expectations of the WUA and the Department of Water Affairs (DWA) concerning the new formalised status of the WUA and its responsibility to raise fees from its constituents.

The study attempts to make a case for a property rights approach to freshwater governance. The presentation illustrates the central role of property rights in mediating the relationship between freshwater governance and sustainable development. Making property rights more explicit can help direct freshwater governance towards enhanced sustainability.

Property rights, as an instrument of governance, regulate and facilitate access to and use of freshwater ecosystems. Clearly defined and secure property rights are a vital means of building up society for the common good, and by which people can cooperate to achieve that common good. Clearly defined property rights provide the means for social coordination and ordered rule in the delivery of freshwater ecosystem services. Secure property rights provide incentives to invest in the sustainability of the freshwater ecosystem.

### **Discussion**

**Mr Andrew Muir (DHI):** (To Prof. Nkhata) I am interested in your model of incorporating rights under the water user association. Did you consider arguing that those rights should have been incorporated under the reserve, and that the reserve in providing for basic householders water needs could have been a mechanism to secure the rights of the floodplain dwellers to receive water as required for their lifestyles? It is a different slant, and the reserve potentially creates much stronger rights than the property rights under the water user association, which are subject to allocations and licensing requirements.

**Prof. Bimo Nkhata (Monash South Africa):** That is a very good point. From the outset, one of the rationales for the development of this proposal was that we were able to identify that if you look at the current legislation in South Africa, it does not adequately capture the essence of the concept of ecosystem services. There are multiple ecosystem services that may not be captured through the current mechanisms that we have, such as licensing and authorisation, so we thought that if we combined the concepts of ecosystem services and property rights, we could capture what is usually missed. But I really support your idea, and hope that we can incorporate as we refine our research.

**Dr Junaid Memon (Pakistan Institute of Development Economics):** Most of us are talking about the right to access to water. When you have clear concepts and a conceptual framework, such as internal property rights, then only talking about access is problematic. For example, one may be entitled to access water from a dam, but if the dam is very far, it is not accessible. Access and water withdrawal are conceptually two different things. Over the last two days, much has been said about access, but not much about withdrawal. So in that context, I really appreciate your presentation.

You said that there are four types of property regimes (private, public, common or open-access). Conceptually I think that there are only three - common property is basically a special case of private property, but of a group and not an individual.

Your design principles are not design principles for property rights, but for collective action; they relate only to common property.

**Prof. Bimo Nkhata:** Thank you for your comments. There are different conceptualisations around property rights, common pool resources, and the relationship between common pool and public. We developed these principles for the establishment of effective property rights regimes for the governance of common pool resources. According to our studies, we can distinguish between common property and common pool. For us, common property refers to the institutions that support the governance of common pool resources.

**Ms Ndileka Mohapi (DWA):** I feel that there are some misconceptions in your understanding of a governance-related issue – that of water use authorisation or licensing. When we allocate licenses or carry out authorisations, it is based on a predetermined reserve. That reserve takes into consideration the allocation required for basic human needs as well as ecological needs. What could be causing confusion is that we are in a situation whereby we are ‘fixing an aeroplane that is already in the air’. Initially we did not have a reserve in our river systems, and we are now attempting to address that. When we conduct authorisations, we take that into consideration as well as the fact that our resources are already stressed. It will take time for us to reach a point where we do have the ecological reserve as well as the basic human needs reserve in our river systems.

**Prof. Bimo Nkhata:** Most of you agree that one of the challenges faced by South Africa is to operationalise the concept of a reserve. We hope that through these studies we can make a useful contribution towards addressing that challenge. We have come a long way now; there are very few instances if any, where we have seen the reserve concept operationalised to take into account the various services that are provided by particular ecosystems.

**Prof. Charles Breen (University of KwaZulu-Natal: SAAES):** (To Mr Muir) What we have to understand is that the ecological reserve is designed to deliver the ecosystem services - what we are talking about is the regulation of the use of the ecosystem services. Just because you deliver the environmental reserve to sustain the ecosystem services does not mean that they will necessarily be sustained, as the use of them may be unsustainable. So the property rights regime has much to do with managing the use of the services that are delivered by the environmental reserve.

**Dr Barbara Tapela (UWC: PLAAS):** In the presentation, the issue of power could have come out more clearly in terms of how power relates to the property rights issue within that context (Pongola). Looking at issues of upstream and downstream users, and looking at commercial users and subsistence users of the floodplain pans, there are very clear power dynamics. As Prof. Breen said, an additional category of property rights could be contested property.

**Prof. Bimo Nkhata:** I agree, but our intention was not to come up with a framework that will embody all parameters that determine the evolution of property rights. I agree that power might be quite critical, but it was beyond the scope of this study.

## **CLOSING PLENARY**

**Chair: Mr Design Naidoo, WRC**

### **The next biennial International Conference on Fresh Water Governance for Sustainable Development: Australia 2014 – Prof. Jennifer McKay, University of South Australia**

Prof. McKay made the offer to host the next biennial conference on fresh water governance for sustainable development to the community at the inaugural conference, as well as the broader community of water policy, law and sustainable development researchers.

The next conference will take place in Adelaide, South Australia, with inputs from all the organisations represented at this current conference, with the addition of the Australian Water Association, the

Australian Government, the Government of South Australia and other colleagues from Australia. The conference will focus on the human rights aspects of fresh water governance and sustainable development, and people will be commissioned to run sessions and papers will be invited. The themes in addition to those at the current conference will be:

- Human rights aspect of fresh water governance and sustainable development in the urban and rural sectors
- Conflict resolution measures that have evolved in the various jurisdictions and lessons learnt from more sophisticated jurisdictions to be transplanted into other jurisdictions, if possible.
- The approach of regional water management plans (however so described), the way they operate and whether they are the way to go.
- The role of markets and how markets need to fit into a regulatory environment to preserve the human rights and sustainable development aspects.

The conference will be a joint effort between the WRC and the University of South Australia, and will build on the developments and outputs of this conference. Everyone will be welcomed to Adelaide in November 2014.

### **Inter-university water law debating exchange II: Presentation of prizes – Ms S Nienaber, Department of Science and Technology**

The inter-university water law debating exchange was run by the Young Water Professionals during the conference. The purpose of the two debates was three-fold:

- To try and address some of the unresolved and highly contentious issues in the South African water legislation
- To generate awareness about the importance of having good water lawyers in South Africa and encourage young lawyers to consider going into environmental law, specifically water law.
- To equip students and young water professionals with the skills to eloquently deal with contentious water issues in this country.

The first debate was a prepared debate where the team prepared a position paper and engaged each other, looking at whether the Water Tribunal was achieving the aims and objectives of the NWA. Participants were given the opportunity to engage on a number of legal issues and the kind of challenges that face water lawyers in South Africa, and develop debating and public speaking skills. The second was an unprepared debate where the teams were given the topic, trading water use entitlements, an hour before they had to speak.

Debating skills had improved substantially over the two days of the conference and it was anticipated that the talented group of debaters would go from strength to strength.

Prizes were presented to the best speakers from the first and the second debates:

- Mr Wayne Ncube (LLM International Law, Lawyers for Human Rights)
- Ms Jacqueline van Wyk (LLM Environmental Law, University of the Witwatersrand).

### **Keynote address: The African Water Calendar – Prof. Mathole Motshekga, ANC Chief Whip and Chair of the Kara Heritage Institute**

The earliest calendars in the world were found on the African continent. This was not surprising because Africa was the 'Cradle of Humanity'. The African calendars were based on star or celestial maps containing solar arks known as zodiacs. The celestial maps show that the universe is a living organism consisting of parts that are inter-connected, inter-related and inter-dependent. The earth and humanity are parts of this living organism.

In African thought a calendar was not an arbitrary organisation of the days of the year but a record of the spiritual and physical order and administration of the affairs of the universe. Therefore in order to understand the origins and application of the African Water Calendar, one requires a sound knowledge of the spiritual and material structure of the universe.

## The spiritual roots of the African Water Calendar

In African spiritual cosmology the primal being called 'The One' (the ptah) manifested itself as the Ennead or the Trinity of Trinities ( $3 \times 3 = 9$ ) made up the decade ( $1 + 9 = 10$ ). Principles which manifested themselves as the creative energy (Amani) of the gods in the form of a universal virgin mother known as the Great Pool (Dzivaguru) or House of Light (Hathara).

Thus water symbolised by the universal virgin mother became the primal substance of being. This contained the sacred fire (or light) as the creative agent that transformed the primal waters or chaos into the souls and physical bodies of all things that came into being.

The arcane (arkana) principle born of the Great Pool manifested itself as the triune principle of the unity that underlies all existence.

These principles were Leo (Mwanamu Tapa), Virgo (Musasi/Masase), Libra (Mutapa) who are reputedly known as Osiris, Isis and Horus. These three gods are represented by the three stars of the Orion (Urhana) Belt known as Luonde or Makolobeng (i.e. Mountains of the Three Wild Pigs). This spiritual trinity was symbolised by the central star (Saba) or Spiritual Sun (Kara), known in popular language as the Bull of Heaven, which projected itself into the four quarters of heaven, which represents the four elements of water (*manu*), fire (*aakhut*), earth (*rastau*) and air (*amenti*). The Bull itself represented the ether (made up of the mind, soul and light body) from which the four elements emanated).

The Bull of Heaven was surrounded by Seven Cows of Heaven represented by the seven Pleiades or circumpolar stars orbiting the central star (*saba*) or spiritual sun (*kara*). The Bull and Seven Cows of Heaven or The Spiritual Sun and seven Pleiades or circumpolar stars made up four pairs of female and male principles constituting the chaos or waters of origins from which the diverse parts of the universe(s) including the earth and humanity originated.

The three stars of Orion's (*urhana*) Belt represented three primal hills which came out of the chaos or watery abyss. This means that water and fire were the primary substances of being. In summary:

- The Godhead manifested itself as the chaos or watery abyss conceived as the Mother of All.
- The Sacred Fire (Kara or Charaoh) or Divine Light was the offspring of the Waters of Origins.
- The Sound or Voice (Ham or Cham) of Light as the Word of God (Hamptah or Champtah).

The Spiritual Sun (Charaoh) or Word of God (Hamptah or Champtah) unfolded itself into the four quarters of the universe which, in turn, unfolded themselves into the Twelve Houses of the Solar Ark called the Zodiac. The Bull of Heaven or Spiritual Sun (Kara) was linked to the Zodiac by the Seven Cows of Heaven represented by the seven Pleiades or circumpolar (Menrah or Khelemela) stars.

The Zodiac, in turn, was linked to the earth and humanity by the seven outer planets (the Kabiri). The seven Pleiades or circumpolar stars and the seven outer planets (the Kabiri) made up the Ladder of Creation consisting of fourteen rungs or steps which leads to the Bull of Heaven or Spiritual Sun that is called God. This confirms that the different parts of universe, including the earth and humanity are interconnected, inter-dependent and integrated parts of one whole or living organism.

The appreciation of water as the source of life and the inculcation deepening and entrenching of the culture of water and environmental conservation and protection cannot happen outside space and time. The African Water Calendar was therefore indispensable to water and environmental conservation and preservation in Africa.

## Time and space

The greatest contribution of the African Renaissance to humanity will be the restoration of spirituality to mitigate the crass materialism that threatens to devour humanity. The African Cultural Renaissance Campaign of the African Union (AU) should first and foremost reawaken humanity to the fact that human development has both spiritual and material aspects and that therefore the individual should live in both the spiritual and material world at the same time. The individual must achieve harmony between his spiritual and physical aspects and harmony between himself, herself, nature and God. This requires human regeneration as a prerequisite for the Regeneration of Africa.

The twelve houses of the Zodiac form the boundary between the spiritual and the material world. The building blocks of the spiritual world are mind, soul and body (of light), while the building blocks of the material world are the four elements of water, fire, earth and air. Thus all reality or existence was made up of five elements of ether, water, fire, earth and air. Since the ether is a triune element it means there are seven building blocks of all reality consisting of mind, soul, body, water, fire, earth and air. This means that all reality including the earth and humanity are made of the same substance and have, therefore, the same intrinsic value called Ubuntu. There is therefore no spiritual or scientific basis for human, gender and other forms of inequalities.

In the spiritual world the Spiritual Sun (Kara) and the seven Pleiades or circumpolar (Khelemela) stars are used to measure time. In the material world the Zodiac and the Ladder of Creation are used to measure time. For these purposes the Zodiac was structured as follows.

### **Structure of the Zodiac**

Each of the 12 houses of the Zodiac was divided into three groups of ten stars called the decans. There are therefore 30 (3 x 10) stars in each of the 12 houses of the Zodiac. These are therefore 360 (12 x 30) stars and 36 decans in all 12 houses of the Zodiac. The Zodiac was used to measure the cosmic, solar and lunar years.

### **The cosmic year**

The sun takes 72 years to traverse one of the 30 stars in each of the 12 houses of the Zodiac, thus the sun (Ra) takes 2 160 (30 x 72) years to traverse one of the 12 houses of the Zodiac and 25,920 (2 160 x 12) to traverse all 12 houses of the Zodiac. This period of 25,920 years was called the cosmic or great year.

### **The solar and lunar years**

The moon (*ma/maia*) and the sun (*Ra*) take three weeks of 10 days each to traverse the three groups of 10 stars. Thus the moon (*ma/maia*) and the sun (*Ra*) takes a month of 30 (3 x 10) days to traverse each of the 12 houses of the Zodiac. Thus it takes the two luminaries 360 (12 x 30) days to traverse all twelve houses of the Zodiac. At the completion of their cycles these two luminaries unite and become an androgyne being which reproduces the five elements of ether, water, fire, earth and air on each successive day, bringing the total number of the lunar and solar years to 365 (360 + 5) days.

The union (Mara or Maria) of the moon (Ma Or Maia) and the sun (Ra) was known as the Sky Goddess (Koremukuru, i.e. one among the clouds). This Sky Goddess was the Rain Maker who was (and still is) worshipped throughout Africa. In southern Africa the shrine of this goddess were found in Meroe in the Sudan (heartland of Ancient Ethiopia), great Zimbabwe and Matomboni in Matebeleland (formerly Guruhusekwa) in south-west Zimbabwe, Maphungubwe, Lwandali (Kheedeulu) and Maulwe in Bolovedu (the Land of Offerings) of Mudjadjji, the Rain Queen of Africa. This means that South Africa and Africa are the only remaining places on the globe which still worship the Rain or Water Goddess.

### **Water and the lunar year**

It was shown above that the God of Light (Kara), the earth and humanity are linked together by fourteen rungs or Steps of the Ladder of Creation. The earth and humanity draw their energy from the God of Light through the moon and the fourteen light or spiritual beings which govern the fourteen rungs or Steps of the Ladder of Creation. To put it otherwise, these spiritual or light beings are messengers of the God of Light (Ramasedi) who carry the energy of this Most High (Modimo) God to the earth and humanity on each of the 14 days of the Waxing moon.

On the 15th day of the lunar month the moon is full and the gate between heaven and earth is open. On this day the Most High (Modimo or Mwari We Denga) issues a creative Word known as Mbekara or Mbire, popularly known as Thau Thau – Harama (Greek Thoth – Hermes). This Mind or Word of God was symbolised by the baboon (Soko) and was therefore known as Soko Mbekara or Soko Mbire.

From the 16th to the 30th of the lunar month, the 15 lunar gods return to the God of Light to draw fresh energy. Thus a lunar month has 30 (15 + 15) days and a lunar year of 360 days. The union (Mara or Maria) of the moon (Ma or Maia) and the sun (Ra) at the completion of their cycles reproduce the five elements of spirit ether, water, fire, earth and air, on every successive day, bringing the lunar year to 365 (360 + 5) days.

### **Water and the solar year**

At the end of April the three stars of the Orion (Urhana) Belt disappears for three months and reappears towards the end of June. These stars are also Celestial Wild Pigs (Nedemba or Makolobeng). The reappearance of these stars announces the rising of the Celestial River, in the region of the Milky Way; and the Nile River, its earthly counterpart. The source of the Nile is located at the Mountains of the Moon (Tamera or Kumara) in Punt or Afura (Hebrew Ophir), root of the name Afuraka (Greek Africa). Punt (or Afura) is the Cradle of Humanity particularly the Khemites or Hamites including the Zendj (or Bantu), Ancient Ethiopians and Egyptians. This means that founders of the Ancient Ethiopian and Egyptian civilisations were indigenous African peoples.

The Ancient Egyptians located the rise of the Nile to the Ethiopian Highlands and the First Cataract or the Tropic of Cancer. More specifically, they located this to a cave in Bigo where they painted a vulture and two serpents attending to the Water Goddess Aquarius (Kanuba) pouring out water from a jug on the floor, like one pouring libation to the gods. This Water Goddess was surrounded by seven Pleiades or circumpolar (Khelemela) stars, announcing that the ploughing time had arrived.

To inculcate, deepen and entrench the culture of water and environmental conservation and protection ancient Africans (or Khemites), developed certain solar and lunar festivals.

### **The solar festivals**

The earth and humanity draw their energy from the Bull of Heaven and 14 Light or Spiritual Beings through the Agency of the Moon. From its dawn the moon travels and traverses the 14 rungs or Steps of the Ladder of Creation which are governed by these spiritual or light beings. To put it otherwise these beings are messengers of the Bull of Heaven or God of Light which carries the energy of the Most High (Modimo) to the earth and humanity on each of the 14 days of the waxing moon.

On the 15th day of the lunar month the moon is full and the gate between heaven and earth is open. On this day the Most High (Mwari We Denga) issues her creative word, ThauThau-Harama (Greek: Thoth-Hermes) also known as Mbekara or Mbire. This mind or word of the Sun (Ra) or spiritual Sun (Kara) was on the Tropic of Capricorn (Anuba) the Sun (Ra) spends 5/6 days performing a round solar dance (Khekhapa). These days also represent the birthdays of the gods who correspond to the five elements of ether (Mundu\Kabachat). The birthdays of these gods were celebrated as First Fruits celebrations. Thus the water, feasts of Lights and First Fruits are interconnected and interrelated.

From the Tropic of Capricorn the sun (Ra) travels for three months before reaching the equator (Aptu/Atpu) again on the 21 – 22 March. This period was called the Autumn Equinox. The period means the death of the sun in the southern hemisphere and its rebirth in the northern hemisphere on March 23. The death of the Sun (Ra) on March 21 – 22 marks the beginning of the harvest (Faro) period in the southern hemisphere which is celebrated as Easter holiday.

The Sun (Ra) travels for three months to reach the Tropic of Cancer and complete a solar cycle of 365 days. This period represents the solar year. Thus the solar cycle and solar festivals were used to honour the celestial gods particularly the water goddesses such as Virgo (Isis), Aquarius (Kanuba), Saba, Kore etc.

### **The lunar festivals**

The lunar year was divided into three seasons of four months each. These seasons known as the ploughing, harvest and initiation seasons are dealt with below.

*The ploughing period (September to December).*

The first season of the lunar year starts with the appearance of the seven Pleiades or circumpolar (khelemela) stars in September. The ploughing period was named after the seven Pleiades or circumpolar (Khelemela) stars. Thus this period was called *khelemo, selemo, Isilemo, shirimo, chirimo, kilimia*, etc.

The celebration of the African new year in September creates a platform for creating awareness about the African heritage and indigenous knowledge systems (IKS) – including archaeo-astronomy, spiritual, cultural and agricultural festivals and particularly the African Water Calendar.

Throughout October month indigenous African people held rain-making ceremonies to thank god and gods, including royal ancestors, for the rain and fertility of the soil. During October ploughing also takes place.

In November the seeds sown in September and October germinate and grow. Thus in November nature is reborn, the environment must be protected, the cutting of trees and killing of female animals is prohibited. Thus November was and should remain an environmental conservation and protection month.

The new moon in December enjoins communities to begin preparations for First Fruits celebrations, which started during the full moon in December. These celebrations reach their peak during the Summer Solstice (21 – 25/6) when the Sun (Ra) remains stationary on the Tropic of Capricorn and performs a solar dance. December 25, in particular, was regarded as the birthday of Lion Gods (e.g. Osiris or Mwanamutapa), Horus or Mutapa and Ra Harakhte or Xpakhte (Greek Xpictoc) pronounced Christos. The ploughin time was also called Akhte (Greek Eichton, popularly known as Aton or Aten). This god is symbolised by the Piscean symbol IHIS.

*The harvest period (January to April)*

The second season of the lunar year starts in January and ends in April. The lion gods (Bondoro/Bontoro), born on 25 December, remains in seclusion for 12 days before its public appearance described by the birth of the Light Child (Hahu or lhy), child of the virgin mother (Kore). This festival was celebrated on 6 January. It started with a Night Virgil on 5 January. The celebration involved trumpet music and dance.

**The water calendar and human development**

In many conferences on water, environment and sustainable development, the indigenous African cultural heritage and knowledge systems are left out of account. The scientific or materialist concepts used in these conferences and resulting literature do not make sense to indigenous people because they do not speak to both the spiritual and material aspects of water and the environment.

Instead these materialist approaches are seen as producing development projects which damage the ecosystems, sacred springs and forests. These eurocentric approaches have also rooted out African spirituality and the worship of the Water Goddess who was (and still is) central to water and environmental conservation and protection.

The continued celebration of water festivals by Balobedu of Mudjadji the Rain Queen and Other communities in southern Africa and the rediscovery of the Maphungubwe heritage site which was the first rain making shrine in southern Africa, provides a framework for the revival of the African Water Calendar and its use as a tool to raise the awareness of indigenous African communities whose culture of water and environmental conservation and protection is fast diminishing because of the dominant materialist world-view that undermines the African spiritual traditions.

The launch of the Maphungubwe Heritage Route that links the water heritage shrines of Balobedu of Mudjadji, Lake Fundudzi, Maphungubwe, Mamagwa in Botswana, Matomboni in Zimbabwe etc. provides an integrated rain belt and chain of festivals which could be institutionalised and supported by government to advance water and environmental conservation and protection. This is the only tool that can get traditional communities to buy into new policies and programmes.

The current arbitrary dedication of months as transport, environment etc. months is not consistent with natural cycles. In view of the fact that food insecurity, climate change, decline of agriculture are the greatest threat to human survival, it is proposed that the African Water Calendar and Maphungubwe Heritage Route and particularly, the related solar and lunar festivals should be adopted and institutionalised to address the aforementioned challenges.

This should be coupled with the farming co-operative movement that President Jacob Zuma repeatedly called for. The slogan 'let's return to the fields' (*asibuyeleni a masimune*) must be translated into a national imperative and developmental goal. The achievement of this remains the only route to enable Africans to feed, dress and heal themselves.

### **General conclusions**

Since the Water Goddess, Mohale, Mwalinkulunkulu or Mwari We Denga was (and still is) worshipped in southern Africa and Africa, and African religion has also been recognised as one of the major world religions, there is a conducive climate for the revival of the African Water Calendar as a tool for the African Cultural Renaissance and in particular, the Maphungubwe Heritage which is consubstantial with that of Meroe and Napata in the Sudan (heartland of Ancient Ethiopia), Great Zimbabwe, Yemen (Ya-Amun).

### **Discussion**

**Unknown person:** A potential avenue for people to appreciate this message is the concept of human values that must be brought to communities and inculcated into their culture. This is valuable information for delegates to take back to their respective countries and should not be lost.

**Unknown person:** I am a water professional and work with rural people at grassroots level. I have found that in order for water systems to be governed at the grassroots level there is a spiritual dimension in which people live and professionals need to engage with this dimension in order to make progress. You portray the spiritual realm in a neutral way, yet reality is that there are two dimensions: dark and light, good and evil. There are confounding issues concerning legal pluralism, customary law and Roman Dutch law which refer to 'witchcraft'. This is a dilemma in terms of human rights and the constitution of this country, and the other rights enshrined in customary law concerning the spiritual dimensions.

**Prof. Mathole Motshekga (ANC Chief Whip and Chair of the Kara Heritage Institute):** I agree that the restoration of human values should be a foundation of anything that we do because we have reached a level where we think that the only life is the one we live in the physical form and the only needs of humans are material. We forget about spiritual needs. The consequence is that human values are not better than those of animals and humans have nothing to fear. When we remember that before we exist in physical form, we existed in spiritual form, and the spiritual form will survive the physical form. When people understand this they will realise that killing and harming others creates more problems for themselves. The spirits of those that are harmed live on to haunt them. A new understanding is needed of what a human being is, and this will lead to respect for one another.

There is light and darkness and they are two sides of the same. There is good and evil, which need each other. The spirit or the light in us is good – it comes from the good in the heavens. This spirit is embodied in a physical body that needs water, food and clothes. Unless we are properly educated and initiated, we focus only on the needs of the physical body and neglect the spirit, creating tension between the two. Our spiritual and our material needs need to be harmonised. There is nothing that we need that others do not need. Therefore do not become greedy as this will create an imbalance.

Pluralism creates problems. English common law and Roman Dutch law are customs of the English and the Dutch. Colonisation led to the imposition of the customs of Europe on Africans and created a difficult situation for African people. That which dictated these customs in Europe did not necessarily exist in Africa. African people are stripped of their humanity and how they respond to the environment and make them follow other people's customs as if they were ordained by god. Africans should be allowed to make their common law into customary law. President Zuma correctly said that we must Africanise or indigenise the law. Above all, in South Africa we say that this country belongs to all who

live in it, which means that diversity must be respected and the law must take into account the traditions and customs of all people.

Witchcraft is the abuse of knowledge and is based on IKS. It can be used for good or, if abused, it can be used for evil. Some serve the forces of darkness and use their knowledge to hurt others. In Africa, we have always respected traditional healers and law recognises traditional health practitioners. Traditional healers deal with witches. Traditional healers are not witch doctors, but are health practitioners that protect us against witches, in the same manner as bishops and priests do.

Some who want to make a profit from traditional medicines say that traditional health practices are inspired by the devil. Medicine comes from nature, and traditional health practitioners understand nature and the medicinal properties in nature. Scientists and researchers are not able to invent any medicine because they do not know the medicinal value of nature. Traditional healers are not learned, yet their ancestral spirits guide them to find herbs that are used as medicine. Researchers test the herb in a laboratory, confirm what the traditional healer already knows, and then claim to have discovered a new medicine. This 'verification' is recorded, patented and the originator receives five per cent royalty. We need to protect indigenous knowledge systems so that they can benefit our people.

Delegates from different parts of the world received a Kara Heritage Institute document pack from Prof. Motshekga.

### **Conference main messages: Where to from here? – Mr Hastings Chikoko, Regional Representative of IUCN in South Africa**

The conference succeeded in bringing together brains from the continent and beyond to address the triple bottom line of sustainability, resulting in rich discussions. Key messages captured by the rapporteurs of each session and highlights from the conference were presented.

### **Consensus that water governance is about people**

Although WRM is a traditionally technical field, it involves people and should be driven into development debate and plans. Prof. Mazrui was clear that, "Water is indispensable for survival, but it is sometimes destructive in tropical storms and tsunamis". As Dr Mapedza said, "irrigation is not about pipes, canals and dams, it is about people. It is only about pipes, canals and dams in as far as the pipes, canals and dams address the needs of the people".

### **Remembering Mrs Mkwanazi**

Adv. de Lange, in delivering the Minister of Water Affairs' speech, introduced the character of Mrs Mkwanazi to emphasise that water resources are a critical enabler or a constraint for most economic activities and social needs. Water governance is about development and people and therefore about equity. 'While serving the needs of big business, the mines, the farmers, our systems must ensure that Mrs Mkwanazi is able to access water for productive and domestic purposes and that she has access to sustainable sanitation services, to road and transport services to get her produce to market, and that she can make a living that enables her to feed and educate her family to live with dignity.'

### **Main messages: Legislation, regulation, rights and accountability (Sessions 2,5,9 and special sessions)**

- Good laws are meaningless if they are not implemented. It is necessary to redefine a new path for implementing the laws where they exist, move from analysis paralysis and set clear priorities for action at all levels, and accelerate implementation by focusing on improving access to information and justice processes, and establishing effective dispute resolution mechanisms. Dedicated and long-term leadership is critical for implementation of legislation to avoid loss of memory and skills.
- Strong and self-sufficient institutions for vertical and horizontal governance and accountability, which have a clear legal mandate and the ability to connect levels of governance and which exist both within the state and civil society.
- All actors must play their part in capacity development to ensure water integrity and accountability (busting corruption), targeting both public officials and civil society because the responsibility for

addressing unethical practices is well distributed. While government has a key role to lead the way (because political resolve is needed to make accountability and enforcement systems work in practice), citizens should be encouraged to obey the law demand accountability, exercise their right and not become complicit to improper practices through inaction.

- Unlawful use of water must be addressed through extensive awareness creation and a less complex administrative process (supported by legislation) for determining the lawfulness (or otherwise) of a water use activity.
- Effective tools, guidance and mechanisms for regulation and accountability must be developed to strengthen the ability of regulators to, not only deal with illegal activities, but also to set targets for correcting the illegal activity and rehabilitate the resultant impacts of the transgression.

#### **Main messages: Markers of good governance (Sessions 3, 6, 12, 15, 16 and special sessions)**

- It is necessary to move from a state-centric view of water governance to broader and participatory or polycentric governance where the human element plays a bigger role. There is important to establish who the actors are, what makes them act and what the consequences of such actions are, and establish what brings change in society.
- Stakeholder/multi-stakeholder platforms and involvement in water resources management: State institutions should take a leading role in stakeholder involvement in water resources management. This could be achieved by urgently establishing effective CMAs with clear roles and functions, other effective stakeholder forums, ensuring financial sufficiency and institutional viability, and ensuring that neutral and unbiased facilitators are available where there is a need to build consensus among stakeholder groups.
- Effective and mutually beneficial partnerships should be established between rural and disadvantaged communities and other actors (state, private sector, civil society) taking due cognisance of the power and accountabilities of the partners involved. The partnerships should benefit poor and disadvantaged partners, give decision-making powers to the poor and disadvantaged partners, offer employment opportunities, and be built on transparency.
- Relationship building is a key ingredient to good governance and in developing governance indicators. There is a need to add specific indicators that measure the strength of relationship built at all levels. This should look at relationships between different actors including relationships between men and women.
- Provision of non-tangible emotional benefits (hope and promise) as ingredients for good governance. Water practitioners should have a paradigm shift and start using emotion-driven parameters as a more appropriate indicator for good water governance especially in situations where the benefits are long-term. Pro-poor justice is not only achieved by distributing tangible benefits.
- Focus on provision and uptake of data and information through more investment in research and development and ensuring a strong link between research and policy-making.
- Effective mechanisms for greater scrutiny of activities, rewarding good behaviour and punishing bad behaviour.

#### **Main messages: Multi-level, multi-sectoral and transboundary governance and adaptive management (Sessions 4, 7, 8, 11, 14 and special sessions)**

- Improve cooperative governance of shared river basins using IWRM strategies and plans as an important starting point, building on credible and agreed information as well as effective communication channels, participation, mutual trust, shared vision and objectives, and agreed water resources development and management interventions and plans.
- Understanding integration, both sectoral and regional. Water affects many sectors and cannot be looked at in isolation and must be integrated with land use and agriculture. Regional integration remains cardinal and the areas of cooperation with neighbours regarding water scarcity must be understood.
- Strengthen institutions such as river basin organisations, for multi-level, multi-sectoral, transboundary governance and stakeholder engagement.
- Developing a suite of win-win benefit sharing projects as incentives for sustainable cooperation between states in the region.
- Developing effective mechanisms for decentralised management, such as WUAs that take into consideration awareness creation, communication and information sharing, voluntary compliance

mechanisms, administrative responsibility and bureaucratic inertia, conflict resolution mechanisms and the integration of traditional models.

- Strengthen integration across sectors and understand the nexus between water, energy, food, health and climate.
- Improving water governance in the rural context should be based on a clear understanding of the social and traditional complexities and challenges, including inadequate capacity, lack of clear access rights, gender dynamics and customary common property rules.

### **Main messages: Tools for implementation (Sessions 10, 13, 16 and special sessions)**

- Establish a system of benchmarking water governance and performance across countries to track progress. Benchmark responsiveness, rule of law, accountability, participation (including gender) and transparency.
- Develop and implement tools for spatial planning to understand the complexities and improve integration in WRM.
- Need for data and information management tools such as simple decision support systems to support effective governance.
- Strengthen capacity building in water governance to enable sound management and the use of water resources. Lessons learnt suggest that the building of water governance capacity requires longer term time frameworks
- Use the ecosystems approach to be able to understand the hidden ecological demand for water.

The overall message was that fresh water governance is about people.

### **Closing remarks – Mr Desigen Naidoo, CEO: Water Research Commission**

The global dialogue on water is generally unanimous that we are moving into a difficult water future on the back of a variety of factors including unprecedented population growth combined with rapid levels of economic movement in the developing world in particular. The latter has resulted in growing middle classes with the resultant change in consumption patterns. This in many ways is the starting point to defining the new Malthusian challenge. At the same time, years, decades and indeed centuries of environmentally insensitive and water wasteful practices, particularly in mining and industry, have come to haunt us. This combined with the newer challenge of global change, has defined the water challenge of the 21<sup>st</sup> century.

We are also clear that the developments in water sciences and engineering alone have not delivered adequately to engage this challenge and there is a strong need to consider the social dynamics, culture and heritage issues towards developing more holistic and complete solutions. In fact, we have for a while in our individual corners, been lamenting the lack of a reasonable global dialogue on this very important matter including the matter of water governance to address this. We have in the past three days made an important start to this global dialogue. We have converged from 29 countries and five continents to apply our minds, our experiences and insights to both the deeper analysis of the issues as well as the solutions. We have engaged these issues in five groups:

- Legislation and regulatory environments, human rights and accountability
- Markers and measures of good governance in the water domain
- Multi-level, multi-sectoral and transboundary governance and adaptive management
- Tools for implementation
- The need for new knowledge and capacity for investments in R&D to develop and implement better and sustainable solutions to our challenges.

This has been enormously beneficial, but we have gone two steps further. The first of those is that in these three days, we have forded a few solution streams and started the path of many more. The second in that we have organised ourselves into an important continuity paradigm as many of the issues we have engaged will move to the next level in a series of discipline and areas specific domains, like next year's International Conference on Water and Gender before we come back together for the International Conference on Fresh Water Governance for Sustainable Development in Adelaide in 2014.

At a South Africa level, the deliberations and outcomes of this conference will directly feed into the finalisation and implementation of the National Water Resource Strategy (NWRS) 2 as well as the processes of legislative reform and institutional alignment being led by Minister Edna Molewa.

Please allow me use this opportunity on behalf of the WRC, our co-host DWA and all the other organisations at this conference to thank you and your institutions for your excellent participation and generous contributions during the conference. A special word to Prof. Ali Mazrui, Prof. Motshegka and the other excellent keynote speakers – the wealth of knowledge and insight you have shared have been inspiring and direction-setting.

Finally, I would like to say that we are here, not only as ambassadors of a better water management paradigm, but that we need to lead by example. Duly encouraged by Prof. Mazrui's quoting of Harry Belafonte's 'Island in the Sun', I thought I would close with a quote from a great poet and philosopher of my own generation – Michael Jackson:

*I am starting with a man in the mirror  
I am asking him to change his ways  
And no message could have been clearer  
If you wanna make the world a better place  
Then look at yourself and make that change.*

#### **Closing remarks – Ms Eiman Karar, Conference Chair**

This was a joint effort by so many people whom I would like to thank:

- The WRC, for the support from the WRC Board, colleagues and the CEO
- The special speakers, Adv de Lange, Prof. Mazrui and Prof. Motshegka
- Participants, chairpersons, rapporteurs, all our partners, the Champagne Sports Resort, and particularly the conference organiser, Ms Cilla Taylor.

## APPENDIX 1: LIST OF ACRONYMS

AIDS	Human immune deficiency syndrome
AMCOW	African Ministers' Council on Water
ANBO	African Network of Basin Organisations
ANC	African National Congress
AS	Action situation
AU	African Union
AWARD	Association for Water and Rural Development
AWB	Area Water Boards
BAU	Business as usual
BOCMA	Breede-Overberg Catchment Management Agency
CARA	Conservation of Agricultural Resources Act
CEEPA	Centre for Environmental Economics and Policy in Africa
CEO	Chief executive officer
CIRAD	<i>Le Centre de coopération internationale en recherche agronomique pour le développement</i> (Agricultural Research for Development)
CMA	Catchment management agency
CMS	Catchment management strategy
CRD	Cumulative Rainfall Departure
CSIR	Council for Scientific and Industrial Research
CWR	Centre for Water Resources
DG	Director-General
DSS	Decision-support system
DWA	Department of Water Affairs
e-flow	Environmental flow
EFR	Environmental flow requirement
EIA	Environmental Impact Assessment
EMF	Environmental management framework
EMI	Environmental management inspector
EPC	Engineering, procurement and construction
FO	Farmer organisation
GDP	Gross domestic product
GEF	Global Environment Facility
GIS	Geographical information system
GIZ	German Agency for International Cooperation
GRA	Groundwater resource assessment
GW MATE	Groundwater Management Advisory Team
GWP	Global Water Partnership
HI	Horizontal integration
HIV	Human immunovirus
IAAP	Implementation activities and action plans
ICMA	Inkomati CMA
IHE	Institute for Water Education
IIMA	Interim IncoMaputo Agreement
IKS	Indigenous knowledge system
INRM	Integrated natural resource management
IP	Intellectual Property
ISOTG	Inkomati System Operation Task Group
ITT	Itezihitezhi/Kafue George Reservoir
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWMP	Integrated Watershed Management Programme
IWRM	Integrated water resource management
JVS	Joint venture scheme
JWC	Joint Water Commission
KAP	Knowledge, attitude, practice
KfW	<i>Kreditanstalt für Wiederaufbau</i> (Reconstruction Credit Institute)
KJOF	Komati Joint Operations Forum

KOBWA	Komati Basin Water Authority
KTBWS	Kunene Transboundary Water Supply
LDA	Limpopo Department of Agriculture
LIMCOM	Limpopo Water Course Commission
LLM	Master of Law
LM	Local Municipality
MDG	Millennium Development Goal
MWI	Ministry of Water and Irrigation, Kenya
NDP	National Development Plan
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organisation
NGS	National Groundwater Strategy
NPC	National Planning Commission
NRF	National Research Foundation
NRM	Natural Resource Management
NWA	National Water Act (Act No. 36 of 1998)
NWRI	National water resource institution
NWRS	National Water Resources Strategy
NWRS 1	First edition of the National Water Resource Strategy
NWRS 2	Second edition of the National Water Resource Strategy
OKAKOM	Permanent Okavango River Basin Water Commission
ORASECOM	Orange-Senqu River Commission
PAV	Permissible annual volume
PES	Payment for ecosystem services
PJTC	Permanent Technical Commission on the Kunene River Basin
PRIMA	Progressive Realisation of Inco-Maputo Agreement
R	Rand (South African currency)
RBA	River basin authority
RBO	River basin organisation
SADCC	Southern African Development Coordination Conference
SANBI	South African National Biodiversity Institute
SAP	Strategic action programme
SARTAC	Southern African Regional Technical Advisory Committee
SASS	Stream Assessment Scoring System
SEA	Strategic environmental assessment
SIDA	Sindh Irrigation and Drainage Authority, Pakistan
SIWI	Stockholm International Water Institute
SWI	Small-scale water infrastructure
TCTA	Trans-Caledon Tunnel Authority
TDA	Transboundary diagnostic analysis
TEM	Theory-driven Evaluation Model
TPTC	Tripartite Permanent Technical Committee
TWR	Transboundary water resource
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education, Scientific and Cultural Organisation
UNSGAB	United Nations Secretary General's Advisory Board on Water and Sanitation
USA	United States of America
USAID	United States Agency for International Development
UWC	University of the Western Cape
VI	Vertical integration
WARMS	Water Authorisation Resource Management. System
WB	Water board
WC	Water conservation
WDM	Water demand management
WESSA	Wildlife and Environment Society of South Africa

Wits	University of th Witwatersrand
WMA	Water management area
WRC	Water Research Commission
WRM	Water resource management
WRYM	Water Resource Yield Model
WSA	Water services authority
WSP	Water services provider
WUA	Water user association
WWF SA	World Wildlife Fund South Africa
ZAMCOM	Zambezi Watercourse Commission
ZRA	Zambezi River Authority
BRIC	Brazil, Russia, India, China
ZACPLAN	Zambezi River Basin Action Plan

**APPENDIX 2: LIST OF DELEGATES**

<b>Title</b>	<b>First name</b>	<b>Surname</b>	<b>Organisation</b>	<b>Country</b>
Dr	Shafick	Adams	Water Research Commission	
Mr	Nigel	Adams	Dept of Water Affairs	
Dr	Samantha	Adey	Breede-Overberg CMA	
Ms	Maria	Amakali	ORASECOM	Namibia
Dr	Mao	Amis	Pegasys Strategy & Development	
Prof.	John George	Annandale	University of Pretoria: Dept Plant Production & Soil Sc	
Ms	Robyn	Arnold	Write Connection (Scribe)	
Mr	Bernie	Badenhorst	Dept of Water Affairs: Limpopo	
Ms	Hannah	Baleta	University of Cape Town	
Ms	Jane	Ballot	Teach 'n Write	
Ms	Tsakane	Baloi	Dept of Water Affairs	
Ms	Khanyisa Vanessa	Baloyi	Rand Water: Graduate Internship Programme	
Ms	Sharon	Banks	UIS Analytical Services	
Ms	Lerato C	Bapela	University of South Africa	
Mr	Garth	Barnes	WESSA - Mondi Wetlands Programme	
Ms	Lizette	Bekker	Thermo Fisher Scientific	
Ms	Lasya Christina	Bekker	Lizette Bekker	
Mr	Balarabe	Bello	Lake Chad Basin Committee	Chad
Ms	Debbie	Besseling	Idube Media	
Ms	Ruth	Beukman	Global Water Partnership Southern Africa	
Mr	Johnny	Beumer	Aurecon	
Dr	Harry	Biggs	SANParks	
Ms	Lucy	Billy	Rand Water: Graduate Internship Programme	
Ms	Eustathia	Bofilatos	Dept of Water Affairs	
Mr	Dawid	Bosman	TCTA	
Mr	Albert	Botha	Klub Lekkerus / Libertas	
Ms	Jacquie	Botha	Rand Water: Project Leader - GIP	
Dr	Magalie	Bourblanc	CIRAD/CEEPA, University of Pretoria	
Ms	Samantha	Braid	Aurecon (SA) (Pty) Ltd	
Mr	Brendan	Bromwich	UNEP: Post Conflict & Disaster Management Bench	Switzerland
Mr	Chris	Burchmore	Mondi Ltd	
Prof.	Ola	Busari	TCTA	
Mr	Stephen	Cairns	Thermo Fisher Scientific	
Mr	Alexis	Carles	FRS/FNRS: Univ Libre de Bruxelles	Belgium
Ms	Hlengiwe	Cele	Water Research Commission	
Dr	Suvarna	Chandrappagari	Government of Andhra Pradesh	India
Mr	Chengzi	Chew	DHI	
Mr	Hastings	Chikoko	IUCN South Africa	
Dr	Claudious	Chikozho	Univ of Pretoria: Centre for Responsible Leadership	
Dr	Ebenizario	Chonguiça	GIZ Transboundary Water Management in SADC	Botswana
Mr	Shaun	Cloete	Dept of Water Affairs: Kimberley	
Mr	Jude	Cobbing	SLR Consulting (SA) (Pty) Ltd	
Dr	John	Colvin	Global Climate Adaptation Partnership	UK
Ms	Christine	Colvin	WWF - SA	
Ms	Sindiswa	Cutshe	Dept of Water Affairs	
Dr	Lucia	De Stefano	Universidad Complutense de Madrid	Spain
Mr	Thatayaone G	Dedede	Dept of Water Affairs: Botswana	Botswana

<b>Title</b>	<b>First name</b>	<b>Surname</b>	<b>Organisation</b>	<b>Country</b>
Ms	Kristi	Denby	Norwegian University of Life Sciences	Norway
Mr	Jonathan	Denison	Umhlaba Consulting Group (Pty) Ltd	
Dr	Mark	Dent	University of KwaZulu-Natal	
Dr	Chris	Dickens	Institute of Natural Resources	
Dr	Mercy	Dikito-Wachtmeister	Global Water Partnership (GWP)	
Mr	Enoch	Dlamini	Aurecon	
Mr	Mboniseni	Dlamini	Magalies Water	
Mr	Derrick	Du Toit	Assoc for Water & Rural Dev (AWARD)	
Dr	Raphaëlle	Ducrot	CIRAD/UMR G-Eau, IWEGA-Univ Eduardo Mondlane	Mozambique
Ms	Nobuhle	Dyasi	Chris Hani District Municipality	
Dr	Bloodless	Dzwairo	Durban University of Technology	
Dr	Uschi	Eid	UNSGAB	Germany
Dr	Andrew Achuo	Enow	National Research Foundation	
Ms	Heather	Erasmus	Write Connection (Scribe)	
Dr	Maranda	Esterhuizen-Londt	InnoVenton: Nelson Mandela Metro Univ	
Ms	Surina	Esterhuysen	Univ of the Free State: Centre for Environ. Mngmt	
Prof. Dr	Mariele	Evers	University of Wuppertal	Germany
Ms	Joanna	Fatch	University of the Western Cape	
Mr	Robert	Freeman	Mintails SA (Pty) Ltd	
Ms	Nikki	Funke	CSIR	
Ms	Selebaleng	Gaebee	Dept of Water Affairs	
Ms	Maitumelo	Gaolebogwe	ZAMCOM	Botswana
Dr	Dustin	Garrick	University of Oxford	UK
Ms	Pumza	Gasa-Lubelwana	Dept of Water Affairs: Cape Town	
Mr	Martin	Ginster	Sasol Shared Services	
Prof.	Jaqui	Goldin	University of the Western Cape	
Dr	Luiz Airton	Gomes	Universidade Federal de Mato Grosso	Brazil
Ms	Helen	Gordon	WWF-SA	
Ms	Tuleko	Gqweta	Dept of Water Affairs	
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