



The Wicked Challenge of Sustaining South Africa's Water Security

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by

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Summary

Repeated warnings about water crises have not materialised. The country has not faced rolling wash-outs or dry outs. There have been no electricity blackouts caused by a shortage of cooling water for electricity generation, and the City of Johannesburg has not been dissolved by an underground sea of acid mine drainage water.

If the job of water managers is to achieve water security – the 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 – then, to date, we have been successful, despite our difficult physical, social and political climate. The challenge is to sustain and strengthen this water security in the future.

Contrary to popular perceptions, the main threat to water security is not that the country is running out of water; that pollution is causing irreversible damage; or that climate change is as significant as many believe, although the next major drought will reveal many hidden weaknesses.

This presentation will consider some of the less obvious but more significant difficulties that confront water managers and the South African community, and what is needed to address these difficulties.

Introduction South Africa's water challenges in a global perspective

South Africa is not the only country that has water problems.

The water managers in one country that I have just visited are worried because their society seems to think that their water problems have been solved. They are blissfully unaware of the future challenges they face as they build half a million new houses on a vulnerable flood plain; one of those challenges is that there may not be enough trained people to manage the growing risks. That country is the Netherlands.

Another country is about to spend almost R100 billion on a tunnel in its capital to prevent 10 sewage spills a year into a river, affecting perhaps 1000 rowers, to meet strict environmental legislation; they don't want to challenge the laws because it took a decade to get them passed. Technicians also point out that the project is the only way for them to get access to old sewerage systems that urgently need repair. Meanwhile, there is a stalemate over proposals to build new infrastructure to increase water supply, leaving the city at risk. That's London in Great Britain.

Closer to home, water supply to a major tourist town was cut by floods just as the government announced a drought (Maun in Botswana). But unshowered tourists are a tiny problem. For a dramatic example of the importance of good water management, look to Thailand where failure to coordinate the 70 plus agencies involved produced a disastrous flood. So many factories were swamped that, over the next three months, global hard disk drive prices doubled, car manufacturers Honda and Toyota lost 20% of their total production and world industrial GDP fell 2.5%.

And what about the country that resolutely decided that no new infrastructure was needed to ensure water supplies for their major cities, that exhortations about water conservation would be enough. They lost their nerve during a major drought and panicked as dam levels dropped. The quick fix was to build R500 billion worth of desalination plants, which have never been used (it flooded before they were finished); they now spend about R5 billion a year to maintain them (that's Australia).

So it is a relief to come back home to South Africa where repeated warnings about water crises have not materialised. The country has not faced rolling wash-outs or dries. There have been no electricity blackouts caused by a shortage of cooling water for electricity generation, and the City of Johannesburg has not been dissolved by an underground sea of acid mine water. True, Nelson Mandela Bay metro managed to run out of water through gross maladministration (they had a guaranteed supply and just needed to build a pipeline to bring it to the city) and there have been plenty of supply problems and pollution incidents in smaller towns, but by and large, South Africa has come through the first two decades of democracy comparatively well.

At this point, we should probably be very afraid. The fear that South Africa is vulnerable to water crises (if not to one major national crisis) is not unreasonable. There has been no major drought for 20 years, much longer than usual. We have extremely variable weather and our cities depend on extensive supply systems whose vulnerabilities are not always well

understood. Our record of managing infrastructure is not as good as it was, as local level service failures demonstrate. How long before the local failures are repeated on a larger scale?

But I do not want to launch more water crisis scares. What I want to suggest is that our most serious water challenge is not technical or managerial but rather something more complex. It is that the effective management of water resources has become a truly wicked problem.

What is a wicked problem? And water security?

Water security is our current short and sweet definition of the goals of water resource management:

“...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.”

Wicked problems are another story. The “wicked problem” concept was first used in an academic context 40 years ago, by Horst Rittel, a professor of physical planning at UCLA in the USA. As a city planner, he found that the technical tools that he wanted to use were simply not fit for purpose because people did not obey technical rules.

He contrasted the kind of technical problems that could be solved by modelling and analysis with social policy “problems” where the nature of the core problem is unclear (is poverty the cause of poor educational outcomes or the consequence, or both?), responses are conditioned by the attitudes of different sections of society and any experiment will not be repeatable because the original “universe” will have been changed by the first attempt. As he explained, while formal science has a set of rules and its own internal logic, once you start planning for the wider society, that is no longer the case:

“The kinds of problems that planners deal with--societal problems--are inherently different from the problems that scientists and perhaps some classes of engineers deal with. Planning problems are inherently wicked.”

He set out 10 characteristics of a wicked problem, including:-

- There is no definitive formulation of a wicked problem
- Solutions to wicked problems are not true-or-false, but good-or-bad
- There is no immediate and no ultimate test of a solution to a wicked problem
- Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly
- Every wicked problem is essentially unique
- Every wicked problem can be considered to be a symptom of another problem

Following his analysis, even the use of the terminology of “problem” is perhaps inappropriate because in its technical sense, it implies that there is a “solution”. So I have chosen rather to use the word “challenge”, which, according to the Oxford Dictionary, is “a task or situation that tests someone’s abilities”.

So I believe that water and its management more correctly poses a **wicked challenge**. It is as much about social policy as it is a technical activity, which means that it needs tools to address it on an ongoing basis rather than to find once-off definitive solutions.

Why water resource management is a wicked challenge

When I tried to outline why water resource management is a wicked challenge, I wrote:-
“Complexity, interests and localness”

Complexity

Here you have a natural resource which is nominally renewable and self-purifying but is also fugitive, coming and going, according to its own rules and whims. Its presence is extremely variable but those variations cannot be predicted with much certainty. It has a multiplicity of uses (including non-use – preservation for recreation and conservation) while the values that govern it are diverse and location-, community- and use-specific and cannot be reduced to a common economic metric. Managing water can be as much about juggling social priorities and values as it is about manipulating the physical substance.

Interests

There is a dramatic difference between the users who have strong interests in water (farmers, who want to use it to assure and improve their production; industrialists and municipalities, who want to use it to remove their waste-products) and those whose interest is weak and occasional (domestic users are usually only concerned if their water supply fails or becomes unsafe). Its complexity means that water issues are often poorly communicated and the roles and functions of water institutions are seldom understood. As a consequence, it is of limited interest to politicians since the political system encourages them to focus on simple, short term issues. The other strongly interested sector are environmentalists, who seek to protect eco-systems and find that water, as a primarily public resource, offers many opportunities for campaigning.

Localness

A final issue is water's local nature. Compared to other goods, water is low value high volume - for no other commodity are the quantities that find their way into individual households measured in tons per month while farmers use thousands of tons per hectare every season. But the way in which water resources appear and flow through communities in their locales of work and residence is also vastly different from one place to the next. This means that there cannot be any single grand solution to specific water problems. And while local solutions can be very robust, serious challenges emerge when “locals” overlap. There was effective management on one South Australian stream attributed to the fact that all the farmers belonged to the same sports club. But, when they had to take a little more water from a tributary of the Murray Darling, Australia's equivalent of the Orange river they became part of a continental governance system which dictated how they should operate.

Let me give you a couple of South African examples, to illustrate these issues.

The challenge of dealing with **acid mine drainage** is very topical back in Gauteng. And it looks very simple. According to the green narrative, the bad guys (mining companies) pollute the water to maximise their profits; they must be controlled and forced to treat the water that is either pumped or flows out “naturally”, to prevent an ecological catastrophe. The narrative of the (current) miners is that the problem is the consequence of old mines whose closure was not properly controlled. So it is a public responsibility to clean up the water from today’s mines to enable production to continue. In fact both groups are right. There is a great deal of profit maximisation going on, and a lot of historic abandonment that throws the challenge squarely into the public domain.

What is missed though is that salts from water that decants from the mines will only amount to perhaps 15% of the total salt pollution load on the Vaal – general municipal, industrial and agricultural runoff is responsible for the bulk of Vaal salinization, which reduces usability and increases costs for downstream users. Even more significant is the fact that much of the water coming out of the ground goes in from leaking pipes, old mine workings and even current mine dump reprocessing, that could be significantly reduced – there is even one substantial inflow from an artificial lake established in a nature reserve. But it suits some sectors of industry to pump and treat (keeping mines open and offering opportunities for large construction contracts), which also keeps the green lobby happy. Beware comfortable “green-business” alliances! Too often, their consequence is that alternative issues and options struggle for attention or remain invisible and the cost burden invariably falls on the public.

Closer to home, remember the controversy over the **Berg River dam** outside Franschoek? This was South Africa’s Australian moment when local green voices loudly proclaimed that conservation alone could meet future water needs (the fact that migration rates were huge and that service levels would have to be improved substantially was brushed aside). The arguments went on for a decade. Fortunately, there was a dry period during which water restrictions had to be imposed for a few months; the economic and social impact of those were enough to persuade the Minister at the time (Ronnie Kasrils) who was originally sympathetic to his predecessor, Kader Asmal’s role as the flag-bearer for the global anti-dam crusade, to change tack and authorise the dam. Today, swimming competitions are being held there; what was originally an environmental blight has now become a recreational asset. But elsewhere, this issue is still contested, not because of the human rights implications (although those are regularly raised) but because of the belief in some quarters that, as one NGO rep put it to a meeting of African Ministers, the very idea of “water storage” is a sensitive one.

Indeed, because of this contested nature of water, there was an almost total embargo by donors on the development of **water resource infrastructure in sub-Saharan Africa**. The myth of “scarcity” was held up to explain why Africans should focus on conservation rather than increased use (what was scarce was money to build infrastructure). Then, the Chinese arrived and offered no strings alternatives to address local needs and priorities and we soon discovered what Africans real priorities were. So AMCOW, the African Union’s technical arm on water has finally felt able to say that water is a resource that is greatly under-used (only 5% of available water is actually used in sub-Saharan Africa) and that water should be seen as a resource to support growth and development. Provocatively, they have set a target – use 40% of Africa’s water in support of development by 2030!

There are many more examples. If there is time, we might want to consider whether fracking is really a water matter, ask why climate change is really an important factor in water resource management – and why we are not allowed to talk about how geoengineering interventions could help to mitigate it while energy production is transformed to less harmful modes; whether we should try and keep the aquatic environment in a natural state and whether bottled water really damages water resources....

How do we address wicked challenges

But I need to focus on the key question: if water resource management to achieve water security is a wicked challenge, how do we address it?

In discussions with water managers, the prescription is simple. For water security we need:

- Institutions, able to take and implement decisions ;
- Information, to predict, plan and cope; and
- Investments, in infrastructure to monitor, store, transport and treat water and reuse waste water.

In a country like China, where the majority of the political leadership was, until recently, composed of engineers, that technocratic prescription makes sense. There, water management has been a simple business – monitor the resource and its use, understand the underlying natural and social processes, look at future needs and pressures and design and implement a response.

So you got the Three Gorges Dam which, contrary to popular belief was not primarily designed for water supply or even hydropower, but is rather a much larger social project designed to protect the lower Yangtse from the floods which, in the past have killed tens of thousands of people and destroyed millions of homes; to open up the interior at Chongqing as a development hub, avoiding lopsided coastal economic development by turning the Yangtse into the most heavily used inland waterway in the world; to generate almost as much as electricity as ESKOM's total capacity and then, almost incidentally, to support the transfer water to northern China. An authoritarian system like China's can effectively address the technical and economic and even the social and environmental challenges through a straightforward technocratic process.

Few other places in the world work like China. Traditionally, as with the Berg river dam, competent water managers analyse the technical problem but then wait for drought, flood or cholera to table a "solution", which they have been keeping in their back pockets or bottom drawers, to address it along with longer term, more systemic, concerns.

But democratic decision-making processes have become more difficult, time-consuming, expensive – and exclusionary. Increasingly, they demonstrate the true character of a wicked problem since, as different interest groups learn how the decision-making processes work, they adapt their strategies accordingly to manipulate them.

So today, the game is to frame the debate “at source”. The attempts to use the World Commission on Dams to frame water storage as an inherently harmful activity was one successful example – it was part of a process that saw sub-Saharan Africa denied access to international finance for water infrastructure development for more than a decade.

Because of its emotional appeal, water often becomes a medium for quite different issues. The fracking debate, which is actually about continued use of hydrocarbons for energy production, has been focused on relatively minor water impacts, inappropriately in my view.

More generally, setting indicators is another way in which debates are framed. Indicators can be benign and helpful. So the United Nations focus on peoples’ access to water and sanitation as a Millennium Development Goal probably did encourage governments to do more to meet peoples’ needs. But indicators can also be malign and influencing them becomes a powerful means of achieving the narrow goals of individual interest groups.

In the present discussion about post-2015 development goals, there is a strong suggestion that all the world’s wastewater should be treated by 2030. It sounds fine, sounds green, sounds nice. But it ignores the fact that wastewater treatment is not essential for social progress or for long term environmental sustainability. In much water advocacy, there is a determined (and in Europe it is explicit, desire to return to some “natural state”. Yet we live in the Anthropocene; the world is increasingly man-made. All developed countries went through phases during which their environments were grossly polluted; they took decisions according to the social values and priorities of the time, phased and sequenced their interventions and today have generally clean rivers and air although their landscapes bear no resemblance to the original natural environment. But that sequenced approach does not create new business for companies that make, sell and operate wastewater treatment plants and are hungry for new business. So the desirability of new indicators that define their products as global goals is obvious. And if dams were the symbol of public hydrohegemony in the 20th century, wastewater treatment could become the symbol of the private hydrohegemonies in the 21st!

My general point is that water management in a modern democracy is no longer about technocratic management to meet an agreed set of societal needs. And water managers have to learn to work in this new world.

To some extent, we have done this. So in SA, we started democracy with a simple goal (or indicator) in water, ensuring some, for all (not all for some); that was elaborated, **ensuring** (government’s role), that it would be **forever** (because sustainability is important) and achieved **together** (because partnerships between all sectors of society will be needed to achieve it).The change in emphasis, moving from “some for all” to “ensuring some for all, forever, together” reflected collective engagements and discussions. And from those engagements about basic water supply and sanitation services, water managers almost incidentally gained legitimacy and support for their work in water resources.

And it is on that note that I want to start drawing the threads together.

How are we doing?

To date, South Africa has done remarkably well in its management of its water resources, despite many problems on the way. One indicator is that supplies to the country's industry and commerce have been sustained, and expanded (we haven't copied the Australian mistake); even Cape Town has grudgingly benefitted from some infrastructure. That has helped to achieve broader social goals, to be crude, mobilising enough tax revenue to pay social grants as well as sustaining jobs.

If the world moves to fuel cell powered cars which use significant amounts of platinum (and are due to hit the market in 2015) , the water supply for the mining expansion in the so-called Eastern limb of the Merensky reef will be in place (the president was to have opened the De Hoop dam last week). It was planned almost 15 years ago when the potential needs were identified in liaison with the mining sector. The development will also help to maintain environmental flows in the Olifants catchment, arguably the most stressed in the country.

Plans are in place to meet the needs of the Waterberg energy developments (elegantly based on making effective reuse of Gauteng's wastewater, itself derived from Lesotho transfers). The problem is getting decisions on the timing and scale of the energy developments, not identifying the water source and designing the infrastructure. Similarly, proposals about how to use water better in agriculture to generate rural jobs and production depend on the agriculture sector getting its act together. Despite increasing stress on the resource, we are cooperating effectively with our neighbours from Mozambique and Swaziland to Lesotho and Namibia.

Environmental reserves, the water needed to sustain particular environmental qualities, have been determined for the majority of South Africa's rivers although, in many, we must still decide just how much social and economic activity we are willing to sacrifice to achieve environmental goals. But even the fact that this is now an explicit social decision is an important achievement in its own right. We have not allowed a dogmatic "green is good" to dominate decision-making and force us to attempt the impossible task of preserving or recreating nature.

These examples illustrate that we do still have enough water, with clear plans on how to use it, to meet the country's needs until at least 2030, without major constraints. If you want to know how future water needs can be met for any city, most large towns and quite a few other areas where rapid growth or change is expected, you can go to the DWA website and find a summary plan.

This is possible because there has been substantial interaction between water technocrats and a broader community about the country's many different futures. And that brings me back to the real water challenges that will face the country over the next few decades and a righteous response to their wicked nature.

What would be righteous responses to our wicked water challenges

Often invisible to most people, the extensive process of planning and discussion between the technicians who manage water systems and the people who use water today and are thinking about what they or their industries and settlements will be doing decades into the future underpins our water security.

If we try to understand where the capacity to do that comes from, you have to go back over 40 years when a Commission of Enquiry into water matters identified the critical need for a competent water administration in a water-scarce South Africa and recommended building a stronger water research capacity and training the best and brightest school leavers to work in the water sector. That cohort became known as the “Botha babies”. They built knowledge, the hydrological information systems and more recently the planning processes. They may have been conceived by a Nationalist politician but they provided the foundation for water in a democratic South Africa.

Both the information and the planning that uses it are fundamentally important public goods that cannot easily be produced outside of a public administration. So as we debate the need to build a developmental state in South Africa, we should take note of lessons from the past. The apartheid state of the old South Africa served the development needs of a small minority at the expense of the rest. But it did create capacities that have been useful to democracy as well.

In the National Development Plan, we have emphasised that until South Africa has a capable state, we will not be able to create a developmental one. So, for me, one of the greatest water challenges that South Africa faces is that the Botha babies are retiring over the next five years; we need to act rapidly to retain their knowledge and grow a new generation of practitioners who will face more complex problems in the future.

As society’s demands on water resources grow, we need to strengthen capacity to monitor and manage them, to develop the people who are going to do that and to sustain a collaborative working environment with the wider society. This capacity will not come from the private sector alone; private companies cannot invest in people who take a decade to gain the knowledge they need to become really productive. The private sector has always, truth be told, relied on the state to do that.

Even less can we rely on external resources. One present danger is that South Africa’s specialised technical consulting capacity is being bought up by large foreign groups; they have even less motivation to build the local knowledge; indeed, less local knowledge merely expands their future market. And as firms become less local, we risk losing a critical component of a successful developmental state, the culture of cooperation and trust between players. One of the strengths of the old system was that the majority of professionals who practiced in water had started their careers in government. When they moved out into consulting or to the water user sectors, they maintained their relationships; there was a degree of trust and understanding that contributed significantly to the development of appropriate responses to our wicked challenges. This common working

culture and background is a fundamental characteristic of most successful developmental states

This has become a wicked challenge in its own right. How can we produce a new cohort of practitioners with the technical competences but also the breadth of vision that we need, and how can we build a community that bridges public and private sector, that knows, trusts and can work together with colleagues in different sectors. This is part of the broader challenge of building relationships of trust across the fault lines of a deeply fractured South African society. Our history and diversity does not make the task any easier.

Part of that fracture is revealed in attitudes to environmental issues. In some discussions, particularly but not only with civil society, I come away thinking that I am in Europe in terms of approaches taken and standards set. Yet even in Europe, there is a growing recognition that returning to nature is not a policy option. We live in the Anthropocene, in an environment that we have and continue to build. We build our environment. The challenge is not to protect nature but to build an environment that is sustainable, that meets the long term needs of our society and sustains critical natural resources. It is not easy. But it is always easier to reach a goal if you can define it clearly and agree that is where you want to go.

So, to conclude, how should we deal with the wicked challenges of water?

First, we need to recognise just how local water is and avoid trying to impose general solutions to very specific problems and simple solutions onto general complexity.

Then, we do need to acknowledge that we are in the Anthropocene. We will actually serve the environment much better if we stop trying to pretend to preserve it and rather build our societies in ways that retains biodiversity and uses natural functions as part of our lives rather than treats nature as something external to our daily lives that needs to be protected.

Very critically, we have to sustain and strengthen relationships between the people and institutions that use water and those who manage it. The challenges we face can only be addressed through partnerships across society and those partnerships have to be built on trust at all levels, from factory floors and fields to Bank head offices, from villages to Parliament.

This requires special kinds of people, with sound technical knowledge as well as an understanding of the broader community in which they work. Producing, employing and sustaining the new cohort of water managers remains perhaps our greatest challenge. But it also offers wonderful opportunities to contribute to building a better country and a better life for people in it and to have fun while doing it.

Whatever the direction that South Africans want to go in the future, they will need to know what is possible in terms of water. There will always be a need for a good technical understanding of the growing complexity of our water resource systems; both the man-

made infrastructure and its software but also, critically, the natural systems in all their uncertainty and variability with which physical infrastructure interacts. That understanding will be based on up to date monitoring as well as good understanding of how the systems come together.

That information can be upgraded into knowledge of alternatives, models of futures, whether they be future infrastructures or future management arrangements. But that knowledge will only be useful to the extent that it influences the social and political decisions taken in the broader society. Could we not just allow the technicians to do what's needed to maintain and strengthen water security? That is happening, by default, in countries like the Netherlands, where the public has largely left water policy discussions to technicians and politicians. But even there, it is recognised that when decisions are not debated and well informed, the outcome is often, politely, sub-optimal. Billions spent on white elephant desal plants in Australia; on flood damage in Thailand; thousands of lives unnecessarily lost to floods in Pakistan and droughts in Africa, those are the costs of poor water management decisions.

So we must recognise that the institutions that build and manage water systems are human, located in societies with all their imperfections, subjectivities and conflicts. We can no longer assume that the advice of technical professionals will be taken as gospel; more often the contrary will be true. The overarching challenge for professionals remains to keep society's discussions about our common futures technically informed and to understand how we can help to ensure that the information is acted upon.