LEARNING FROM CRISIS

A series of modular learnings from the 2017-2018 Cape Town water crisis

THE RESILIENCE SHIFT

THE CAPE TOWN DROUGHT RESPONSE LEARNING INITIATIVE

module 1

Adapting to climate change

Water resource planning under conditions of uncertainty produced by climate change is challenging. Scenario-based planning, adaptation pathways and negotiated cost-risk trade-offs help in decision-making.

Text component of module 1, accompanying the film www.vimeo.com/cinesouth/ctdrli-trs-lfc-module-1

Duration: 16:38

Adapting to climate change

Decision-making on water resource planning is challenging under conditions of uncertainty created by climate change. Variability, unpredictability and known deviation from past rainfall patterns, combined with the unknown direction and magnitude of the deviation, create a two-fold risk: not committing to expensive large-scale water supply infrastructure investments entails the risk of facing inadequate water supplies in future; committing to these investments on the other hand has the risk of future rainfall turning out to be adequate and the additional infrastructure redundant. A scenario-based approach, starting out from an understanding of system vulnerability and sensitivity under different scenarios, makes for more informed, evidence-based decision-making. Thinking in terms of adaptation pathways allows for flexibility as we learn more over time. And water supply system cost and reliability can be traded off in societal negotiation.

The lesson around climate change is around adaptation to climate and to changing conditions

Dr Kevin Winter

Climate change is here, now, it's real and it's happening, and the way that we manage our systems and the way that we plan for events like this and future events has to be completely different

Claire Pengelly

KEY POINTS

- The City of Cape Town executive management team had a very tangible experience during the crisis that they could not depend on past rainfall patterns as an indication of future trends, as climate change had made the past an unreliable predictor of the future

- Climate change introduces a high level of variability and unpredictability into the system

- While scientific opinions cluster around a consensus or best estimate of what rainfall might look like in the future, there is quite a wide range of uncertainty around that estimate – including outlier forecasts that foresee an *increase* in rainfall

- This uncertainty makes planning and decision-making around water resource infrastructure very difficult

- Water resource infrastructure by its nature requires large investments; avoiding the cost of these investments entails the very real risk of large urban populations facing inadequate supplies of water in future should rainfall turn out to be insufficient; on the other hand, committing to these investments brings with it the equally real risk of setting up substantial infrastructure at huge public cost that is wasted as the infrastructure turns out not to be needed when rainfall is sufficient

- What climate change asks of us is to be flexible in our thinking around how the water resource system might evolve in the future

- The first step is understanding the vulnerability, sensitivity and exposure of the system under various scenarios of how rainfall might change in the future, then making decisions around what your response is going to be under these different scenarios

- Rather than committing to a huge master plan that leads you to building a massive and expensive system with the risk of redundancy, think of a pathway where you have flexibility in the decisions you make through time as you learn more and more about what climate change is actually going to be doing

- Higher increments in system reliability come at increasing cost; a societal negotiation can allow for the explicit trading off of cost and risk, possibly culminating in lower cost combined with higher tolerance of periodic restrictions

Interviewees in order of appearance:

Dr Kevin Winter
Senior lecturer: Environmental and Geographical Science, University of Cape Town

Claire Pengelly
Water programme manager: GreenCape

Councillor Xanthea Limberg
Mayoral Committee Member for Informal Settlements, Water and Waste Services and Energy, City of Cape Town

Prof Mark New
Pro Vice-Chancellor for Climate Change: University of Cape Town

Dr Rolfe Eberhard
Independent public policy advisor

Dr Piotr Wolski
Research associate: Climate System Analysis Group, University of Cape Town

Full interviews on Cape Town Drought Response Learning Initiative website

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Opinions expressed by interviewees are personal viewpoints
and do not necessarily reflect those of their organisations

STRUCTURE

00:00:05 Hooks:

- Question is how we adapt to changing conditions (KW)
- Climate change is already a reality, so planning and management of our systems has to be different (CP)

Challenge set up; then approaches towards resolution articulated:

00:00:56 **DIFFICULTY OF WATER RESOURCE PLANNING UNDER UNCERTAINTY**

- Variability and unpredictability are hallmarks of the conditions we have to deal with, as is the fact that past weather patterns are no longer reliable predictors of the future (KW, XL, CP)
- Climate science also presents us with quite a wide range of uncertainty around best estimates / consensus rainfall predictions (MN)
- Water resource planning very difficult under these conditions, because:
  - by nature capital intensive and requires large investments, and difficult to motivate big investment decisions without data to back them up;
  - hence two-fold risk:
    - risk of doing nothing and then facing situation of inadequate water for large population;
    - risk of investing to secure more supply and then sufficient rains make investment redundant (MN, XL)

00:06:06 **THREE TOOLS: SCENARIO-BASED PLANNING – ADAPTATION PATHWAYS – SOCIETAL NEGOTIATION AROUND TOLERANCE OF RISK**

- Scenario-based planning: know spread of possible changes in rainfall we might have to cope with; understand vulnerability and sensitivity; ask where you might end up under different possibilities (MN)
- Adaptation pathways: rather than committing to master plan for massive system with risk of redundancy, think of pathway with flexibility in decisions you make through time as you learn more (MN)
- Societal negotiation: higher increments of reliability of supply come at increased cost; trade off against higher tolerance of risk (MN)

00:15:34 Close:

Challenge is for citizens to accept expensive infrastructure sitting idle as necessary cost to increase the resilience of the system (RE)

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00:00:56 "The lesson that comes out of this is that we need to be increasingly prepared for these kinds of scenarios where that drought is not just a year or two but longer, and we're seeing that from other countries as well …; the lessons are how we begin to adapt to these conditions which suggest weather variability and / or climate change …; those are a long-term climatic adjustment that we need to start making, and adapting to that change and anticipated change" (KW)

00:01:53 "The key learning lesson of 2017 was that we couldn't depend on the normal standard historic rainfall data that we would normally receive because climate change had, you know, made that completely unreliable" (XL)

00:02:16 "The reality is that the lesson that we've learnt is that climate change produces a high level of unpredictability into the system, and the way that we plan, and the way that we manage has to take that into account; we can no longer take historical trends of rainfall for granted …; so we have to not only have some redundancy built into our system, and expect and pay for that redundancy, but we also have to be ready, so we also need to understand that the means in which we need to respond to events has to be much quicker …; if this is our new reality and this is what climate change brings we just have to change our entire perspective on what it means to live in a drought-stricken environment …; like a lot of people I understood that there was going to be a drying trend, that we would see less water in 2050, but I think what it highlighted for me and it highlighted for a number of people throughout the city is that in fact the way that we will feel climate change is through extreme events and that the severity and unpredictability of the droughts that we experience in this region have been accentuated because of climate change and it's going to only accelerate" (CP)

00:04:03 Much of our planning in future will happen in a climate of complete unpredictability; this is very difficult because "much of what you have to put in place comes at a massive cost, and how do you work from an informed point of view, how do you motivate for the resources that you need to invest without having the data to back it up" (XL)

00:04:39 "One of the issues is that we're not hundred percent certain about what the climate of the future is going to look like; we have a general idea, we have sort of a consensus or a best estimate of what rainfall might look like in the future, but quite a wide range of uncertainty around that; in fact, some of the more sort of outlier type forecasts actually show an increase in rainfall, which then makes planning for water resources very very tricky" (MN)

00:05:25 "Within that environment you can either wait and see, but you are waiting and seeing with the real risk of not being able to provide an adequate level of water to a population of over four million, or you can act, potentially with the very real risk

of spending a lot of resources and then the rain comes …; very very hard decisions to make" (XL)

00:06:06 "So what climate change actually asks of us is to be a little bit more flexible in the way we think about how this water resource system might evolve in the future"; embrace uncertainty rather than running away from it; uncertainty inherent in dealing with the future; there is loads of uncertainty unrelated to climate change and we seem to manage to deal with it; climate change shouldn't be any different; "thinking about water resource planning, one way to work with that is to really look at scenarios; so we know the spread of possible changes in rainfall that we might have to cope with, and the first thing to do is to use those as scenarios of what might happen and understand what it would mean for water security if any of those actually played out; and that basically tells you what your sensitivity is to an uncertain future"; that's always the first step: "understanding your vulnerability, your exposure, your sensitivity, even if you don't know exactly what's going to happen"; then you can start making decisions around what your responses are going to be; take some kind of scenario-based approach "that allows you to say, from the state that the system is in today, under different possibilities of what might happen to the climate over multiple years, where might you end up?"; at least get qualitative assessment of likelihood of different end states; "and that would then provide I think a much stronger evidence base to make critical decisions at the right time to be able to navigate away from highly risky end states" (MN)

00:08:19 Appropriate approach: scenario based; build a plan that is adaptable as circumstances change (RE)

00:08:30 Very limited ability to forecast; "but, you know, a lot can be gained from monitoring, from observing actual current situation, and trying to interpret it as the season goes, and responding as fast as possible to what is happening currently …; but it requires innovative thinking, it requires thinking slightly outside of the box, and it requires creating systems that are able to accommodate that information, and put it into practice, put it directly into communicating the current situation, and reacting to it in terms of, you know, how do we manage dams, whether or not we call for water restrictions and so on" (PW)

00:09:35 Early stage of drought: very little thinking about what would happen if we had more dry years; by the end of drought there were all sorts of probabilistic or scenario-based analysis; "I think we would have probably been better positioned had that kind of analysis really been done more rigorously right at the beginning because then it could have actually been used as evidence to … make suggestions about when particular interventions in terms of water restrictions or actually really thinking seriously about emergency augmentation options come into play"; hopefully that kind of scenario-based methodology to deal with uncertainty about how the system might evolve becomes part of planning on ongoing basis; will

help to know what the response options are, and help to make critical and sometimes tricky political or economic decisions, based on much better evidence to motivate decisions; vision of more rational decision-making (MN)

00:12:19 Concept of adaptation pathways: "rather than having a huge master plan that leads you to building this massive system that might become redundant, think of a pathway where you have flexibility in the decisions you make through time as we learn more and more about what climate change is actually going to be doing" (MN)

00:13:53 Concept of negotiation with society: trading off cost savings on increasingly expensive higher increments of reliability of supply against tolerance and acceptance of higher risk of failure: "almost like a social compact, or a socio-economic compact around what level of reliability we actually want to work with; so designing the system going forward is a negotiation I think between what we can do to augment the supply and what that would cost and what we would be prepared to tolerate in terms of risk, and finding a negotiated sort of cross-over point between the cost of engineering the system, engineering the hell out of the system if you like, so that it almost becomes climate-proofed, which becomes more and more expensive for each increment in reliability you're interested in versus the risk tolerance of society …; much more of a negotiated process of agreeing what the system should look like against a given reliability level that society agrees on" (MN)

00:15:34 The way that water is managed will also change: with more expensive water in the system, this will be implemented on what is called a dispatch basis: "so when the dams are full, the desalination plant will not run, but when the dams are low, the desalination plants will run; the challenge here is to have expensive infrastructure sitting idle and for citizens to accept that this is a necessary cost to increase the resilience of the system" (RE)

Suggestions for discussion:

- How would one go about applying scenario based thinking around water resource planning in your circumstance? What data inputs would be required to underpin the discussion, and is there sufficient political will to look at the full spectrum of possibilities?
- How would one then go about thinking in terms of adaptation pathways over time, in your circumstance?
- How might one go about in practice implementing the notion of societal negotiation around water supply system cost and risk of failure?

Further references:

- For more on climate change science and water resource planning, see full interview with Prof Mark New in the Cape Town Drought Response Film Library
- For more on climate research and adaptation, see full interview with Dr Piotr Wolski in the Cape Town Drought Response Film Library
- For more first-hand reports on the city executive-level experience of having to make critical decisions under conditions of climate uncertainty, see full interviews with Deputy Mayor Alderman Ian Neilson and Councillor Xanthea Limberg in the Cape Town Drought Response Film Library

Source material from the Cape Town Drought Response Film Library,
a research resource of the University of Cape Town's African Climate and Development Initiative

The film library was established with the generous financial support of:
The Resilience Shift, Old Mutual, Nedbank, Woolworths, Aurecon, PwC, Arup, GreenCape and 100 Resilient Cities

Produced by the Cape Town Drought Response Learning Initiative for The Resilience Shift
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26 July 2019