

# The 2017/18 Cape Town drought: A sociotechnical systems analysis

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## THE WORK IN CONTEXT

Our world has become increasingly interconnected and complex. In human factors and ergonomics (human factors) this complexity has been recognised by a growing number of researchers and practitioners as humans face a number of global crises that seriously threaten human wellbeing (and possibly our own existence as a species). Globally-challenging issues such as energy supply, urbanisation, health provision, violence and terrorism, food supply, and water scarcity have now been investigated and interventions implemented by people working in the human factors field. While most of this work has been at a relatively small scale, several human factors authors (including the authors) have suggested that there are now a variety of human factors systems analysis tools that can be used to analyse and find solutions to incidents and unfolding situations at a much larger scale including the analysis of trading on the darknet and an international food scandal. In 2018 the city of Cape Town was literally days away from shutting off the municipal water supply to four million residents. Persistent drought, exacerbated by climate change, had led the city to announce ‘day zero’ – the day when the potable water supplies would be shut off and water would only be available from water tankers at designated safe zones. This didn’t happen. The rains started falling and the water supplies were replenished. In safety science analysis this would be referred to as a near miss. Was this luck or the result of concerted efforts by city officials and the associated human systems (such as residents, engineers, scientists, local government, and national government)? This is the question that we investigated in this paper by examining the human-systems interactions as they unfolded over time from a sociotechnical systems perspective using a series of four STAMP analyses.

## KEYWORDS

Global challenges, drought, systems analysis tools, sociotechnical systems

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## A brief outline of the work carried out

Taking a sociotechnical systems analysis perspective meant that this study involved conducting a series of four STAMP (Leveson, 2004) analyses based on a document analysis of media reports and official communications. We were specifically interested in understanding how this messaging unfolded over time. The Cape Town water crisis was not a single event but consisted of four relatively discrete time periods:

- 1) Before the drought (a time period between droughts where water was relatively abundant).
- 2) The ‘new normal’ (a time period where water was available but a period of drought was unfolding – called the new normal because regular periods of drought were acknowledged to occur).
- 3) ‘Day zero’ (a time period where the drought had persisted for longer than normal and it was recognised that water would run out if the drought persisted).

- 4) Post-day zero (a time period following the drought where rainfall was more regular).

### **Findings/solutions (the outcome)**

Each of the STAMP analyses demonstrated that the city's response to the complex crisis had several interlinked control issues related to management decision-making. These issues were complicated by political power plays at the regional and national level. In fact, it was not possible to implement several possible interventions because of the higher-order political situation. Some interventions at the consumer level worked extremely well to raise awareness whereas other interventions served to exacerbate the situation (for example increased tariffs and the 'day zero' campaign). The analysis also demonstrates the relationships between the different unfolding stages in a manner similar to Gunderson and Holling's (2002) panarchies (how decisions at one stage provide constraints and opportunities for the future stages). The analysis also reflected interactions between top-down (for example actions on the part of the city officials and policy-makers) and bottom-up (for example community groups, Cape Town civilians). We use the analysis as a basis to motivate our current work, which is aimed at exploring the possibility of using community-based strategies to further improve the resilience of Cape Town city to future drought cycles.

### **Impact**

Since drought in this region is cyclical, the analysis provides valuable evidence of the system-based influences (particularly the blockage points) that city management and policy-makers can use for inevitable future drought situations. However, further data from the key stakeholders themselves is planned and will help to unpack in more detail why certain interventions failed whereas others succeeded.