Mixing Water and Behaviour Change: A Case Study of Nudging in the City of Cape Town

Report to the

WATER RESEARCH COMMISSION

by

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EXECUTIVE SUMMARY

BACKGROUND and MOTIVATION

South Africa has been in the grip of one of the worst droughts in decades with eight provinces having been declared disaster areas (all provinces except for Gauteng). The news that Cape Town could be the first major city in the world to run out of drinking water made headlines across the world in the beginning of 2018. In 2016, the University of Cape Town ('UCT') in collaboration with the Water Research Commission ('WRC') and the City of Cape Town ('CoCT') concluded a large-scale study on the impact of nudging to motivate water conservation amongst residential households in Cape Town. The study saw 400,000 households in Cape Town targeted with a series of nudges via an insert included within their monthly utilities bill. Households received one of eight forms of nudges, either addressing informational failures around price and usage of water or promoting water conservation via social incentives and appeals to the public good. All treatments successfully induced a reduction in household consumption, ranging from 0.57% for the tips treatment to 1.86% for the social recognition treatment.

The successful implementation and positive results motivated the CoCT to extend the aims of the original project into a second phase, with a focus on capacity building within the municipality. While the first part of the research project focused on the design, implementation, and analysis of the behavioural nudges, the second phase intended to transfer knowledge and skills between the UCT researchers and the city officials in order to institutionalise the learnings from the study. From a policy perspective, it was also important to assess how behavioural interventions impacted water demand in the longer term, and how behavioural interventions compare to more traditional policy tools, such as tariff increases and water usage restrictions. This research report serves as a summary of the events that took place within the second phase of the project.

AIMS of STUDY

The core aim of the study was to build capacity within the municipality in order to enable the institutionalisation of nudges within the Water Demand Management function. This was achieved through the following three objectives:

- to obtain financial buy-in and support from the CoCT to co-fund behavioural economics interventions and to formalise an agreement;

- to ensure transfer of the information and learnings acquired during the design and roll-out of the behavioural study to the CoCT, and to provide municipalities with additional tools, skills and knowledge for promoting water conservation in the future;

- to conduct further analysis of the original study data, including an assessment of the long-term impacts of nudges and their relative effectiveness compared to tariff changes or the implementation of restrictions.

APPROACH

Due to the study taking place within the height of the water shortage crisis in Cape Town, it was necessary for the study to be flexible and adaptive in its approach. The municipality was extremely resource-constrained due to the increased workload involved in managing the crisis, and new channels of authority and oversight meant that it was increasingly necessary to be willing to adapt. To this end, primarily a collaborative, action research-based approach was used as a means to transfer skills and initiate the foundational work on how to include behavioural insights within the CoCT's water demand strategy. Beyond this, the role of EPRU was to support the municipality in managing the drought crisis through the use of nudging and ad hoc consultation and analysis.

The study incorporated design, implementation and analysis relating to two distinct nudge interventions – the Green Nudges and the Cape Town Water Map, as well as further analysis of data originating from the original nudge study. In these instances, impact on water conservation behaviour was established through statistical analysis of water consumption patterns for households, using difference-in-difference equations based on water meter reading data.

The key outcomes from this study are as follows:

- **Financial buy-in*:*** Full buy-in was obtained from the CoCT in going forward with the study on the 29th of March 2017. The partnership between the CoCT and the study was formalised to include a funding agreement.

- **Knowledge and skills transfer:** Knowledge sharing and skills transfer was achieved across an extensive range of events, incorporating audiences of public, businesses, NGOs, academics and government officials from a local through to international level. The CoCT was provided with formal training in both the theory and practice of Behavioural Insight (BI), as well as having had opportunities to gain practical

experience through the ongoing knowledge support provided by researchers during the crisis.

Aside from the benefits of upskilling local (and provincial) government in BI, a powerful outcome of the BI Conference and Masterclass events was the formation of relationships between these levels of government, and across departmental silos and hierarchies. By establishing connections between these groups, there is the potential and motivation for future initiatives to complement each other and support collaboration for the benefit of civil society. It is hoped that this momentum and community built within these events translates into the establishment of an informal network of BI-savvy government officials that are able to interact and work across the traditional boundaries of government.

- **Innovation:** the study, in collaboration with municipal officials, worked collaboratively on two new nudge interventions, developing and implementing a new operational water demand management project (the City Water Map, hereafter referred to as the 'water map') that built on the findings of the original intervention. In doing so, it was used as an applied means to demonstrate how behavioural insights can be used in strategy formation. This objective was achieved successfully, with the CoCT and the research team working closely together to select, design, and develop the website as a practical expression of the strategy and learnings.

  Additionally, a guide to the process of implementing nudges from start to end was created and shared with the municipality. The guide documents the process of running a behavioural intervention and described the details and technical background required to roll out a behavioural nudges campaign in a utilities context.

- **Behavioural Analysis:** Extensive structured and ad-hoc analysis was completed over the duration of the study. The impact of behavioural nudges on the indigent population was analysed, and the non-responsiveness and undesired behaviour amongst lower income groups was unpacked.

  This analysis focused on the behaviour amongst low income domestic free-standing households in a sample of about 272,000 households in the City of Cape Town. Previous work in nudges in Cape Town has indicated that behavioural messaging is successful in curbing consumption amongst middle and high income groups – in a similar manner that nudges have evoked savings in other developed countries. This

research found that for low income households, this pattern hardly persists and that behavioural responses of the indigent subsample may in some case even be considered undesired.

Generally, the municipality is more concerned with changing the behaviour of the wealthier part of the population since they tend to consume most of the CoCT's water and are responsible for the largest share of payments by far. It is however important to consider that the low income group in the city constitutes more than a third of the entire population. It was found that cooperative behaviour (and conversely free-riding) is a three-edged sword in securing sustainable utilities delivery with average consumption levels, payments for services, as well as response to behavioural nudges influencing each other. The lower income groups are unresponsive to nudging or responded perversely with an increase in consumption. Indigent households who consume more to start with increased their consumption in response to social norm and social recognition messaging. This behaviour is not observed in a similar manner amongst non-indigents in the lower income quintiles and raises the question whether officially being registered as indigent has an effect on willingness to pay for services and feeling of entitlement to free-ride. At the same time, households with higher pre-intervention consumption values tend to pay their bills less often. In turn, conscientious payment of utility bills is also indicative of responsiveness to nudges with those households paying more of their bills being more responsive.

Further, the long-term analysis of the behavioural nudges study showed that the behavioural billing inserts motivated households to reduce their water consumption even after they no longer received the inserts with their monthly municipal bill. The empirical estimates show that the behavioural messages still affect water consumption in the same period two years after the initial messages were sent. There is no crowding out effect and reductions in consumption due to the nudges are on top of what tariff and restrictions have achieved. Particularly the graph and social norms messages still significantly decrease the treatment groups water consumption two years later. It is found that the total average treatment effect of the messages after the treatments were no longer sent to households is a consistent 1% reduction compared to the control group. Assessing the different treatments over a 2-year period shows that the graph treatment, the financial loss, and the social norm treatment show the strongest treatment effects. Behavioural messaging can hence be a viable addition to policy maker's toolbox when interested in affecting longer term behavioural changes.

CONCLUSIONS

Due to crisis management in the CoCT related to the drought, the timelines and some of the goals involved in the project were adapted to fit the unique constraints and challenges. Overall, having the study take place during this time gave the researchers an opportunity to work very closely with the CoCT in using nudges to create behaviour change during the height of the drought, and to observe how behavioural interventions can be leveraged in conjunction with traditional demand side measures during times of scarcity. The study ensured knowledge and skills transfer through a hands-on project collaboratively developed with the CoCT. The CoCT was also supported during the drought crisis through ad hoc consultation and analysis, such as assessing the impact of the letter to high consumers.

RECOMMENDATIONS

This study has informed policy makers in multiple ways. It firstly has shown that there is no “one size fits all” way of communicating the urgency of demand reduction during a time of crisis to a highly heterogeneous population. Policy makers need to consider the importance of different communication to different target groups, for example the indigent population or high consumers.

Further, municipalities need to move beyond price-based measures to reduce water demand and acknowledge that other measures such as campaigns, restrictions, and nudges have had bigger effects on consumption reduction during the Cape Town drought. Seemingly small savings in water due to behavioural nudging campaigns should not be overlooked because over a longer term, the accumulated impact that the nudges have is considerable and very cost-effective compared to alternative options.

When designing and implementing innovative ways of demand management in the future, municipalities should make use of latest technologies to communicate with residents and investigate how data that is already available internally can be used in novel ways.

Overall, the study recommends more collaborative work between researchers and government, but also within different levels of government, such as between the city and provincial level.

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LIST OF ABBREVIATIONS

Abbreviation	**Description**
CoCT	The City of Cape Town
EPRU	Environmental Economics Policy Research Unit within UCT
MoU	Memorandum of Understanding
OECD	Organisation for Economic Co-operation and Development
RUBEN	Research Unit in Behavioural Economics and Neuroeconomics
UCT	University of Cape Town
Water Map	The City Water Map
WCG	Western Cape Government
WDM	Water Demand Management
WRC	Water Research Commission

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1 INTRODUCTION

The news that Cape Town could be the first major city in the world to run out of drinking water made headlines across the world in the beginning of 2018. “Day Zero”, the day that Cape Town residents would no longer receive water through taps in their homes and would have to collect their daily allocation of 25 litres of drinking water at 200 collection points across the city, attracted global media attention.

Cape Town’s water supply system is 88% dependent on rainfall (CoCT, 2018). In 2017, rainfall near Cape Town’s reservoirs was at record low with the years of 2015 to 2017 being the driest three-year period in recorded history. At the same time, Cape Town has been experiencing exponential population growth with an increase in population of 46% in 15 years (CoCT, 2012). However, while population increased, water demand management became more efficient holding water usage at similar levels over years.

While the CoCT explored options to acquire water from other sources (such as ground, re-used and desalinated water), they strongly increased efforts to manage demand down as much as possible. Water restrictions were implemented to limit daily water consumption per person – at the height of the drought residents were allowed to use only 50 litres per day. Corresponding with this, the CoCT launched communication campaigns and provided information to drive behaviour change, such as making household consumption data visually available via a map website to motivate households to stay within usage limits. Pressure reductions (throttling zones) were initiated and water management devices were installed in households that did not reduce consumption. Additionally, punitive tariffs were introduced to dramatically increase costs for households that were consuming large volumes of water. All interventions combined enabled Cape Town to dramatically reduce its water consumption by around 50% in less than 3 years.

1.1 Project Background

In the context of this water crisis, the research team evaluated the impact of various behavioural messages in reducing residential water consumption. In this setting, the intervention provided a test of the ability of behavioural messages to, firstly, encourage water conservation in times of water austerity and, secondly, reinforce efforts by local municipalities (using more conventional instruments) to reduce water consumption.

Eight different behavioural messages were sent to around 400,000 residential households over the period of November 2015 to April 2016. The messages were sent as inserts with the monthly utility bill and classified into two distinct groups:

The **first group** of messages promoted water conservation by addressing informational failures around price and usage of water.

Informational failures, which are prevalent in a water context, likely play a role in inefficient resource usage. In the case of usage, water consumption is often unobservable (toilet flush, washing machine, irrigation, and leaks) and, even in cases where usage is visible, it is not always easily quantifiable, for example, the amount of water used in a shower. Given that quantifying the water used by appliances, toilets, irrigation systems, showers, etc. can be both complex and costly, water usage becomes a de facto unobservable characteristic, receiving less weighting than other preferences (adapted from Ramos et al., 2015). With respect to *price*, consumers are not responsive to price signals when price information is unclear and the pricing system is complex (Ramos et al., 2015; Chetty et al., 2009; Gaudin, 2006). This is particularly true of water where (i) conventionally metered consumers pay for water ex-post and not at the instance of usage and, (ii), the tariff structure used by municipalities are often complex and nonlinear – such as the inclining block tariff system used by the City of Cape Town where marginal prices increase with consumption. While elasticity of demand for water has typically been found to be inelastic (Olmstead et al., 2007), recent literature suggests that consumers are simply inattentive to price changes and thus fail to respond appropriately (Chetty et al., 2009; Datta et al., 2015; Gaudin, 2006). For example, it has been found that consumers underreact to non-salient taxes and shipping costs (Chetty et al., 2009; Hossain & Morgan, 2006). Anecdotal evidence from focus groups held in Cape Town indicated that consumers were not aware of the quantity of water they use, the stepped tariff structure or tariff rates.

With this in mind, when operating in an environment with complex (non-salient) pricing and lack of transparency around usage, households might consume outside of their private optimum. In such a case, sending households regular feedback on both price and consumption (and making both more salient), may provide a private signal whereby utility maximizing people get closer to their private optimal water use. For example, Gaudin (2006) finds that elasticity of demand increases by at least 30% when price information is provided on the bill.

Against this background, the research team designed a series of treatments to address these informational failures around usage and price. The *tips treatment* demonstrated how to reduce water and quantified the water saving associated with each water-saving action. The *tariff graph* treatment provided a visual break-down of the nonlinear tariff structure and situated the household's consumption within six tariff blocks. The *financial gain* treatment replicated the graphic in the tariff graph treatment and additionally quantified the projected monthly and annual savings from reducing consumption and moving into the preceding tariff block. The *loss treatment* was identical to the gain treatment, but quantified the financial dissaving from not reducing consuming and moving to a lower tariff block.

The **second group** of messages promoted water conservation via social incentives and appealed to the public good.

Social norm messaging is increasingly seen as a useful mechanism for promoting pro-environmental behaviour. Allcott (2011) and Ferraro & Price (2013) find that social-norm based appeals reduce US energy and water consumption by 2% and 4.8% respectively. The literature indicates that social comparisons inherent in social norm messaging facilitate social (observational) learning about a households' privately-optimal level of water usage (Allcott, 2011). In the *social norm* treatment, a household's consumption is compared to the average household in their neighbourhood. As the success from using social norms has been well documented, this framing was used as a benchmark for which to compare the effect of other treatments.

Social pressure can be leveraged to drive pro-social behaviour – particularly if social recognition is provided for positive (do-gooding) behaviour. For example, in a lab setting, experiments have demonstrated that revealing identity increases public-good contributions (Andreoni & Petrie, 2004; Rege & Telle, 2004). Randomized field experiments have used social recognition to increase public good contributions in varying public good contexts, for example, charity contributions, voter turnout and blood donations (Gerber et al., 2008; Lacetera et al., 2011). In the context of pro-environment conservation, Yoeli (2009) examines take-up of energy-saving technology in California. Customers whose decisions are made public are 1.5% more likely to sign up for the technology as compared to those customers whose decisions remain anonymous. In the *intrinsic motivation* treatment, households were asked to help the City save water by supporting a City-led water saving initiative and reducing consumption by 10% over the study period. In the *social recognition* treatment, households that succeeded in reducing their usage by 10% were publicly recognized on the City's website.

Water scarcity is a public goods dilemma: while a significant aggregate reduction in water consumption is needed to obviate the impact of the drought, the benefits of water saving are shared equally by all households irrespective of individual contribution, creating an incentive to free ride (Hasson et al., 2010; Brekke et al., 2008). However, evidence from lab experiments shows that, while the dominant strategy in linear public good games is for each player to contribute nothing, subjects make positive but suboptimal contributions to public goods (Cherry et al., 2005). The *public good* treatment appealed to all households to conserve as much water as possible. The public good appeal might alter the moral cost of water usage or, alternatively, generate conditional cooperation whereby households alter their usage in the belief that others will do the same (Allcott, 2009; Gächter & Herrmann, 2009).

In terms of the results, the *social recognition* framing consistently outperformed the other messages over both the short and long(er) run. It was thus found that public recognition of water-conservation efforts was the most effective motivator of pro-environmental behaviour. More specifically, over the full intervention period (December 2015-April 2016), it was found that *all treatments successfully induced a reduction in household consumption.* Reductions ranged from 0.57% for the *tips* treatment to 1.86% for the *social recognition* treatment. An important implication of these findings is the conclusion that behavioural messages are a useful mechanism even under conditions of water scarcity and can promote water saving on top of more conventional DSM tools. The findings suggested that behavioural nudges are a useful addition to the toolbox of DSM instruments available to policy makers and could realise significant savings at local and also national level if implemented during strategic periods.

1.2 Study Objectives

The successful implementation and positive results from this study encouraged the municipality to continue the collaboration with the UCT research team by extending the study into a second phase. While the initial phase had been focused on the design, implementation, and analysis of behavioural nudges, the second phase of the study was focused primarily on knowledge and skills transfer between the UCT researchers and the CoCT officials to institutionalise the learning from the study.

In this way, the overall objective of this study was to scale up the application of behavioural nudges and institutionalise them within the municipality through capacity building and transfer of knowledge. To ensure this took place, researchers and CoCT officials worked together on a variety of collaborative initiatives including local and national workshops, strategy and future directions development, the design and implementation of a new behavioural intervention (the Water Map), and ongoing consulting throughout the water crisis.

Aim 1: *"Reach a formal agreement with COCT which ensures full financial buy-in and support going forward."*

The first objective of the second phase of the study was to obtain financial buy-in and support from the CoCT to co-fund the new project and to formalise a contractual agreement to define the terms of operation. During 2016/17, the UCT and CoCT teams formulated the MoU which formed part of the overall Buy-In agreement (Deliverable 1) with the CoCT. Formal approval to proceed with the study was obtained from the CoCT on the 29th of March 2017.

Aim 2 from the MoU: *"Implement measures to ensure that knowledge and skills transfer occur that will allow for the integration of behavioural interventions within the ambit of the City's DSM tools/strategies"*

The study aimed to ensure that the transfer of information and learnings acquired during the first phase of the project took place effectively, thereby providing municipalities with additional tools, skills and knowledge for promoting water conservation. This objective would be met through the production of a technical process document which would describe the details and technical background required to roll out a behavioural nudges campaign in a utilities context. Local and national workshops would also take place to provide further skills transfer.

An additional objective within this to ensure integration of BI into strategy was for the research team to work collaboratively with the CoCT on how to apply and extend the insights from the first stage of the behavioural nudges study. An agreement was reached between all parties that the team would roll out a new operational WDM project, making use of the learnings from the original study. This hands-on project was used as a means to transfer skills from the researchers to the team within the CoCT, whilst helping the CoCT to realise their future strategy.

Aim 3: *"Examine how different behavioural messages influence residential water usage across all income groups over the long term."*

Aim 4: *"Compare the impact of a tariff increase on water consumption to the impact of behavioural messaging."*

Aim 5: *"Consider the impact on consumption of using behavioural messaging in conjunction with a tariff increase (relative to relying solely on a tariff increase)."*

Lastly, it was aimed to conduct further analysis of the data generated from the original nudges study. This included the assessment of the long-term impacts of nudges and their relative effectiveness compared to tariff changes or the implementation of restrictions.

A detailed description of each deliverable as per the MoU is included in Appendix A.

Approach and Methodology

The aims of knowledge transfer and institutionalising of nudges were achieved through a mix of activities. A series of workshops and events, incorporating both structured and unstructured knowledge transfer, were hosted and attended by the research team and municipality. In parallel to this, the groups worked together to co-develop a strategy for institutionalising nudges.

Two new behavioural nudging interventions were formulated and run during the period, in which the municipality took a more principal role in the conceptualisation and implementation to reduce future dependency on the research team and ensure that the processes were sufficiently institutionalised to continue without UCT involvement.

Further analysis was performed to evaluate the impacts of the new nudges as well as to interrogate deeper the original data set from the first nudges. Analysis primarily comprised of difference-in-difference, or 'DiD', calculations to establish their impact on water consumption levels between a control group of households not receiving the intervention, and those that did. The DiD estimate can be calculated within a regression framework:

Equation 1: Difference-in-Difference Regression Framework

$$Y_{kt} = \propto + \beta_1(Treated\ Individuals_k) + \beta_2(Post_t) + \beta_3(Post_t * Treated\ Individuals_k) + \beta_4(Trend) + \beta_5 X_k + \varepsilon_{kt}$$

where $(Treated\ Individuals_k)$ is a treatment variable indicating if the individual is in a treatment group, either before or after the intervention is received and $(Post_t)$ is a time variable indicating whether treatment has commenced. The coefficient β_3 on the interaction between the treatment and time variables $(Post_t * Treated\ Individuals_k)$ gives the average DID effect

of the programme. The variables ($Treated\ Individuals_k$) captures the underlying differences between treatment and control groups while ($Post_t$) captures the underlying differences between the two-time periods. It is also controlled for trend. Finally, X_k is a vector of controls, which are informed from the balance and pre-intervention trend regressions as well as the stratified randomisation.

In the case of the water map, due to no control group being present, evaluation of impact considered the social impacts, viewership of the map and the impact on consumption of a corresponding billing insert campaign run to promote the map.

1.3 Limitations and Challenges

By August 2017, following another winter season of low rainfall, the extent of the water crisis had become a point of major concern for both the CoCT as well as for scientists working on water issues. It had become clear that the study would need to be adapted to fit the challenges of the growing water crisis and the demands that this placed on the resources of the CoCT. With crisis management overwhelming the resources of the CoCT, the timelines and means to achieve the aims of the project had to be adapted to fit the unique constraints and challenges. This was discussed between project stakeholders and agreed as a reasonable and necessary deviation from the original plan that had been outlined in the contract.

Given the circumstances of the drought, the research team's technical expertise proved to be useful to the CoCT in many more ways than initially intended. The support took the form of providing information and technical advice, as well as assistance in the development and implementation of priority projects during the height of the drought. Throughout the crisis, the research team focused on building capacity within the municipality, helping the CoCT to develop internal capabilities in applying behavioural insights to relevant policy issues and evaluating the impact of such interventions. While the project deliverables had to be adapted to the drought situation, all changes were very much in line with the aim of transferring knowledge and skills from the researchers to the CoCT officials to build capacity.

As a result of the escalating drought, the strategy for integration and cooperation formulated jointly between the research team and the CoCT was to become more "hands on". An agreement was reached between all parties that the research team would roll out a new operational water demand management project (the Cape Town Water Savers Map), making use of the learnings from the original study, and use it as a means to transfer skills from the researchers to the team within the CoCT, whilst helping the CoCT to realise their future strategy.

Beyond the scope of what had been outlined in the project deliverables, the research team also helped analysing some of the interventions that were rolled out during the water crisis to curb water usage. The team analysed the impact of warning letters that were sent to households consuming more than 50 kl per month in the beginning of 2017 ("Green Nudges in the DSM toolkit: Evidence from Drought-Stricken Cape Town"). Further ad-hoc consultation was given around the framing and presentation of information to residents.

The following points summarise the changes made:

- ***Deliverable 4*** (Strategy for integration and cooperation) additionally incorporated the process undertaken in developing the Water Map.
- ***Deliverable 5*** was changed from "Pricing vs. Behavioural Instruments as DSM Tools" to subsequent behavioural initiatives the CoCT undertook based on previous learnings including the "*Green Nudges in the DSM toolkit: Evidence from Drought-Stricken Cape Town*" and a paper on the "*City of Cape Town Water Map*".
- ***Deliverable 6*** no longer only consisted of the analysis of the long-run effects of behavioural nudges but included an analysis of the impact that nudges had on the city's indigent population ("*Heterogeneous responses to behavioural messages: evidence from a large-scale randomised control trial in Cape Town*") and a paper on the long-run assessment of the nudges as well as the impact that tariffs and restrictions had on water demand during the crisis ("*Long-run effects of Behavioural Nudges vs Traditional DSM measures: What worked?*").

Overall, the water crisis presented the research team with an opportunity to work very closely with the CoCT in using behavioural insights to institute behavioural change during the height of the drought, and to observe how behavioural interventions can be leveraged in conjunction with traditional demand side measures during times of scarcity.

1.4 Overview of Report Structure

This introductory chapter is followed by a short literature review about behavioural insights and its application in policy making included in chapter 2, and a guide to the process of designing, implementing and evaluating behavioural interventions, including references to how this was practically applied in the city in chapter 3. Chapter 4 covers the local and national workshops that took place to transfer knowledge, as well as the collaborative development of a strategy to institutionalise nudges within the municipality.

The “Behavioural Nudge Interventions” chapter 5 outlines the work completed in relation to the three behavioural nudges implemented to reduce water consumption in the city. It includes details regarding the development and roll out of the Water Map and the letters to high consumers, as well as further analysis of the billing inserts.

A conclusion of the overall research study and key findings is included in chapter 6, including details on the innovations that were realised through the work. Lastly, the implications of the findings for policy making are presented in the final chapter 7 of this report. Supplementary information for all the above is included in the appendices.

2 LITERATURE REVIEW

The literature review included below is a summarised version of the most salient literature included from various reports produced for the project. More extensive literature is available on request from the research team.

2.1 Behavioural Sciences and Policy Making

Policy makers traditionally use price-based methods such as tariff or tax increases to change people's consumption behaviour. Another conventional tool in utility demand side management is to implement structural approaches, such as restrictions on water and electricity usage, or to provide information and education campaigns about the importance of conservation and providing explanations on how to save water and/or electricity. However, price changes and information campaigns have often shown minimal effects on consumption behaviour (Chetty et al., 2007; Olmstead et al., 2007; Nolan et al., 2008). Consumers lack transparent consumption information and are subsequently unable to understand how using the washing machine, taking a bath, or flushing the toilet relates to the total amount of consumption on their monthly utility bill. Further to this, consumers are unable to link consumption activities to costs, leading to them being unresponsive to price changes (Burgess and Nye, 2008).

Classic economic theory assumes that humans have complete knowledge of their available choices, can calculate each strategy's payoff, and make optimal choices accordingly (Jessoe and Rapson, 2012). Behavioural economics combines insights from psychology and economics to better reflect human decision-making acknowledging that humans do not always act rationally or have the computational abilities to evaluate all choices (Thaler and Sunstein, 2008). It recognizes that people have limits to information, attention, cognitive ability or resources when making decisions (Gigerenzer and Gaissmaier, 2011).

In recent years, public policy designers have therefore increasingly been using applied behavioural sciences to develop non-price based behavioural interventions that take true human decision-making into account and nudge people into self-beneficial behaviours. Behavioural insights can be used as complementary tool to more traditional policy instruments such as tariff increases and structural changes. Psychological cues, which combine insights from cognitive and social psychology and economic theory, are popular as policy instruments because they are cost-effective, less expensive than price changes and allow households to choose from the original choice set with the same relative prices (Allcott and Mullanaithan, 2010; Croson and Treich, 2014; Momsen and Stoerk, 2014).

Behavioural economists consider that people have bounded rationality, bounded willpower and bounded self-interest (Kahneman, 2003). Understanding the underlying behavioural mechanisms is pivotal to developing more effective and efficient government interventions and improving existing ones. An overview of behavioural mechanisms is provided in Table 3.

Table 1: Overview of Behavioural Mechanisms

Bounded Rationality
Individuals do not have unlimited information about all possible alternatives and their consequences, they do not have unrestricted cognitive abilities, or endless time to make decisions. Hence, people make decisions under constraints. Human behaviour therefore differs from the behaviour predicted by standard economic models of unbounded rationality. The way information is presented or phrased has an influence on an individual's decision-making (framing). Individuals focus on the information that is emphasised and overlook the rest. The pain of losing is about twice as strong as the pleasure of gaining (Tversky and Kahneman, 1992). People avert risks in the domain of gains, and seek risks in the domain of losses (loss aversion) (Tversky and Kahneman, 1992; Kahneman, 2003). Framing information in terms of loss or gain has an impact on people's perception of risk and behaviour. Using penalty frames rather than gain frames is therefore expected to motivate households to conserve more water. Loss aversion also explains the endowment effect and status quo bias. Individuals are biased towards what they already have (endowment effect) and value something higher if they already possess it compared to when they acquire it. Individuals also value their current option higher than alternatives (status quo bias).
Bounded willpower
People make decisions that they know are not in their long-term interest, for example, people smoke even though they know that it is bad for their health in the long run. People show inconsistencies in their beliefs and behaviour (cognitive dissonance) and consequently have a state of conflict in the mind. For example, if an otherwise water conscious Cape Town resident showers for 20 minutes, they would reduce their dissonance by changing attitudes or beliefs ("Residents should not be responsible for saving water"), justifying their behaviour ("I have been saving so much water elsewhere") or changing their behaviour ("I will not shower for 20 minutes again"). People show time-inconsistent preferences; they are attracted to immediately available rewards but are able to make rational trade-offs when the reward is delayed.

Bounded self-interest

People are not only self-interested but care about others, including strangers. Individuals' decisions are influenced by altruism, social norms and fairness.

People evaluate their behaviour in relation to other individuals, especially in relation to individuals who are close to them in terms of gender, age, social status, or educational level. Messages appealing to normative behaviour by providing feedback information to individuals about their own behaviour compared to the average individual in their social group have shown to successfully induce behaviour change.

2.2 Behavioural Levers and Interventions

Behavioural interventions are designed using insights from social or cognitive psychology experiments. Behavioural insights can be used to diagnose policy problems, to design and implement new policies or to improve existing ones. An overview of behavioural levers that have been used to inform policy interventions in multiple contexts are provided in the section below (following Mont et al., 2014).

Information Complexity and Framing

Information needs to be clear and accessible in terms of language and design. If information is too complex, individuals are unable to navigate, process, and understand it. Changing the structure or reducing the amount of information given to an individual can have a positive impact on the acquisition and processing of information as well as decision strategies and quality. Further, the way information is framed impacts the way it is processed.

For example, Gaudin (2006) analyses differences in informational content of utility bills (383 utilities across the US) and finds that when better price information is provided on water bills, consumers show stronger reactions to changes in price. Consumer understanding of their water consumption was increased, and water conservation was encouraged. Sending households regular feedback on both price and consumption – and making both more salient – could help households to reach their optimal water use.

Changing the Environment or Changing the Defaults

Individuals are influenced by the way in which their external environment is structured, for example, changing the presentation or arrangement of available products has an effect on the purchase behaviour of consumers. If a supermarket wants to encourage its customers to buy

healthy products, simply placing them in a more visible spot impacts consumers' purchase decisions.

Individuals often don't make active choices but rely on the option that has already been selected for them (Allcott and Mullainathan, 2010). Loss aversion and the endowment effect, but also procrastination and inertia, lead people to stick with the default option. To increase the amount of renewable energy used, policymakers could set the default energy contracts to 50% renewable energy and 50% conventionally produced energy and thereby increase energy efficiency (Pichert and Katsikopoulosa, 2008).

Providing Social Norms

Empirical evidence has shown that a household's actual energy and water use is influenced by the perceived usage of other households because people benchmark their own consumption against peers (Schultz et al., 2007; Nolan et al., 2008). For example, comparing a household's consumption to that of the average for the neighbourhood, has a greater positive influence on environmental friendly behaviour than appeals to save the environment or be socially responsible (Schultz et al., 2007; Nolan et al., 2008).

Allcott (2011) tests a behavioural intervention by the home energy report company OPOWER across the U.S. and finds that using social norms results in an average decrease of 2% in energy consumption consistent over a two-year period. As part of the study, 600,000 households received feedback on their monthly energy consumption, were compared to the average household in their neighbourhood with regard to energy consumption and, finally, were sent personalised tips on how to conserve energy (Allcott and Mullainathan, 2010; Allcott, 2011; Ayres et al., 2013; Allcott and Rogers, 2014). The 2% average reduction in consumption is equivalent to a short-run electricity price increase of 11 to 20% or a long-run price increase of 5% (Allcott, 2011). This shows that non-price interventions can have effects on household electricity demand that are comparable to large price changes.

Ferraro and Price (2013) sent behavioural messages to water consumers in Atlanta, USA, and found that household consumption comparisons with the median use in the county (strong social norm message) had a greater impact than pro-social messages highlighting the importance of saving water (weak social norm message) or informative messages which gave tips on how to save water through behavioural or technological changes. The impact (4.8%) can still be measured two years after the study.

Pro-social behaviour can hence be encouraged by making social norms more explicit.

Giving Timely Feedback

Behavioural changes can be incentivised through feedback designs. In order to map behaviour to outcomes, individuals need transparent and frequent feedback information. It is important to minimise the time gap between intervention and target behaviour. Individuals' inattention and forgetfulness as well as time inconsistent preferences need to be addressed and attention needs to be directed towards the target behaviour (Rogers and Frey, 2015). Therefore, direct feedback given to consumers through smart meters are most successful in reducing energy or water consumption (Darby, 2001).

Rewarding (through money or public praise)

Pro-social behaviour can be driven by intrinsic motivation to contribute to society and achieve positive goals or by extrinsic motivation such as receiving external rewards like money or public praise.

Social pressure can encourage people to perform good deeds especially if norms attach reputational benefits to these deeds (Batson et al., 2003; Freeman, 1997). People like to think of themselves as altruistic and generous and want to have a reputation of being so (Dunning et al., 2012). Receiving public acknowledgement or social approval motivate people to behave socially, such as to conserve resources.

Motivating "good" behaviour using the concept of public recognition has been tested in a variety of settings from blood donations to charities to the workplace. In the context of pro-environment conservation, Yoeli (2010) studied take up of energy savings technology among around 8,000 electricity customers in California. Customers whose decisions were revealed to their neighbours were found to be 1.5% more likely to sign up than those whose decisions remain anonymous (when their decision was framed as a contribution to a public good). Publically recognising people's participation in the energy conservation programme was more successful than offering a $25 incentive.

Setting Measurable Goals

Future costs or efforts of performing a target behaviour can be reduced through commitment devices because less self-control, memory, or attention is needed. Commitment to a path of action in the future can be achieved through simply stating the commitment to a path of action or through entering a contract with peers to perform a target behaviour. Non-compliance can be punished with monetary loss or simply by peers seeing that the goal was not achieved.

Public good

Experimental evidence shows that people are not only driven by narrow economic self-interest but consider the broader implications of their actions and cooperate much more in social dilemma situations than predicted by standard economic theory (Hasson et al., 2010, Brekke and Johansson-Stenman, 2008). Not contributing to a public good is often seen as selfish free-riding behaviour. Conditional cooperation, reciprocity, and trust in others have been shown to explain people's positive contributions towards public goods. Previous research findings imply that it might be possible to leverage water scarcity as a public goods dilemma to incentivise conservation.

2.3 Behavioural Insights in South Africa

The Research Unit in Behavioural Economics and Neuroeconomics (RUBEN), based at the University of Cape Town, is an interdisciplinary group of researchers who use economic experiments to examine the role that social, cognitive and emotional factors play in economic decision-making. The Western Cape Government has been using behavioural insights since 2012, forming partnerships with local expert groups such as RUBEN but also international collaboration with the Organisation for Economic Cooperation and Development (OECD). Researchers from RUBEN have previously collaborated with the CoCT as well as with the Western Cape Government in applying behavioural insights in a water and electricity context. In two projects, Professor Martine Visser and Grant Smith used social-norm messaging to reduce residential electricity consumption (2013a) and residential water consumption (2013b) in collaboration with the CoCT.

In an application to electricity, Smith and Visser (2013a) randomly allocated a total number of 11,137 households from eleven different Cape Town suburbs into one of four treatments – each of which received a different insert with their electricity bill between January 2010 and December 2010. The study tested whether consumption declined when a household's monthly electricity consumption was compared to either the average consumption in their city or neighbourhood. The results of the study show that the treated households significantly adjusted their consumption towards the reported norm, irrespective of whether the social norm was the household's neighbourhood or city. Hence, the degree of social distance did not have an effect on electricity consumption levels.

With funding from the Water Research Commission, Smith and Visser (2013b) further tested the effectiveness of behavioural elements to reduce residential water consumption. The Randomised Control Trial was run in Cape Town in November 2012 involving over 280,000

households that received a once-off insert with their monthly utility bill. Raising water consumption salience, either by reporting a household's previous consumption in a bar graph or by comparing their consumption to their neighbour via a bar graph, was found to significantly lower water consumption. The use of social norms did not induce significantly greater behavioural adjustments than raising salience. Further, it was found that reporting consumption for the previous month was more effective than reporting the household's total consumption for the previous year. Merely providing water savings tips did not result in a noticeable reduction in household water usage.

3 DESIGN, IMPLEMENTATION AND EVALUATION OF A NUDGE PROJECT IN THE COCT

3.1 Introduction

The process of establishing a nudge intervention within a municipality necessitated a variety of strategic and operational tasks and considerations. This section of the report details the process, in terms of the logistics and technology that were required to roll-out the interventions used during the study. It thereby serves as a written transfer of knowledge required to allow for the integration of behavioural interventions within the ambit of the CoCT's DSM strategy.

Building on the theory explored in the literature review, the chapter provides guidelines on how to design, implement and evaluate a behavioural intervention, using the "Behavioural nudges for water conservation in Cape Town" study as a case example. Expanding on this, it provides insights into the processes that the research team went through during the different stages of the project and documents the technical and logistical issues experienced throughout the lifecycle of the study.

3.2 Process Guide

Although there are many methodologies to follow that serve to guide the process of implementing behavioural interventions, most incorporate some version of the steps shown in Figure 1. It outlines the tasks involved, from *defining the problem* and *designing the solution,* through to *implementation* and follow up *monitoring and evaluation.* Within each step, the case example of how the various tasks were addressed within the process of establishing the program within the CoCT is described.

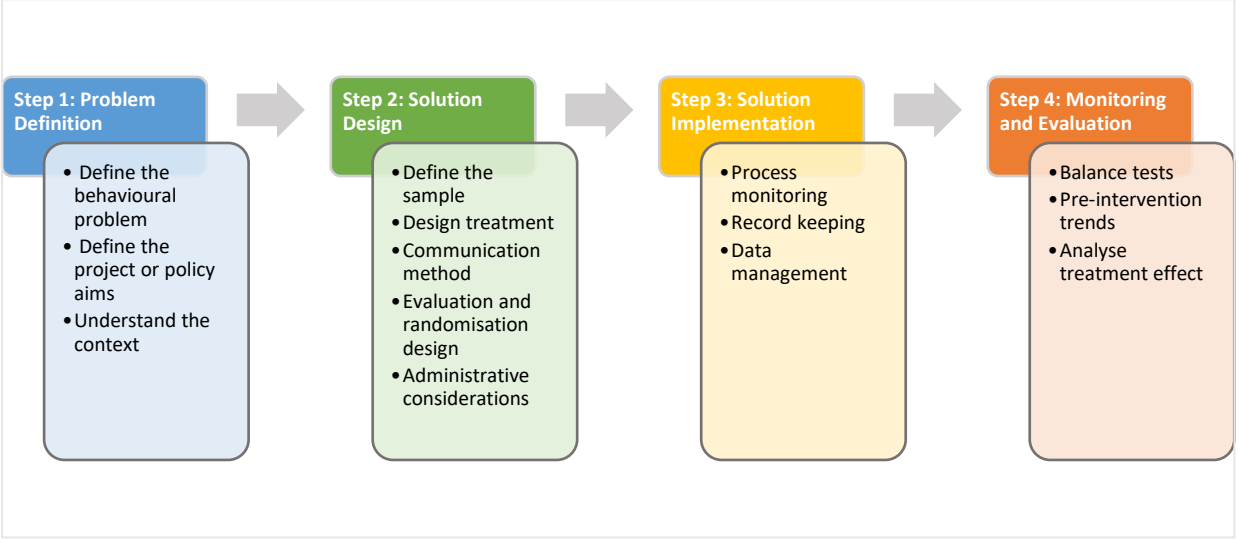

Figure 1: Behavioural Intervention Process Guide

Step 1: Defining the Problem

To begin with, it was necessary for the study to **clearly define the condition** that needed to be improved within the municipality, and the behavioural problem that needed to be addressed. To achieve this, focus groups were run at the University of Cape Town with cleaning, administrative and academic staff. These groups were selected to proxy individuals with low, middle and high income, respectively.

The main points that were addressed during the focus group discussions were the following:

- *Are people aware of/do they understand the Inclining Block Tariff system (with the step tariff being an implicit conservation tool)?*
- *Are people aware of what consumption block they are in?*
- *Are people aware of the link between water and sanitation?*
- *Do people read their bills and would notice an insert?*
- *What steps (if any) do people take to conserve water?*
- *What would motivate individuals to reduce water? For example, financial incentives, social recognition or environmental considerations.*

One of the main findings from the focus groups was that none of the participants (from any of the groups) were aware of the inclining block tariff – despite the fact that consumption at the different tariff rates is indicated on the bill. Focus group participants said that they rarely read the bill in depth but just glance at the amount owed and not at the quantity of water used.

These factors implied that the Inclining block tariff is not being effectively utilised as a conservation tool because there is a lack of understanding around the inclining nature of the tariff. Additionally, across all income groups, participants felt that financial motivations for saving water superseded environmental motivations. The insights from the focus group discussions were used to design the treatments for the study.

Step 1: Guide to Problem Definition

A problem definition must be formulated that states the problem and the aims of the project or policy. In order to formulate the problem definition, questions to consider include:

- *What question does the organisation want to have answered?*
- *What behaviour needs to be influenced?*
- *What needs to be achieved with the intervention?*

To define the problem, it is vital to understand the situation and the people who are involved. It is important to comprehend the context in which individuals perform a certain behaviour to be able to design a sensitive and practicable intervention (BIT, 2014). Since small changes to the context can have big effects on behaviour, it is necessary to look into the small details of a process (BIT, 2014). It also needs to be considered what the biggest constraints and enablers within a process or problem are. Various methods can be used to collect information on what behavioural mechanisms are underlying the issue that needs to be solved.

It also needs to be considered how the behaviour can be measured reliably and efficiently, and how large the behavioural change needs to be in order to make the project valuable (BIT, 2014).

Before data collection begins, researchers should check what information is readily available. Analysis should be performed on existing documents, databases, meeting notes, public records, evaluation of any similar programmes, and research reports. Where information is not readily available, it should be thought about who can answer the questions and information should be collected from them. This could be people with special expertise, residents, administrative staff, or policy makers. Information can be collected through structured questionnaires or through qualitative interviews in which groups of people or individuals are asked about their experiences and perceptions. Focus group discussions can give valuable insights to how the behavioural lever needs to be designed.

Step 2: Designing a Solution

Following the defining of the problem to be addressed, an appropriate solution was conceptualised, taking into account both the research design, and the design of the potential intervention.

<u>Defining the Sample</u>

In the study, the total sample that was targeted consisted of just over 400,000 residential households in Cape Town, South Africa, living in free-standing houses. All participating

households had access to piped water, an uncontrolled water supply and a conventional credit meter.

The following households were excluded from the sample:

- Households served by bulk water meters, such as a block of flats
- Households receiving electronic bills
- Households in the lowest consumption block (receiving the free allocation of six kilolitres of water per month)

While the CoCT gave the researchers permission to message households with indigent status, the proviso was that only certain messages were to be sent to indigent households: specifically, only messages without financial information such as the social norm, social recognition and public-good messages.

Designing the Treatment

The aim of the research was to test which treatments, delivered through monthly utility bills, best incentivise residential households to reduce their water consumption. Therefore, the researchers did not only test one behavioural insert but used eight treatments described within the introductory chapter.

Medium of Communication

Various mediums of communication were explored to facilitate the intervention aside from billing inserts, for example, households could receive short messages to their mobile phones throughout the month. However, the CoCT's mobile database was not large enough for the purposes of the study and there were concerns about the veracity of the data – for example, the mobile number might belong to a family member of the account holder as opposed to the actual account holder. Given these issues, it was decided to proceed with communicating to households via billing inserts only.

Designing for Future Evaluation

In order for accurate analysis of the impact of the intervention to take place, steps were required to ensure that the data collected would be appropriate.

For the study, October 2015 consumption data was used to randomise households into treatment and control groups. The randomisation process is illustrated in Figure 2 below.

Importantly, when randomising, households identified as having indigent status were not allocated to the tariff graph, financial gain and financial loss treatments. As these households receive a subsidy on their bill, the information on the inserts would be inaccurate (for example, specifying a total bill and monthly/annual savings which do not account for the subsidy).

In terms of the mechanics, before randomising, households in tariff block 1 and indigent households were excluded from the sample. The remaining sample was stratified on both suburb and tariff block and then randomised into control and treatment groups. Thereafter, the same procedure was followed with the previously excluded indigent households, who were then randomly allocated into the control group and tips, social norm, intrinsic motivation, social recognition and public good treatments.

In this way, households were allocated to the control and treatments groups for the first wave of inserts in November 2015.

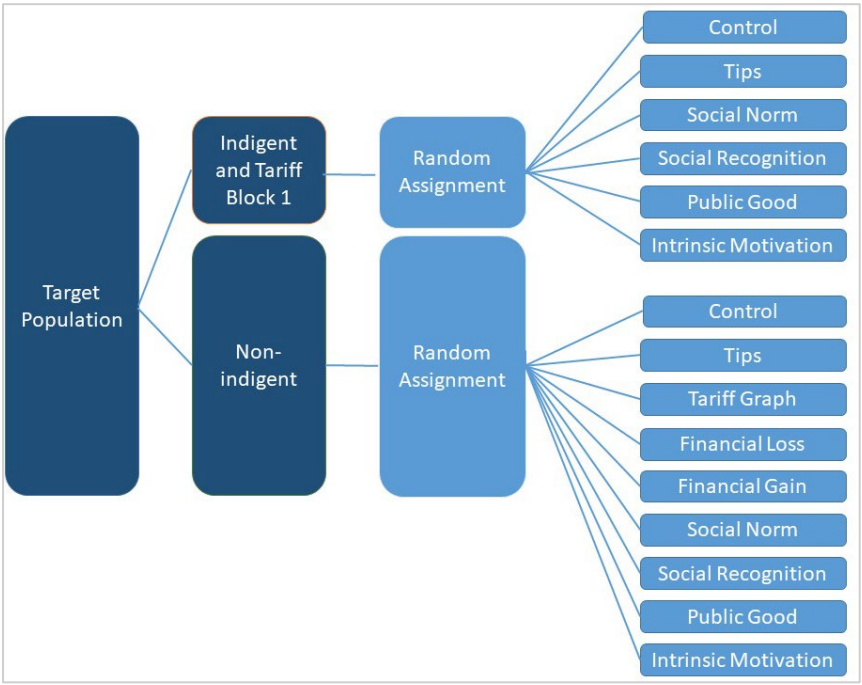

Figure 2: Illustration of the Randomisation Process

Other Considerations

Legal Considerations

One of the major legal issues in the research was whether messaging households via inserts in the monthly municipal bill constituted any violation of individuals' right to privacy. The CoCT's legal department found that there was no legal prohibition on facilitating a link between

the municipality and the research team which would enable the researchers to send messages with the utility bills. Additionally, the legal department found that these messages were very much within the ambit of the functions of the municipality.

In order to execute the research, the research team needed access to monthly municipal data. For example, for households in the social norm treatment, the neighbourhood averages from the previous month needed to be calculated and inserted into the bill for the current month. Furthermore, access to both historical consumption data and consumption data over the period of the study was needed to calculate the impact of the messages. Comprehensive approval had to be gained from various groups within the CoCT.

Finding a Study Collaborator

In the case of the research, common objectives were found with the department of WDM within the CoCT. As South Africa has been subject to extreme drought conditions, the proposed behavioural nudges were very much in line with the department's own DSM agenda. It is important to understand the chain of commands within the municipality and to find a collaborator that has authority to give permissions or is at least enthusiastic to drive the project forward and ensure that requests are going higher up in the hierarchy. In setting up the current study, the research team needed to liaise with a number of different departments in parallel. These included the Utilities Directorate, the Water Demand Management Department, the Legal Department, the Finance Department, Customer Services Departments (Call Centre), the Communications Department, the Revenue Department and the Billing Department within the municipality.

Knock-On Process Impacts

The research team worked together with the CoCT's call centre and set up a UCT-based call centre run by research assistants in one of the UCT research offices to answer any project-related queries. This was an important element in obtaining signoff for the study. The telephone number for this dedicated line was published on the tips page of each insert. The call centre at UCT was closed and the dedicated line was redirected back to the CoCT when it became apparent that most of the calls were about issues within the CoCT's domain, such as a pipe burst or complaints about water wastages.

Step 2: Designing a Solution

Defining the Sample

A sample is a subset of a population that a researcher wants to study, collect data on and make inferences from. The term "population" has a slightly different meaning in this case: it includes all members of a defined group that the researcher is interested in. The population could be all residential houses in Cape Town, it could be a specific area such as all residential households in Constantia, or a population with certain characteristics such as all individuals between the age of 20 and 30, or all South African matric students.

In order to avoid biased or unrepresentative samples, the sample is usually selected randomly – every member of the population has the same chance of being selected for the sample. It needs to be decided on the guidelines for which individuals can or cannot participate in the behavioural insights study. Thereby, it is decided on a number of characteristics that must be shared by all participants. Such criteria could include gender, age, income, suburb, level of education, employment status.

Designing the Treatment

Before designing the treatments, the underlying behavioural mechanisms that lead to the problem need to be understood and it needs to be decided on the behavioural levers accordingly.

- *Is the information presented in a way that is too complex?*
- *Are people biased towards their status quo?*
- *Do people lack information on what behaviour is "normal"?*

When the behavioural mechanisms that are potentially underlying the problem are chosen, the behavioural levers used for the policy intervention are identified. This could be providing social norms, changing the framing of messages sent to the public, or changing default settings. The BIT's EAST framework can help to design the behavioural insights used for the policy or intervention.

Medium of Communication

A crucial step of the study design is to decide on the means by which the message is transmitted to the information receiver. Different spaces should be considered that the behavioural levers could be tested in. The information could, for example, be conveyed

through a letter in the post, daily or weekly text messages, road signs, or the way that groceries are ordered on shelves in a super market.

Thereby it needs to be kept in mind, what medium of communication would have the biggest impact on behaviour change and if the target population can be reached through the selected medium.

Evaluation and Randomisation Design

Data about the implemented intervention needs to be accurately collected, analysed and evaluated in order to show the impact and effectiveness of the behavioural nudges. It is important to assess which treatment works and which one does not to ensure that time and money is spent on interventions with measurable positive effects. The results will indicate if the financial costs of the programme can be justified and if it is feasible to scale up the study.

Most interventions will use a randomised control trial to test the intervention's effectiveness. Randomised field experiments are used to scientifically measure the impact of an intervention on a particular outcome. In a Randomised Control Trial, study participants are randomly allocated into treatment and control groups. The treatment group(s) are exposed to the intervention (for example, they receive a social norm message) while the control group is not (for example, they do not receive an insert with their utility bill).

Randomisation is achieved when there is no pattern with regard to the assignment of subjects into treatment groups and control group and with regard to any known or unknown confounding characteristics of the subjects (i.e. it is not the case that households in the treatment group consume more water on average than households in the control group). Every household is as likely as any other household to be assigned to the control group or to any of the treatment groups.

When randomly allocating households to either treatment or control group, it is expected that if both groups had not received a treatment, they would have had similar average monthly water consumption. When individuals are randomly assigned to treatment and control groups, the groups will be unbiased in terms of confounding variables and there won't be a selection-bias (Duflo et al., 2008). Self-selection problems occur if participation in a study is voluntary because characteristics about households that volunteer could be different from households that do not volunteer. For example, if launching a programme that encourages consumers to voluntarily track their water consumption through a smart meter

reader, households that are already more likely to take steps towards water conservation would be more likely to sign up for the voluntary study.

In order to make causal inferences and obtain the average impact of the treatment, outcomes in the treatment group(s) (group of people that were exposed to the programme) need to be compared to outcomes in the control group (households that are not part of the programme). The difference in outcomes (for example average water consumption) between the two groups will tell us the effectiveness of the intervention.

When designing a randomised control trial, the power of the experimental design is the probability to correctly reject the hypothesis that there is no effect when the effect actually exists, given a certain effect size and statistical significance level (Duflo et al., 2008). Power analysis is used when designing a study to calculate the minimum effect size that can be detected using a given sample size. Effect sizes are important to calculate for the different treatments in order to interpret the effectiveness of the different billing inserts. Statistical significance alone does not give information about the magnitude of the effect, i.e. how much each billing insert affected household's daily average consumption.

To create a random sample, the population needs to be defined, it needs to be decided on the sample size – the sample size choices will reflect budget constraints and time limits. As next step, the entire population needs to be listed and each individual in the population needs to be assigned a number from 1 to N. A list of random numbers needs to be created for example with a random number generator and the numbers are used to select the sample from the population, as illustrated in Figure 3 below.

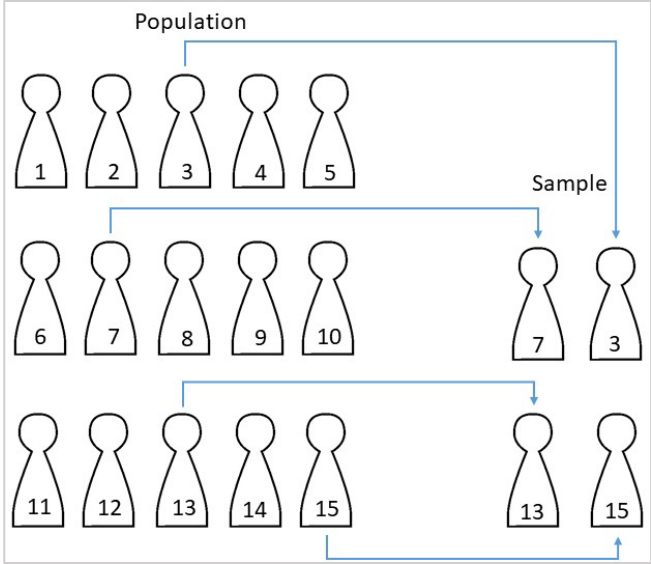

Figure 3: Choosing a Sample from the Population

Other Considerations

Legal Considerations

Before rolling out the behavioural intervention, legal clearance may need to be obtained, particularly where the intervention is taking place within a municipality or other government environment. The speed of this process can be prohibitive and should be initiated early in the process.

Similarly, in order to conduct and evaluate the effect of the study, the researchers might need access to highly confidential data. In order to obtain access to the data of interest, confidentiality agreements between the parties involved need to be signed. Furthermore, a Memorandum of Agreement (MOA) could be signed between the two (or more) parties that are interested in the design, implementation and evaluation of behavioural insights to the policy issue to ensure a common line of action.

Finding a study collaborator

If the work is happening within the municipality and it would be desirable to implement behavioural insights into the policy design, it is important to find other people within the municipality who are interested in designing and implementing the study. Invest time to find a team/person within the municipality where there are synergies between objectives and the specific municipal department's goals. It is important to understand the chain of commands within the municipality and to find a collaborator that has authority to give permissions or is at least enthusiastic to drive the project forward and ensure that requests are going higher up in the hierarchy. It is important to have a sense of who has the mandate to sign-off on interventions of this nature.

Knock-on Process Impacts

It needs to be taken into account what effect the introduction of behavioural insights into the design of policies has on the support services of the municipality. The municipality might be concerned that the behavioural messages would induce an increase in account-related enquiries to their call centre.

Step 3: Implementation

During the implementation stage of the research, the research team had to check and populate the behavioural inserts, run a call centre, and trouble shoot last-minute issues. The full

Process Report, available on request from the research team, gives a detailed list of the processes that the researchers went through during the roll-out of the study.

Step 3: Implementation

Throughout the implementation phase of the research, processes need to be monitored and record of the different steps need to be kept to allow for retrospective assessment.

Depending on the nature of the intervention, this may entail keeping track of the interactions between the municipality and the research team, reporting the progress of the study and ensuring that data is collected and reported in accordance to the protocol, and managing the data to ensure that data quality is high.

Step 4: Evaluation

In order to analyse the data for all treatments, the high-performance cluster hosted at the University of Cape Town was used. The data was stored on the cluster and requests were sent to the cluster online. A major drawback using the cluster was that it did not operate in real-time.

The research team used October 2015 data to randomise households into the treatment and control groups. As such, the same October 2015 data was used to check that treatment and control groups did not differ significantly in terms of monthly consumption, daily average consumption, property values and number of billing days. This was done using regression analysis.

Pre-Intervention Trends

Figure 4 graphically depicts water use trends in the pre-intervention period (December 2014-April 2015) (the intervention was run in December 2015-April 2016). From the figure, it is evident that there is a seasonal component to water usage: specifically, mean monthly consumption is higher in the warmer summer months. The increase over the summer months is due to both an absolute increase in consumption commensurate with both warmer weather and the holiday season (for example, filling pools and increasing the frequency of irrigation) as well as an increase in the billing period (number of days billed in a particular month) as the CoCT has a lower staff contingent over the holiday season (pers. comm.). However, while there is an element of seasonality in water use, this seasonal trend is common across treatment and control groups, lending credibility to the parallel trends assumption needed for difference-in-difference estimation. This can also be confirmed using regression analysis.

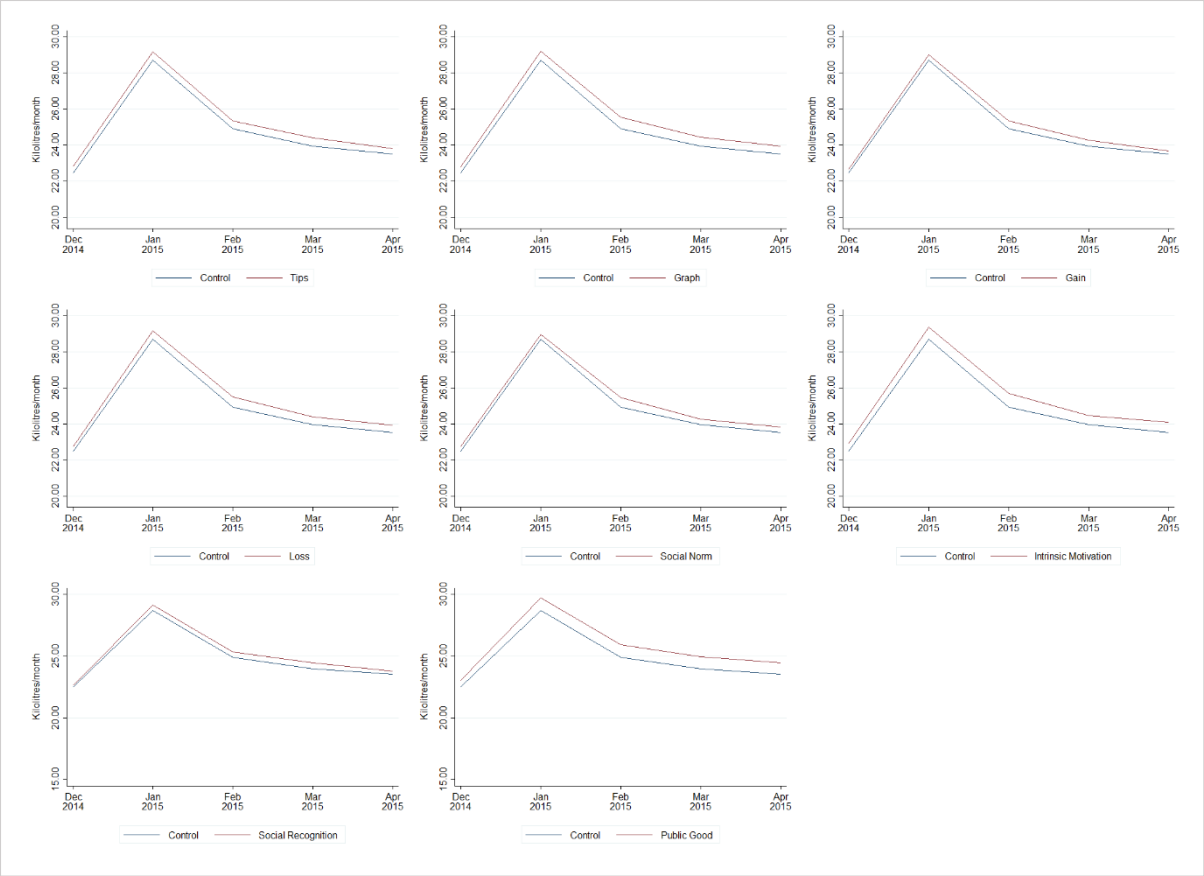

Figure 4: Mean Monthly Consumption per Treatment Group

Analysing the Treatment Effect

For the research, variables include property values, baseline tariff block (the tariff block the household was in October 2015 when the randomisation was conducted), month and suburb fixed effects and an indicator for indigent status. In addition, a control is included if the household was a “late receiver”, a status given to households billed later in the billing period. It is also controlled for the amount of times the household appears in the panel (frequency) and lag variables for both the bill and, separately, marginal tariff rate (tariff rate of the household’s highest tariff block). These lag variables control for the effect of the previous bill on consumption in the current month. For example, if a household was charged at a higher rate in November, either due to an increase in tariff or due to higher consumption/presence of a leak, any subsequent behaviour change (such as a reduction in consumption) will be reflected in the December bill. Heterogeneous effects of the treatments across different subgroups of water users were assessed. It was assumed that there is differential behaviour across income groups. Households were divided into five quintiles (low to high) depending on their property value (as a proxy measure for income) and the regressions are calculated

separately for these subgroups. The analysis of the results makes clear if different messages should be targeted at different groups of people.

Step 4: Evaluation

The results and impacts of the behavioural intervention need to be evaluated in order to make any assumptions on what works and what does not. Furthermore, it should be assessed if the interventions have any long-term impacts.

In order to conduct the analysis, data needs to be collected before the roll-out of the intervention (baseline data), during the roll-out and ideally for some time after the intervention has concluded. The data can be analysed using statistical software, a computer programme that is specifically used for statistical and econometrical analyses. There are a lot of different statistics packages available, some are open source others are proprietary.

Running analytics on large datasets means that huge data volumes need to be processed. In order to process large volumes of data at a respectable speed, increased computer memory and parallel processing is needed.

Balance Tests

The first part of the analysis entails checking whether the treatment and control groups are balanced in terms of important demographic characteristics. If it is found that the treatment and control groups are not balanced in a particular area (for example, property value), this needs to be controlled for in all analyses because otherwise it could bias the results.

Pre-Intervention Trends

When running a behavioural intervention, it is assumed that behaviour trends would be the same in the control and treatment groups in the absence of the treatments and that the intervention induces the deviation from this common trend (Angrist & Pischke, 2008). It is therefore important to confirm that treatment and control groups have comparable pre-intervention trends.

Analysing the Treatment Effect

There is a variety of data analysis methods that could be used to calculate Average Treatment Effects of the behavioural insights. One of these methods is Difference-in-Difference (DID) which compares the before-and-after outcomes for the individuals that received the behavioural intervention and the before-and-after outcomes for the individuals

that did not receive the behavioural intervention. Then the difference between the difference in outcomes for the treated and the comparison is calculated.

As noted previously, the DID estimate can also be calculated within a regression framework:

$$Y_{kt} = \propto + \beta_1(Treated\ Individuals_k) + \beta_2(Post_t) + \beta_3(Post_t * Treated\ Individuals_k) + \beta_4(Trend) + \beta_5 X_k + \varepsilon_{kt}$$

where $(Treated\ Individuals_k)$ is a treatment variable indicating if the individual is in a treatment group, either before or after the intervention is received and $(Post_t)$ is a time variable indicating whether treatment has commenced. The coefficient β_3 on the interaction between the treatment and time variables $(Post_t * Treated\ Individuals_k)$ gives the average DID effect of the programme. The variables $(Treated\ Individuals_k)$ captures the underlying differences between treatment and control groups while $(Post_t)$ captures the underlying differences between the two-time periods. It is also controlled for trend. Finally, X_k is a vector of controls, which are informed from the balance and pre-intervention trend regressions as well as the stratified randomisation.

3.3 Results and Discussion

The previous chapter aimed to give guidelines on how to design, implement and roll-out a behavioural intervention, taking the “Behavioural nudges for water conservation for Cape Town” study as an example. Insights into the processes that the research team went through during the different stages of the project are given and all the technical and logistical issues experienced throughout the lifecycle of the study are explained.

For government officials who would like to implement behavioural insights into their policy making, it would be interesting to assess to what extend behavioural insights can be applied to different contexts – geographically, culturally and behaviourally. If behavioural interventions are successful in a specific country, it would be interesting to test the same intervention in a different country to try disentangle the impact of the behavioural intervention from any influencing factors that are country specific. Moreover, it could be looked at how different policy areas could benefit from applying behavioural insights, for example by testing successful behavioural interventions in various contexts. It should also be looked at how behavioural interventions interact with traditional policy tools.

4 NUDGE TRAINING AND CAPACITY BUILDING IN THE COCT

4.1 Knowledge Sharing Activities

Introduction

In order to foster knowledge sharing, the EPRU research team committed to conducting workshops with CoCT officials to disseminate information about the study and to ensure that training and skills transfer took place. Aside from building capacity within the municipality, it was also intended for the findings of the study to be disseminated to a broader, national, audience. This section of the report presents the efforts that were made to achieve the spirit of these study deliverables, whilst still adapting to accommodate the unique context of the drought crisis, and the constraints placed upon CoCT staff as a result.

Method and Approach

As noted previously, CoCT officials were under extreme pressure in handling the water crisis as well as their day-to-day tasks. With these constraints in mind, there was initial reluctance to dedicate time to workshops on BI, and it was requested that the project deliverables be adapted to focus more on using the insights from the previous study in other ways than billing to deliver further reductions in water consumption. As a means to combine the research project aims with the city's very reasonable priorities of focusing on the drought crisis, the local workshop deliverable was adapted to become a combination of knowledge-sharing activities, all jointly contributing to the dissemination of information about the study.

The national workshop was scheduled to take place towards the end of 2018, by which time the immediacy of the drought crisis had, to some degree, lifted, allowing for a more formal event to take place. A sustainability conference track within an international BI conference was jointly hosted by the CoCT and the WCG, which was used as a platform to publicise the results of the study. This was further reinforced through a full day BI Masterclass provided for 50 CoCT and WCG employees, focussing on context-relevant water related BI, also taking place after some of the pressure of the drought had lifted.

This section of the report gives details on each activity and clarifies when and where the activity took place, who attended, what was the aim, and what was achieved by the research team. An overview of all additional meetings held with the CoCT as part of the training and skills transfer process as well as the formulation of the future strategy is given in Appendix E. A flyer was produced for distribution at the events to summarise the results of the study in Appendix B.

Data and Analysis

Western Cape Water Indaba 2017

16th of May 2017; 08:00-17:00 at Goudini Spa, Rawsonville

Who attended? Presentations were among others given by the Premier of the Western Cape, the National Minister responsible for Water and Sanitation and the Provincial Minister responsible for Local Government, Environmental Affairs and Development Planning. Audience and presenters did not only include politicians but also researchers from universities as well as representatives from businesses and NGOs.

What was the aim? The aim of the Water Indaba was to create a common understanding by bringing together key sectors to share ideas and innovation on current and future regional water planning, thoughts on solutions for long-term water security and the impacts of drought. The Water Indaba was aimed to bring leaders across society up to speed with the current water situation in the Western Cape. It also created a forum to debate potential solutions and plans for water supply challenges.

What was achieved by the research? Two researchers from the team attended the Water Indaba and informally shared knowledge with key policy makers to create awareness of the behavioural study and increase interest in behavioural change. One such conversation with ICLEI, a global network committed to building a sustainable future, resulted in the behavioural nudges for water conservation study being published as case study for “The Sustainable Urban Resilient Water for Africa: Developing Local Climate Solutions (SURe Water 4 Africa: Developing LoCS)” which is partially funded by EuropAid.

Presence at the City of Cape Town’s Think Water Exhibition

Friday 9 June-Sunday 11 June 2017 at Canal Walk Shopping Centre, Cape Town

Who attended? Besides members of the broad public, CoCT officials, and politicians such as the Premier of the Western Cape and the WDM team from the CoCT attended the Water Expo. The local press, as well as the radio channel Good Hope FM, also reported from the event.

What was the aim? The Cape Town Mayor invited members of the public to the City's Think Water Exhibition at Canal Walk Shopping Centre to get informed about water saving and

alternative water equipment. Over 30 organisations exhibited their innovative water saving and alternative water-related equipment to the residents of Cape Town.
The research team hosted one stall to represent three WRC project initiatives: (1) the behavioural nudges for water conservation study, (2) Drop, and (3) BridgIot Dropula Smart Water Meter.

What was achieved by the research? The research informed individuals from the general public, academics from other South African universities, a wide range of CoCT officials as well as top-level officials such as the Mayor about the three initiatives.
Pictures from the Expo can be found in Appendix C.

Presentation at Water Demand Management training session

30th of June 2017 at the Peter Sauer Building, Cape Town

Who attended? Various officials from the CoCT, particularly from WDM and the Environmental Resource Management Department, including Communication Officers, Water Conservation Officers and Head of Environmental Capacity Building, Training and Education; sustainability strategist from Steadfast Greening; EPRU researchers.

What was the aim? The Voluntary Behaviour Change presentation was a 30-minute session to teach attendees about behaviour change and the technology that can be used to support it. It comprised of three sections detailing behaviour change, behavioural nudges, and technology for behaviour change. The objective of this presentation was to build capacity in the city with regard to understanding the tools and methods available to induce voluntary behaviour change in citizen's water consumption.

The CoCT officials were firstly presented the behavioural nudges for water conservation study that the EPRU research team has been running in collaboration with the CoCT. They were given some background information on the study, such as behavioural economics, and the researcher then described to them the study design, the results, and the main conclusions. Secondly, a researcher from the iComms team presented to the city officials how the insights from the behavioural study would be used to design behavioural interventions to facilitate uptake of technology for behaviour change in the water sector.

What was achieved by the research? I Information about the study was disseminated and valuable background information that can be used by the CoCT for future initiatives was given.

The training ensured that skills transfer between the research team and the CoCT occurs. Discussions were held about how the CoCT could use behavioural nudges to change behaviour in other ways, for example one official mentioned using social norms to reduce water consumption at schools.

The training schedule for the full-day training session can be found in Appendix D.

Feedback and Strategy Meetings

27th of July and 28th of August 2017 at the Water Demand Management & Strategy, Goodwood Municipal Building; Civic Centre, Cape Town

Who attended? Head, manager and other officials of the WDM Department; officials from the Department of Informal Settlements, Water and Waste; Hero Strategic Marketing; Head of Technical Services at the CoCT; Director of Communications at the CoCT; UCT researchers.

What was the aim? The aim of the meetings was, on the one hand, to provide high-level feedback to the CoCT about the findings of the study. On the other hand, it was aimed to agree on a strategy of how to take the insights from the behavioural study further.

What was achieved by the research? Information was shared about the results of the study across various departments of the CoCT. Ample opportunity was provided for robust discussion around the potential future application of the findings, and for the development of strategies going forward. In addition, these sessions helped to develop the relationships between the research team and the city and enabled the researchers to provide guidance on other water crisis interventions.

Sustainability Conference Track at Behavioural Insights Conference

27th and 28th September 2018 at the Cape Town International Convention Centre, Cape Town

Who attended? The event's audience and presenters consisted of policy makers, leading behavioural insight practitioners and academic researchers from a local, national and international stage. Aside from the Western Cape Government, the following national South African governmental groups were represented at the event: National Department of Energy, National Department of Economic Development, Department of Planning, Monitoring and Evaluation, Department of Social Development, South African National Biodiversity Institute,

Department of Economic Development and Tourism and the National Department of Community Safety. A full list of attendees is included as Appendix F.

What was the aim? The WCG, partnered with the Office for Economic Cooperation and Development ('OECD'), ran a two-day conference, titled *'Making a Real Difference: Nudging for Policy Change'.* Within the BI Conference, the WRC, CoCT and UCT partnered with the organisers to co-host the Sustainability track of the conference (*Breakout 3: 'Making better choices in water, energy and transport'*), described as per the conference report below:

> *"Human beings' footprint is 1.5 times the earth's total capacity to provide renewable and non-renewable resources. Today, the world population consumes three times the amount of resources consumed in 1970 – and this is expected to double again by 2050. Individual and organisational choices and behaviour matter for the use of energy, water and transport, and so does the regulatory and institutional framework that needs to reflect and facilitate these choices. In addition, new technologies are providing opportunities and challenges for adapting the provision of key public utilities to citizens and businesses. Beyond resource conservation, there might be also opportunities to better reflect the behaviour of end-users in the design and provision of these services and thereby increasing resilience of the system.*
>
> *This session will explore the application of BI to the design and implementation of policies and regulation related to key public utilities."*

The conference track consisted of two sessions. The first of these was an 'unconference', which helped set the scene for the second event, a panel discussion on sustainable behavioural interventions in government. Presentations were given by the WRC and UCT about water and the crisis interventions. The full conference programme, along with bios of the panellists is included in Appendix F.

What was achieved by the research? The calibre of the participants and the interactive, practical nature of the sessions meant that attendees were able to derive practical learnings relating to the implementation of behavioural insights into government services, with a strong focus on sustainability and water.

It was an effective platform to present and share the research findings of the nudges study with a national and international audience, reaching a diverse range of interested parties, from various tiers of government, through to private practitioners of BI, to other research groups.

Further to this, by co-hosting the sustainability track within the larger WCG and OECD initiative, the costs and logistical administration of running the event were kept low, while enabling a wider range of audience members to be reached due to their attendance at the main event. It facilitated cross-pollination of learnings between nudging in relation to other sustainable behaviours beyond the scope of water and into other municipal services, including electricity, waste and transport. Lastly, it helped to set up a collaborative relationship between the WCG and CoCT to pursue joint initiatives in the future.

Behavioural Insights Masterclass

1st October 2018 at the Tygerberg Nature Reserve, Cape Town

Who attended? The CoCT and WCG each selected 25 delegates from their organisations to attend the masterclass, from a range of departments including policy, strategy, water demand management, communications and environmental affairs. Aside from that, two researchers from UCT attended as well as the team from Ideas 42, an international behavioural consultancy who hosted and ran the event.

What was the aim? The purpose of the event was to consolidate the learnings shared in the conference and the overall project experiences into a distilled, practical process in order to equip officials with a process toolkit to manage future BI projects. The day was structured as a series of modules following a process of applying BI from start to finish, beginning with developing a definition of the problem to be tackled, through to diagnosing the causes, designing a solution, implementing the solution and, finally, evaluating the outcomes.

Within each module, the theory of the topic was presented, followed by a practical activity to be undertaken, first in pairs, and then consolidated by table, and finally fed back to the rest of the class. Each activity built upon previous steps, allowing participants to complete a mini cycle of work that spanned the full lifecycle of the BI process.

What was achieved by the research? The Masterclass was a successful event for ensuring city and provincial policy makers and implementers are equipped with a detailed framework for designing and developing a nudging solution, and an appreciation for the importance of designing BI solutions in a way that facilitates analysis and research to take place. The interactive nature of the session, with a strong focus on simplifying the theory for an audience without a background in BI, and relating it to real situations, helped to ensure that there was practical benefit derived for participants. Satisfaction and value of the event was established

through an online survey that was conducted by Ideas42 after completion, and through informal discussions amongst participants. Photographs from the event are included in Appendix G.

Results and Discussion

Knowledge sharing and skills transfer was achieved across an extensive range of events, incorporating audiences of public, businesses, NGOs, academics and government officials from a local through to international level.

The CoCT was provided with formal training in both the theory and practice of BI, as well as having had opportunities to gain practical experience through the ongoing knowledge support provided by researchers during the crisis.

Aside from the benefits of upskilling local (and provincial) government in BI, a powerful outcome of the BI Conference and Masterclass events was the formation of relationships between these levels of government, and across departmental silos and hierarchies. By establishing connections between these groups, there is the potential and motivation for future initiatives to complement each other and support collaboration for the benefit of civil society. It is hoped that this momentum and community built within these events translates into the establishment of an informal network of BI-savvy government officials that are able to interact and work across the traditional boundaries of government.

4.2 Strategy Development for Institutionalising Nudges

Introduction

As a component of building capacity, the research team and municipality set out to co-develop a strategic plan to institutionalise nudges within the CoCT.

A significant challenge to the development of a long-term strategy was that the research was undertaken in a time of an unprecedented and ever-worsening drought crisis. This affected the research in several ways. All individuals within the WDM team, as well as other individuals within the CoCT involved in managing the water crisis, were stretched to capacity and not able to dedicate time to initiatives outside of resolving the immediate crisis. In addition, the CoCT was implementing a range of water demand management measures which made it difficult to measure the direct impact of the behavioural nudge intervention as originally planned.

Following discussion between the major stakeholders in the project, namely the CoCT, the WRC and UCT, it was decided that an opportunity existed to refocus the study towards maximising immediate reductions in water demand and the transfer knowledge and skills through experiential learning in the form of an action-based case study. An agreement was reached between all parties that the team would undertake to roll out a new operational WDM project, making use of the learnings from the original study, and use it as a means to transfer skills from the researchers to the team within the CoCT, whilst helping the CoCT to realise their future strategy.

This section of the report provides a summary of the Strategy report that was co-authored by UCT and the CoCT. It documents the strategy development process followed and notes the learnings from both UCT and the CoCT that may help guide future collaborations, strategy, and nudging implementations. The full strategy report is available on request from the authors.

Method and Approach

UCT and the CoCT worked jointly to consider how the findings from the research could be used to inform the development of strategy within the CoCT. In addition to this, it was necessary to formulate an approach to equip CoCT staff with the skills necessary to initiate or maintain nudging projects in the future to ensure the sustainability of the initiative and lasting impact.

On consultation between the stakeholders, it was agreed that a practical, action-based approach would be taken to achieve these objectives. The teams undertook to run a secondary water conservation nudging project within the CoCT in which the learnings from the original study would be applied, and the project would be designed, implemented and analysed by a joint team of researchers and CoCT officials. It was intended that by doing so, the following benefits may be realised:

- Further water conservation amongst households would be achieved in a time of worsening drought
- Experiential learning has been shown to be extremely effective means to transfer skills
- Constructive use of funds allocated to the project to achieve multiple aims
- CoCT officials that were responsible for aspects of WDM were under a great deal of pressure during the time of crisis, and achieving buy-in for allocation of resources to theoretical knowledge transfer (e.g. attendance at workshops) was a challenge

On agreement of this approach, UCT engaged with various internal and external stakeholders related to the CoCT to formulate a shortlist of potential projects that would allow the team to achieve these objectives.

Project Proposals

Three projects were shortlisted based on their potential to save water, their technical feasibility, and the timelines involved to design and implement them. All of the projects proposed would seek to make use of the findings of the original study that demonstrated the efficacy and longevity of nudging households based on social comparisons and recognition, compared with other treatment groups.

Numerous presentations and collaborative meetings were held to gain input from various stakeholders within the CoCT to inform the selection of the project, including:

- Department of Water Demand Management
- Billing & Invoicing Department
- Department of Informal Settlements, Water and Waste
- Department of Organisational Policy and Planning
- CoCT spokesperson
- CoCT's drought management team
- CoCT Manager for Digital Communication
- CoCT Communication Department and water communication group
- Legal Department
- External City of Cape Town collaborators: Hero & resolve communication

Proposals included the introduction of a subsidy scheme to incentivise uptake of Smart Water Meters, promoting the use of a mobile app for tracking water consumption, and the creation of a public website to recognise low water consuming households through the display of a map of Cape Town with colour coded icons representing their water use.

The Cape Town Water Map

The winning project proposal, that of the Cape Town Water Map, was inspired by the finding that the message which consistently induced the largest water reduction from the original nudging study was the "social recognition" treatment, which advised households that the names of the top water savers would be published on the CoCT's website. It was further shown that publicly recognising desirable water consumption behaviour has a particularly large impact on high income households.

Households are affected by how they compare to peers and their desire for approval can motivate pro-social behaviour. Encouraging competition and rewarding households that demonstrate very large water reductions can be a powerful tool to promote sustainable and environmentally friendly behaviour. In this context, it was proposed that the CoCT could introduce a map that highlights homes that are compliant with targets.

The Water Map would be a publicly viewable map website of households in the city that were using less than the recommended water amount per month, targeting all Cape Town residential properties. Water consumption indicators would be displayed on the map at the property level, with distinct map symbols being displayed on properties with low consumption.

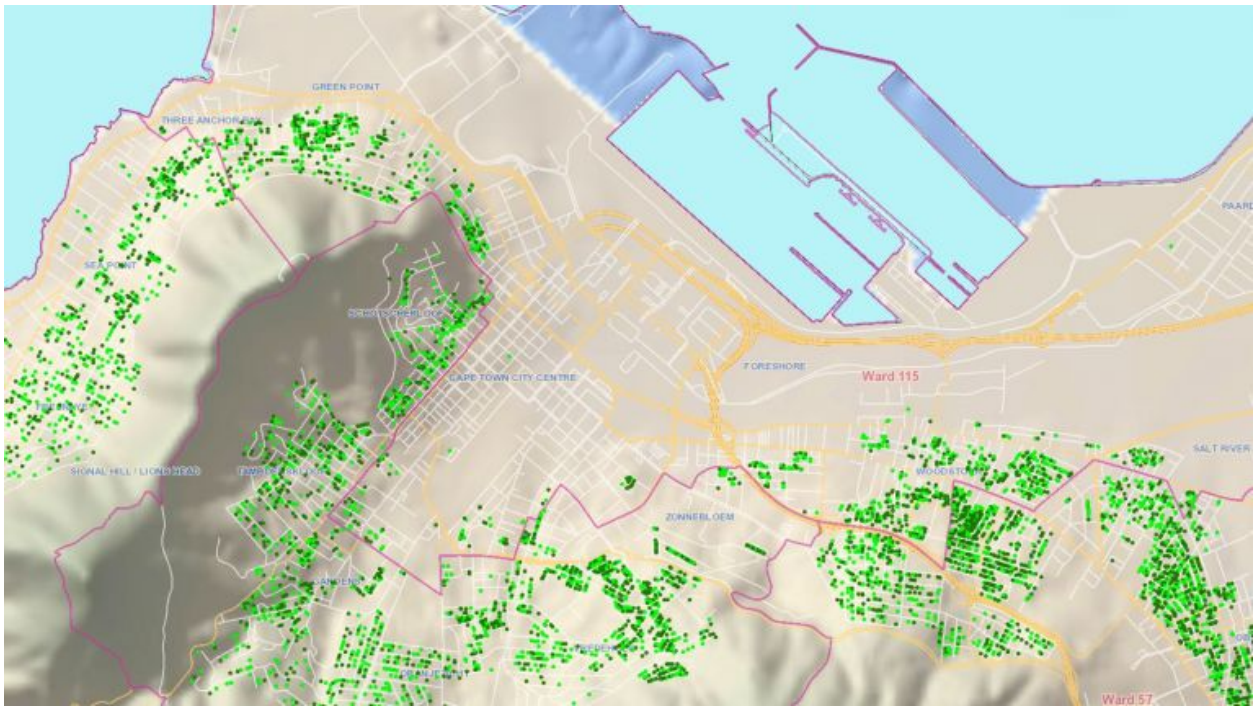

Figure 5: Screenshot from the Cape Town Water Savers Map showing households saving water

By presenting this data openly, feedback would be provided to consumers on how they perform relative to their neighbours and others in the city, as well as provide an indication of differences in compliance between suburbs. The website would be designed to provide positive recognition for desirable behaviour, and intentionally would not punish wasteful behaviour by displaying households that were transgressing water restrictions (no naming and shaming).

Additional encouragement to look at the website would be offered to a random selection of the population through billing inserts. Those selected households would receive a billing insert

with their monthly utility bill to alert them to the existence of the website, while the control group would not receive any communication through their monthly bill.

It was felt that the water map project had the following advantages:

- By including all households in the city, the potential impact on water savings would be greater than the other two projects
- The project would be making use of well-established findings around the strength of social recognition as a nudge
- Development of the website was technically feasible within the desired turn-around times to enable it to be impactful during the crisis

The CoCT viewed the water map as an important mechanism to complement existing awareness campaigns and WDM projects and to help achieve an immediate further reduction in water demand. In particular, the CoCT believed that the Water Map had potential to reduce consumption in the high-income residential sector which, at the time, was using a disproportionately large amount of water.

An additional weighting in favour of the project was that a separate initiative was taking place within the CoCT to explore how the water data for the city could be used to motivate reductions in domestic water consumption. The CoCT was investigating whether the monthly water consumption data could potentially be published through the open data portal, the open access City Map Viewer, or other channels, in various formats. The Water Map concept was neatly complementary to this.

A more detailed description of the design, implementation and analysis of the water map will be given in the next section detailing the drought interventions undertaken as part of this project.

4.3 Data and Analysis

Stakeholders involved in the project were encouraged to reflect on their experience of working on the Water Map project. In order to formulate these reflections in a structured way, a set of questions was posed to an individual from each of the core groups of stakeholders involved in the project to act as a representative of the experiences and learnings for their team. From the individual responses, recurring themes were identified and highlighted to formulate the concluding recommendations.

The questions posed were as follows:

1. *How has your understanding of behavioural insights changed through your involvement in this project?*
2. *How have you made use of behavioural insights during the water crisis?*
3. *What has been your experience of working in an inter-disciplinary team making up of researchers, municipal officers and other stakeholders?*
4. *Where do you see future opportunities for applying behavioural insights within the city?*
5. *How do you plan to make behavioural insights a routine part of your process?*
6. *What do you see as being the main barriers that inhibit the use of behavioural insights within the city?*

Responses were collated and consolidated with the experiences of the research team to formulate the recommendations for future strategy and research outlined below.

Removal of Barriers to Applying Behavioural Insights

The project post-mortem inputs from stakeholders identified a variety of barriers that make it difficult for projects involving BI to be undertaken at the CoCT. Some items noted include:

- Lack of management understanding and buy-in
- Lack of funding available to dedicate to special projects
- Inhibited capacity to implement changes due to other, higher priority, projects

Further investigation is required to identify solutions to address these issues comprehensively. It is hoped that through the knowledge sharing and successes of the project, management buy-in may be easier to achieve in the future, which could lead to improved access to funding and prioritisation.

Formalised Stakeholder / Project Management

Future undertakings of this nature, i.e. involving the roll out of some sort of behavioural intervention, should be handled according to formalised best practice in terms of project management. For example:

- Projects involving varied groups of stakeholders would benefit from the inclusion of a designated member of staff from within the CoCT who is responsible for acting as a communication channel for external stakeholders to keep them abreast of internal developments, and to disseminate information provided by the external group as necessary.
- Stakeholder groups should be clearly outline early and definitively in the process by the CoCT to prevent late stage requirements and multiple rounds of approvals. Within this, the individuals who are responsible for approval of a project should be identified as such up front.
- Project timelines should be drafted and agreed to upfront to enable a considered spread of time between key milestones.

Support Data-Driven Learning through Experience

Any sort of behavioural intervention, whether informed by BI or not, should be underpinned with an evidence based, data-driven approach to monitoring the impact of the intervention. Without this in place, it will be difficult to be able to build up a context-specific body of knowledge as to what works and what does not in the unique Cape Town/South African environment. Monitoring and evaluation can take many forms, one of which is a randomised control trial in which a control group is not exposed to the intervention.

Further Research Projects

The potential exists for further research to take place into the development of either of the remaining original project proposals. In addition to this, the core results in relation to the power of socially derived nudges to be applied to other utility services within the CoCT, or to remain focused on water, but be implemented in another municipality to evaluate the difference in results resulting from the local context.

Aside from this, there is still extensive analysis work taking place relating to the data gathered throughout the first and second phases of nudging for water. This should continue to take place to maximise the learnings based on the intervention, particularly in relation to longevity of impact.

4.4 Results and Discussion

The use of a case project as a means to transfer skills and initiate the foundational work on how to make use of BI within the CoCT's water demand strategy was effective, and should be heralded as a good example of how a flexible approach to project structures can enable municipal and academic stakeholders to achieve real impact. Within the formulation of strategy around institutionalising behavioural nudges, a number of key themes emerged. Barriers to implementation were identified, including a lack of management understanding and buy-in, limited funding available to dedicate to special projects and an inhibited capacity to implement changes due to other, higher priority projects.

The importance of strong stakeholder and project management skills was identified as being vital in collaborative ventures of this nature. Likewise, the necessity of designing interventions in such a way as to enable robust, meaningful data to be collected was highlighted. Without these considerations around the requirements for future monitoring and analysis taking place in the initial design of the project, evaluating the cost-benefit of nudges against other forms of intervention is not possible.

Having jointly shared the running of the water map project, the CoCT will be well placed to take the lessons learnt through the process, and continue in this path to embed BI both into their water demand strategy, as well as other utility services. The project was a useful learning opportunity for all stakeholders involved, with a number of valuable points noted in relation to how future projects may build on the work completed.

5 BEHAVIOURAL NUDGE INTERVENTIONS

Three nudge interventions were completed within the project, namely, the “green nudges” – a personalised letter sent to top consuming households, the Cape Town Water Savers Map and the original wide scale nudging that took place through the billing inserts. This chapter details each of these interventions in turn by providing an introduction to each intervention that covers the purpose and background to the work, followed by an explanation of the methods and approach undertaken. Next, the findings are presented along with supporting data and a conclusion.

5.1 Nudge Intervention 1: Green Nudges (Letters to Top Consumers)

Introduction

Against the backdrop of the drought in Cape Town, the local municipality asked the research team to assess the impact of a social-norm inspired behavioural intervention. A personalised letter which combined social comparison with a punitive threat was sent to households consuming excessive amounts of water. This social feedback was incorporated into a letter of warning which admonished recipient households for unacceptable, excessive and above-average water consumption. It was sent to residential households consuming over 50 kl of water in January 2017. A copy of the letter is included in Appendix I.

The letter informed errant households that their consumption was above the average of 20 kl, cautioned against excessive and unacceptable water usage and threatened the household with the installation of a flow restrictor. While it is not possible to unbundle the effect of the social-norm comparison from the warning, the research could exploit the fact that a subset of eligible households did not receive the intervention and estimate the cumulative effect of the intervention.

The research aimed to calculate the impact of a once off behavioural intervention in the short- and long-term in relation to lowering consumption amongst highest consuming households. Further to this, the aim was to assess the extent to which spontaneous interventions launched by the CoCT can be rigorously evaluated for academic purposes and to inform policy. Ultimately, these findings can motivate other municipalities to use behavioural interventions and green nudges as powerful tools to supplement their DSM toolkit.

Method and Approach

Experimental Sample

The municipality sent letters alerting over 7,000 high water consuming households to their consumption and the extent of the drought between February 2017 and March 2017. The analysis was conducted with a small subsample of residential households who were eligible (consumed more than 50 kl per household per month) to receive the letter. The treatment effect was estimated using monthly consumption data obtained from the local municipality. In addition, by merging this data with other administrative data obtained from the municipality, it was possible to link households with their property values (acting as a proxy for income).

In terms of the sample, this analysis is restricted to only those households that were in the control group of the large-scale randomised behavioural intervention conducted the previous year (Brick et al., 2018) in order to isolate the impact of the green nudge from those that were previously launched by UCT. As such, the sample analysed consists of 655 households that consumed 50 kl or more in January 2017 and were eligible to receive the letter. Of these households, 380 received the warning letter from the local municipality between February-March 2017. The households that consumed 50 kl or more in January 2017 but did not receive a letter (275 households) act as the control group.

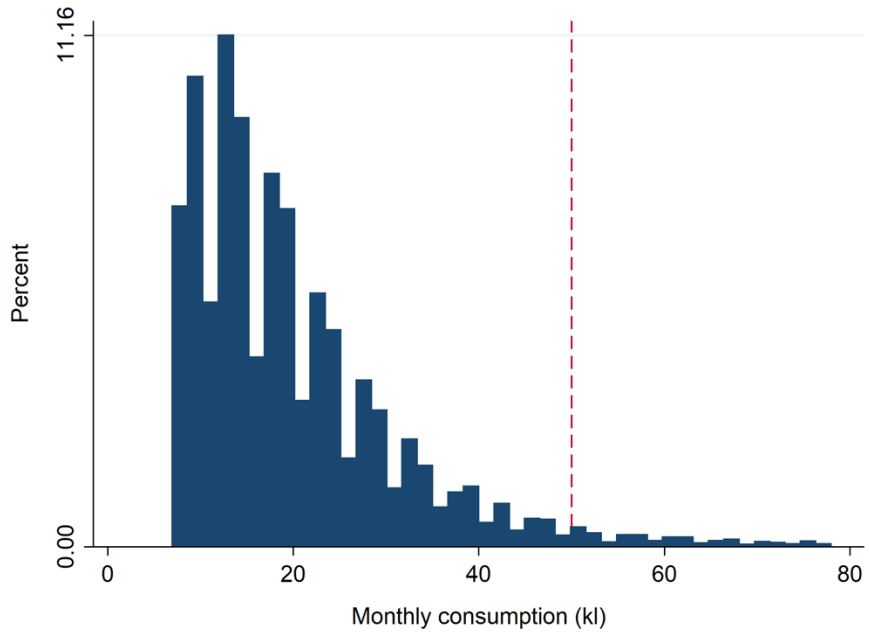

Figure 6: Distribution of monthly consumption in January 2017

Note that the level of consumption in January 2017 was a necessary but not sufficient condition for receipt of the letter. The local government applied additional selection criteria – for example indigent households were not sent the insert (and have thus been excluded from this analysis).

Methodology

Following Abramitzky & Lavy (2014), the difference in pre- and post-intervention consumption in treated households relative to the control is modelled with the standard DiD regression described in Chapter 1.

The control variables include tariff block, suburb, seasonal and income quintile fixed effects and an indicator for length of billing period. All standard errors are clustered at the suburb level. A fixed effects model is estimated to control for the unobserved heterogeneity across treatment and control that does not vary over time.

Balance tests and Pre-intervention time trend

It was tested whether treatment and control groups were balanced in terms of several key observable outcomes and demographic characteristics in January 2017 – when these households were “allocated” to treatment and control. When including the participants' tariff block and suburb as additional controls in the balance regressions, mean characteristics no longer differ significantly across the treatment and control groups.

It was also considered whether treatment and control groups have comparable pre-intervention trends. While there is an element of seasonality and time trend in water use, this seasonal trend is common across treatment and control groups.

Column 1 and 2 of Table 2 provide the mean and standard deviation (in parenthesis) of monthly consumption (kl), daily average consumption (kl), property value (ZAR), number of billing days and tariff block for treatment and control cohorts, respectively. Columns 3 and 4 reflect the estimated difference between the treatment and control groups. The estimated coefficients in both columns 3 and 4 are estimated by regressing the treatment indicator (explanatory variable) on the characteristic or outcome variable (i.e. consumption) (dependent variable) (Abramitzky & Lavy, 2014; Bhanot, 2015). Standard errors are clustered at the suburb level. The estimates provided in column 3 reflect regressions with no additional controls. As evident from the results, characteristics do differ significantly across the two groups. Specifically, water consumption in the treatment group is significantly higher relative

to control; also, treated households live in homes with significantly higher property values. As expected, given these results, treated households are also in a higher tariff block relative to households in the control. Column 4 replicates the balance regressions, but includes the participants' tariff block and suburb as additional controls. With the inclusion of these controls, mean characteristics no longer differ significantly across the treatment and control groups.

Table 2: Balance tests for treatment and control cohorts for January 2017

	(1)	(2)	(3)	(4)
	Treatment	Control	Difference	Difference
Monthly cons.	61.09	58.99	2.101***	1.058
	(7.57)	(8.24)	(0.656)	(0.814)
Daily avg. cons.	1.78	1.73	0.047**	0.007
	(0.26)	(0.29)	(0.023)	(0.028)
Property value	2136974.3	1199055.4	937918.92***	161045.8
	(2628348.8)	(1742357.2)	(213531.88)	(273043.0)
Billing days	34.56	34.3	0.265	0.417
	(2.89)	(2.77)	(0.257)	(0.271)
Tariff block	5.63	5.54	0.084**	-
	(0.48)	(0.5)	(0.037)	

*Note: Standard deviations in parenthesis. Period of analysis: January 2017. Standard errors clustered at the suburb level (columns 3 and 4). Sample: 655 households that consumed 50 kl or more in January 2017 and were eligible to receive the Mayor's letter. *, ** and *** signify significance at the 10%, 5% and 1% level, respectively.*

Data and Analysis

The findings indicate that the green nudge had a positive impact on water savings amongst high consuming households in the short run, with households reducing their consumption by 3% within the first two months. The longer term impact of these nudges were equally successful with sustained reductions of 2.5% in average household consumption even 7 months post the intervention. The implication is that the nudge was extremely effective in eliciting a response in a group of households that were price insensitive and slow to respond to higher tariffs and restrictions.

The regression estimates provided in Table 3 demonstrate the effectiveness of the insert. To determine the impact of the letter, analysis is restricted to the first meter reading after receipt of the insert. As the date of receipt of the insert is between mid-Feb and mid-March, the analysis is conducted for the period April-October 2017 (as April is the first month for which it can be concluded with certainty that all households received the letter).

Regressions are estimated for various timelines. The estimates in columns 1, 2 and 3, reflect the short-term impact of the letter. For example, column 1 displays regression estimates for the period April-May 2017, two months after the intervention. Similarly, columns two and three provide treatment effects for the first three and four months after households first received the letter. The remaining columns indicate the long(er)-term impact of the intervention with column six eventually reflecting the impact seven months after the letter was sent. For all these regressions, and as previously discussed, to control for seasonal water use, the same month in the preceding year as baseline water consumption is used (April-October 2016).

To control for unobserved heterogeneity, all regressions in Table 3 are fixed effects regressions. As evident from the table, the regressions include dummy variables for tariff block, month (via a seasonal dummy variable), property quintile and billing period.

The results from Table 3 indicate that errant households, that received the social norm inspired warning letter, reduced consumption by between 0.9-1.2 kl per month relative to control households and depending on the time period.

More specifically, considering the first two months after the intervention (column 1: April-May): the *Post* variable indicates that consumption in both groups decreased by an average 1.3 kl per month relative to the previous year. However, treated households additionally reduced consumption by an average 1.1 kl per month relative to control households (*Treatment x Post*). Table 4 provides the mean consumption values for two subgroups: namely, eligible households (who consumed in excess of 50 kl in January 2017) as well as the full sample. The time periods in Table 4 mirror those from Table 3. As mean consumption for *eligible* households over the April-May pre-intervention period was 36.88 kl, this implies a reduction in consumption of 3.0% for eligible households.

Table 3: Short and long(er)-run treatment effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Consumption	Consumption	Consumption	Consumption	Consumption	Consumption
	(KL/month)	(KL/month)	(KL/month)	(KL/month)	(KL/month)	(KL/month)
	APR-MAY	APR-JUN	APR-JUL	APR-AUG	APR-SEP	APR-OCT
	2 months	3 months	4 months	5 months	6 months	7 months
Post	-1.346***	-1.249***	-1.193***	-1.130***	-1.216***	-1.361***
	(0.466)	(0.383)	(0.331)	(0.297)	(0.28)	(0.252)
Treatment x Post	-1.102*	-1.207**	-1.095***	-1.101***	-1.076***	-0.948***
	(0.568)	(0.474)	(0.421)	(0.379)	(0.352)	(0.328)
Constant	-16.868***	-16.498***	-15.520***	-13.490***	-11.401***	-11.992***
	(4.28)	(3.182)	(2.593)	(2.299)	(1.977)	(1.946)
Tariff block fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES
Property quintile fixed effects	YES	YES	YES	YES	YES	YES
Control for billing period	YES	YES	YES	YES	YES	YES
R-squared	0.825	0.835	0.838	0.842	0.842	0.848
Observations	1875	2754	3599	4462	5351	6244
Treated	1134	1675	2215	2744	3288	3816
Control	741	1079	1384	1718	2063	2428
Clusters	243	244	245	246	246	246
Fpvalue	0.000	0.000	0.000	0.000	0.000	0.000

*Note: Fixed effects regressions. Standard errors clustered at the suburb level. Regressions estimated for various post-intervention periods. Pre-intervention baseline period is always the commensurate period of the previous year. Sample: 655 households that consumed 50 kl or more in January 2017 and were eligible to receive the Mayor's letter. *, ** and *** signify significance at the 10%, 5% and 1% level, respectively. Results for control variables available on request.*

Table 4: Pre-intervention mean consumption

Period	Sample	
	Eligible	All
APR-MAY 2016	36.88	18.03
APR-JUN 2016	34.34	17.17
APR-JUL 2016	33.68	16.90
APR-AUG 2016	34.16	17.17
APR-SEP 2016	35.12	17.35
APR-OCT 2016	37.74	17.88

As evident from Table 3, the negative treatment effect (*Treatment x Post*) persisted over all time periods and a significant effect was still evident seven months after the intervention (column 6, April-October 2017).

Figure 7 graphically depicts the treatment effects. The figure confirms that treated households consistently reduced consumption relative to control households across the timeline. Furthermore, Figure 8 plots the percentage reduction in consumption associated with the letter

for both eligible households as well as the entire sample. As evident from the figure, the subgroup of eligible households reduced consumption by between 3.5% (three months post intervention) and 2.5% (seven months post).

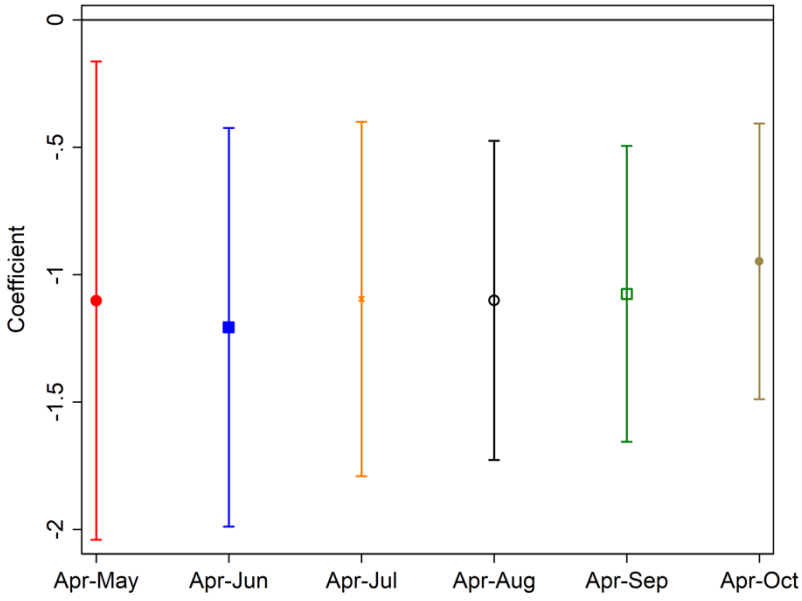

Figure 7: Graphical representation of treatment effects

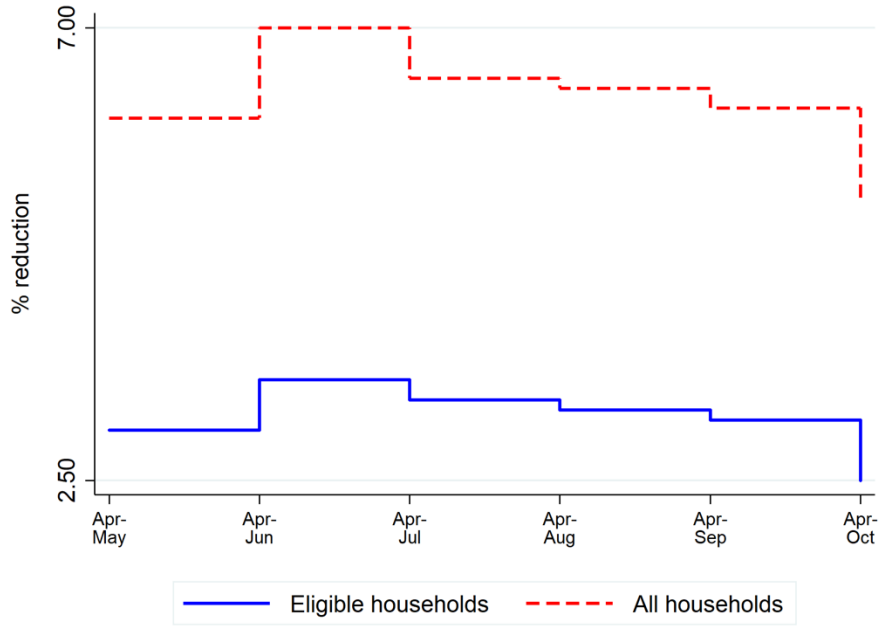

Figure 8: Percentage reduction of treatment effects

Conclusion

In mid-February to mid-March 2017, a subsample of households consuming in excess of 50 kl of water were sent a letter of warning by the local municipality. The letter admonished these households' "unacceptable" and "excessive" consumption, noted that their consumption was outside the norm of 20 kl per household and, finally, threatened households with the installation of a water-management device should households not reduce consumption levels. This study evaluated the cumulative impact of this intervention over both the short and long(er)-run.

With respect to the treatment effects, two months after the intervention, treated households had reduced consumption by an additional 1.1 kl relative to control households. This treatment effect remained relatively consistent as the intervention period was extended, and still registered a reduction of 1.1 kl six months after the intervention. At the seventh-month check, treated households had reduced consumption by an average 0.9 kl relative to control households.

The study used some back-of-the-envelope calculations to contextualise this saving against the crisis that subsequently escalated to the point where in January 2018, the Mayor of Cape Town announced April 10 as ‘Day Zero’ – the day when taps in the City of Cape Town had been predicted to run dry. Assuming that this earlier intervention by the City led to an average reduction of 1 kl per month over twelve months (as indicated by the study), this implies a saving of 12 kl per household. Under Level 6b restrictions where individual consumption is capped at 50 l per person per day, this saving is equivalent to almost 2 months of water consumption of a four-person household. The fact that Day Zero was subsequently staved off indefinitely, is clearly the result of a combination of effective interventions such as these.

The research emphasised four important points:

Firstly, households targeted for treatment were both the biggest consumers and the most resistant to the physical restrictions and tariff hikes. Figure 9 depicts the mean consumption of treated households relative to the rest of the sample (i.e. eligible and non-eligible households that did not receive a letter) for the extended timeline of June 2014-Feb 2017. As evident from the figure, treated households consumed substantially more than the broader (non-treated) sample over this period. Moreover, the figure signals that, in contrast to non-treated households that began to reduce consumption from June 2016 onwards, treated households were much slower to adjust their consumption. The finding of a *persistent* 3%

reduction in consumption among the top consumers highlights that the nudge was able to elicit a response in a group of households that were price insensitive and slow to adhere to the physical restrictions.

Secondly, this is a significant finding given that such a large reduction was achieved in a period where further price increases and physical restrictions would have been less politically palatable.

Thirdly, these treatment effects were further achieved at the end of a period which has seen increasingly stringent physical restrictions and tariff hikes: prices in the 5th and 6th tariff blocks increased by 293% and 689%, respectively and these prices subsequently increased by a further 700% and 201% in February 2018 with the phase-in of Level 6b tariffs.

As the warning letter induced additional water savings on top of these more conventional DSM tools, green nudges present as an effective tool for reinforcing government policy, particularly in a time of crisis.

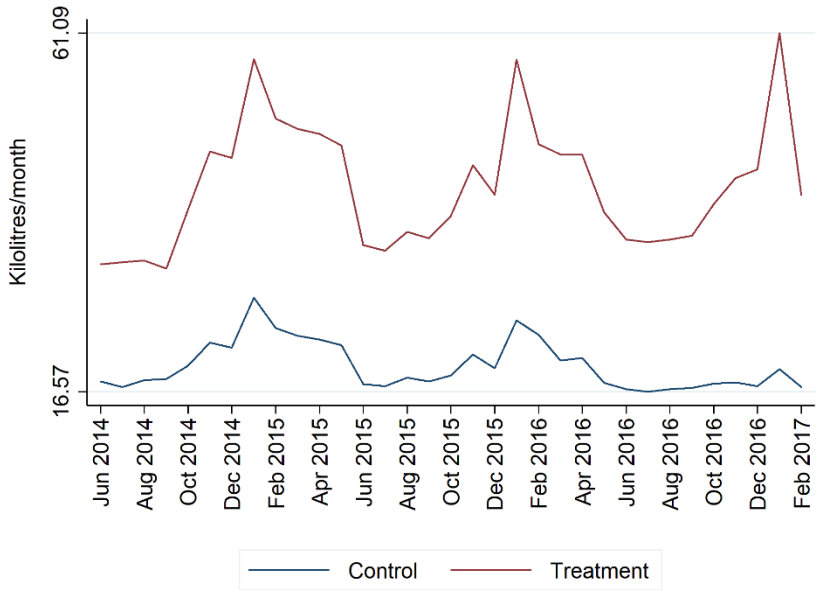

Figure 9: Average monthly consumption for treated and non-treated households, Jun 2014-Feb 2017

Finally, the intervention was extremely cost effective. Using information on pricing provided by the city, costs are estimated at around 31c (South African Rand) per insert. Again, using back of the envelope calculations and assuming an average saving of 1 kl per household per month over a 12-month period, calculations indicate a total water saving of 4560 kl. The cost is thus calculated to be less than 2,6c per kl saved.

Overall the results present compelling evidence that the use of green nudges is successful as a complementary tool to traditional DSM policy instruments and that municipalities should aim to scale up the use of such interventions particularly during times of crisis.

5.2 Nudge Intervention 2: Cape Town Water Map

Introduction

The aim of the water map was both to reduce residential household water consumption, and to serve as a case example for applying behavioural insights as strategy in managing the drought.

The previous chapters provided extensive detail into the intervention as a form of strategy case study, and the background to how it originated. This chapter will outline further planning, design and implementation considerations, as well as evaluate the outcomes of it in terms of water consumption and response from the public.

Method and Approach

Treatment Design

Risks and Considerations

Due to the risks that this potentially controversial proposal posed to the CoCT, it was necessary to investigate and address a number of legal and ethical considerations in the planning for the project.

Water consumption records for individual consumers are considered to be private records and the CoCT has a responsibility to protect their confidentiality. Even when only publishing information on households meeting water-saving targets and providing public recognition for such households, it is possible for the public to view surrounding households and easily identify properties that are potentially not meeting water-saving targets by the absence of consumption symbols on the map.

Households that achieve water saving targets could benefit from public recognition, however, the flipside of this is that households that did not receive the recognition may experience disappointment, embarrassment or anger. While it was hoped that this would motivate water saving behaviour, it was also anticipated that this could lead to complaints and criticism of the Water Map.

The CoCT was concerned to promote public cohesion during the water crisis and CoCT communications was working hard to counter scapegoating. There was concern that the Water Map could contribute to disunity by identifying high consumption suburbs or ostracising high consumption households.

Approval for Publication of the Map

Due to the political sensitivity of the intervention and the risks outlined above, it was necessary to obtain high level approval from within the CoCT for the project to proceed. Potential water savings and risks were accessed and presented to CoCT management, stakeholder groups, communication specialists, political leadership and water planning committees for input and discussion. In addition, an assessment of the legal risks was undertaken by the CoCT's Legal Department.

Although, the initiative was generally supported, it was difficult to obtain final approval due to the risks involved. Nevertheless, as the drought intensified, the initiative was finally given the go-ahead in December 2017 and was signed off by the CoCT's drought management team and supported by the Mayor.

System Development Resources

The CoCT chose to undertake the development of the website using internal resources. The basis for this approach was the opportunity to make use of the ArcGIS platform, a mapping software tool already used internally within the CoCT, and the ready availability of an internal team to complete the work within the timelines prescribed.

Further to these reasons, using the in-house system would allow the CoCT to take greater ownership of the platform, both within the development process and in the long-term. The CoCT would find it easier to maintain the monthly data cleaning and upload of households for the water savers map by making use of the systems already in place. In addition, it would allow the CoCT to investigate and respond to complaints, correct customer information where necessary, update and improve the link between consumption records property information, and allow for the publishing and automatic updating of other water crisis spatial information such as emergency water distributions points, water pressure zones and treated effluent collection points.

Design of Map Interface

The design of the map interface was handled by the CoCT. Light and dark green dots were used to indicate household using less than 6 or less than 10.5 kl per month (compliant

households). Dots were selected rather than a more complex symbol in order to keep the map interface as simple as possible and to allow for viewing at smaller map scales. A map label was set to display at larger map scales to indicate the consumption category and whether the reading was an estimated or actual reading.

Consumption indicators (green dots) were only shown for compliant households while records for non-compliant households were deleted from the data and not displayed on the map. However, it was noted that both non-compliant households and households with account or GIS data discrepancies would be displayed on the map without a consumption indicator. To differentiate these groups and to avoid stigmatising low-consumption households with data discrepancies, a grey symbol was used to indicate households with data discrepancies. Similarly, different symbols were used for properties with estimated readings.

Website Development and Launch

The website was fast tracked during the holiday season in December 2017 and the go-live date was changed to the second week of January 2017 by the Executive Director of Informal Settlements, Water and Waste as this would correspond with households returning from annual holidays and schools reopening. A functioning prototype of the website was developed by the CoCT's internal GIS team which was used to gather final approval and support for the project within the CoCT. The map was released to the public on the evening of Monday 15th of January 2018.

Although the Water Map focused on single residential properties, the grey dot category was expanded to include group housing and additional household accounts which were not linking up on the map. The GIS team monitored the map and data and developed systematic ways to address recurring issues in order to reduce volumes of queries and complaints. Revisions to the default display of the legend (initially not shown by default to make the website mobile-friendly), and the size of the dots was increased to improve viewing.

Overall, the final development and implementation of the map took place swiftly, leaving little opportunity to refine the design to improve usability. While the speed of implementation offered the benefit of quicker water savings, some issues relating to the map could have been avoided had more time been taken on this phase of the project, particularly in refining the aesthetics of the website to improve user experience.

Billing Insert Development and Launch

Initially, it was proposed to design inserts with four different message framings. It was suggested that it could be assessed whether a positive framing or a "shaming" framing of the message would be more successful at inducing households to reduce their monthly water consumption. Residential households would be randomised into groups: a control group and four treatment groups. The treatment groups would either receive a positively framed message or a negatively framed message, while all households would be asked to view the new water map online.

As the project progressed, and in the context of the increasingly politically charged drought crisis, the CoCT decided that only the 'positive' social recognition message should be used, leading to a single treatment group instead of four. UCT was requested to keep the insert as "generic" as possible to potentially cover future updates to the map design.

The final wording is shown below, while full versions of the text and layout of inserts through the various design iterations are available to view within the appendices of this document:

> *"Take a look at our water map **https://citymaps.capetown.gov.za/waterviewer/** to see if you are complying with the City's restrictions around water use. You can also check how others in your community are doing.*
> *Use the browser on the map to search for your own home address. Households that consumed less than 10,5 kl in the last month are shown with a light green dot. Households that consumed less than 6 kl in the last month are recognised with a dark green dot. You are our water savings champions! Thank you for your efforts to save water during this crisis!"*

Following the agreement on the wording proposed, the final layout of the insert was designed by the CoCT's graphic designer. The final insert was approved by the CoCT Director of Communications, the CoCT's drought management team, the Billing & Invoicing department, the Manager for Digital Communication and the Head of Water Demand Management.

UCT worked closely with Mailtronic, the CoCT's contracted supplier for printing all municipal bills at the time, to oversee the roll out of the changes to the bills. Spot checks of the inserts were done when the first portion was printed to check for errors. Random checks for account numbers being correctly allocated were performed, and no issues were found. The team did several more spot checks throughout the billing period, initially twice a week, and reducing to once weekly after no issues were uncovered.

After the map went live, it became apparent from monitoring of social media and news articles that some users did not understand how to interpret the meaning of the different household indicators displayed on the map – particularly the grey dot indicator or missing indicator. Wording of the insert text was updated to address this issue by including an explanation.

A copy of the billing inserts is included within Appendix H.

Research Methodology

After discussion between stakeholders it was decided that no control group would be provided for within the map. This was in large part due to the severity of the water crisis. The CoCT felt it was necessary to prioritise reducing water consumption as much as possible, and by having a control group excluded from appearing on the map any potential water savings related to their households due to the nudge would be lost. Because of the exclusion of a control group on the map itself, it was understood at the outset of the project that it may not be possible to empirically evaluate the impact of the map on water consumption.

The CoCT agreed to a control group within the billing insert component of the project. It was agreed to use a control group of 40% and treatment group of 60%. The control group needed to be bigger than expected because there were five other inserts sent within the same bill that may have impacted the results, including an insert warning all households consuming more than 10.5 kl. In addition to that, Level 6 restrictions and the punitive tariffs were going to be introduced in February 2018. The standard DiD regression was used to calculate the impacts of the intervention.

All residential households with access to piped water and a conventional credit meter, living in free-standing houses in Cape Town were targeted for receiving billing inserts. Households served by bulk water meters, such as a block of flats or housing complexes, were excluded from the sample. Households receiving electronic bills were also excluded from the sample due to logistical difficulties.

Data and Analysis

Two primary areas were considered in evaluating the impact of the map and the billing inserts – the quantitative impact on water consumption within the city, and the societal impact in terms of the qualitative experience of the map amongst residents.

In evaluating the impact of the map project, it is important to consider the context in which the intervention was taking place. Aside from a city-wide communication campaign to reduce water demand, a variety of other private sources were also applying pressure to residents to reduce water usage – from company campaigns, to radio talk shows and general news coverage.

One such overlap in demand reduction was the issuing of warning letters to high consumption households (over 10.5 kl) within their monthly water bill. While this did not cause any logistical problems with the project, it makes the impact evaluation of the map more difficult. Ideally, the map should have been launched a month earlier so there would have been no overlap with the letter to high users.

Similarly, on the 18th of January 2018 it was announced that level 6B water restrictions would be implemented on the 1st of February, setting the new water consumption limit to 50 litres per person per day. The new restriction also included a punitive tariff that would charge residents exponentially higher rates for water usage above 6 kl per month, while households consuming above 10.5 kl could be fitted with a water management device. The new restrictions also limited the use of borehole and wellpoint water for irrigation.

Table 5: City of Cape Town Water Tariffs

Consumption per month	**Previous Tariffs – total household water bill**	**New 6B Tariff – total household water bill**
6 000 litres	R28.44	R145.98
10 500 litres	R109.50	R390.82
20 000 litres	R361.06	R1 536.28
35 000 litres	R1 050.04	R6 939.57
50 000 litres	R2 888.81	R20 619.57

Another key event within the period of the study was the announcement of “Day Zero” by the Mayor of Cape Town, and the inclusion of this concept in the campaign messaging, which created an increased awareness and focus of the public and media on the worsening water crisis.

Impact of the Billing Inserts on Water Consumption

Balance tests were conducted to assure that treatment and control groups were well balanced in terms of total monthly consumption, daily average consumption and the number of period days per month. No significant differences were found between treatment and control groups in terms of any of these variables (Table 6).

Table 6: Balance tests for the City Water Map sample

	(1)	(2)	(3)
VARIABLES	consumption	daily_avg	period_days
treatment1	-0.0145	-4.42e-05	0.00185
	(0.0218)	(0.000949)	(0.00673)
2.TB_baseline	3.981***	0.133***	0.0247***
	(0.0276)	(0.00120)	(0.00852)
3.TB_baseline	9.466***	0.317***	0.122***
	(0.0282)	(0.00123)	(0.00872)
4.TB_baseline	17.66***	0.592***	0.193***
	(0.0427)	(0.00186)	(0.0132)
5.TB_baseline	25.55***	0.858***	0.134***
	(0.0953)	(0.00415)	(0.0294)
6.TB_baseline	24.89***	0.846***	-0.181***
	(0.136)	(0.00593)	(0.0421)
Constant	6.858***	0.231***	29.78***
	(0.0242)	(0.00105)	(0.00747)
Observations	413,668	413,668	413,668
R-squared	0.412	0.294	0.001

Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

As anticipated, due to the lack of control group included in the map, and multiple overlapping initiatives taking place to reduce demand, the results of the impact of the intervention were not statistically significant in terms of reducing water consumption amongst households. The DiD analysis (Table 7) showed that overall households in the treatment group slightly increased their consumption (26.5 litres per month) compared to the control (column 1). Households in the treatment group who had a green dot on the map reduced their consumption further (11.9 litres per month, column 2). However, both changes in consumption were insignificant.

Table 7: DiD analysis impact of the City Water Map billing inserts on water consumption

	(1)	(2)
VARIABLES	Overall analysis	Households with green dots
treatment	-0.00386	0.0199
	(0.0253)	(0.0283)
Post	-5.383***	-4.696***
	(0.134)	(0.105)
treatment_x_Post	0.0265	-0.0119
	(0.0286)	(0.0329)
period_days	0.285***	0.214***
	(0.00740)	(0.00568)
TB2	3.307***	3.088***
	(0.0277)	(0.0264)
TB3	7.567***	5.840***
	(0.0444)	(0.0426)
TB4	13.70***	9.880***
	(0.101)	(0.138)
TB5	19.38***	11.52***
	(0.300)	(0.404)
TB6	18.04***	9.900***
	(0.450)	(0.464)
QPV_2	0.0515	0.0927
	(0.123)	(0.0900)
QPV_3	-0.301**	-0.309***
	(0.146)	(0.0923)
QPV_4	-0.110	-0.157
	(0.180)	(0.112)
QPV_5	0.771***	0.750***
	(0.207)	(0.133)
indigent	-0.0113	-0.392***
	(0.100)	(0.116)
Constant	-0.464	1.073***
	(0.289)	(0.220)
Observations	687,768	422,662
R-squared	0.465	0.369
Robust standard errors in parentheses		
**** p<0.01, ** p<0.05, * p<0.1*		

It is important to note that this is not an indication that the map was not effective at reducing water consumption, but rather that it is not possible to accurately assess what reduction in water consumption over the period is attributable to the map, compared with other initiatives.

Social Response to the Map

Following its launch, the map was widely reported on in the media and high volumes of web traffic were observed, indicating that many residents were aware of and accessing the website. Viewers of the map were able to access it via the information landing page set up by the CoCT, or via other channels. The figure below indicates views only from the landing page as other data is not available and shows that there has been a consistent pattern of accessing the map since its initial launch, with initial highs of over 16,000 views. It is expected that viewership incorporating the other channels would be significantly higher.

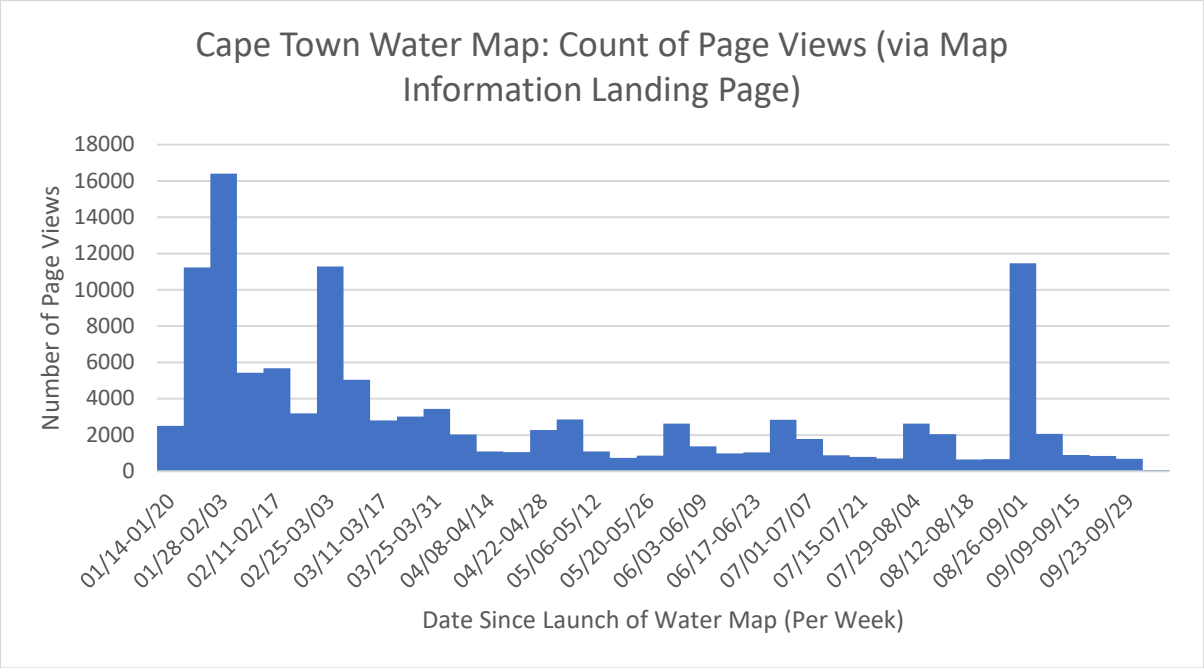

Figure 10: Views of Cape Town Water Map since launch (access via Map Information Landing Page)

It was also, however, clear from news coverage and informal monitoring of water-related social media that the project would prove controversial amongst citizens, with both positive and negative commentary reported in the media. The most commonly cited concerns centred around the website and information being confusing, and privacy of the water consumption data.

Clarity and Consistency of Information

There was confusion around the meaning of the various markers on the map, and the calculations that had been performed to deduce whether households would appear on the map or not.

While there was ample, detailed supporting information provided on the website in the form of an FAQ and instructions to address many of the queries, it appears that these did not resolve some of the confusion. In further iterations of the project, additional consideration should be given into how to provide guiding information in a more easily digestible format.

Privacy Concerns

Some citizens expressed concern and frustration that their private information was being shared online. Although the CoCT had obtained legal counsel to affirm that it was not legally a breach in privacy to disclose this data, the sentiment from some of the public was that their privacy was being negatively impacted. Future designs should consider introducing an "opt out" function, whereby residents could choose to remove themselves from the map display.

Conclusion

The Water Map was an innovative and effective, if controversial, tool to create awareness of water consumption in the city. By making use of and combining existing resources, in terms of the CoCT's data records of water consumption and the GIS platform, as well as the learnings from the previous research project around effective nudges in the city, an entirely new product was created. There are many opportunities available to build upon the design which are explored in detail within the 'Innovation' chapter of the report.

It is unfortunate that the impact on water consumption was not able to be quantified due to the design of the intervention, however high viewership of the website indicates that Cape Town residents were engaged enough in the information to continue to check it, even after the threat of Day Zero had passed.

5.3 Nudge Intervention 3: Billing Inserts

The format of the first nudge intervention run by the CoCT and EPRU, in which 400,000 households received nudges as billing inserts, differs slightly in format from the other sections of this chapter in that two sets of distinct analyses were carried out – one concerning the long-term impact of nudges, and the other investigating the impact of nudges on indigent households. For the sake of clarity, these are dealt with separately.

Long-Term Impact of Nudges on Water Consumption

Introduction

The aim of this research analysis is to assess the long-run impacts of behavioural nudges as a DSM tool. This analysis aimed to assess the question of how persistent the treatment effects were after the behavioural intervention ended. Given the initial treatment assignment and water consumption data over several years, treatment effects of the behavioural nudges study were analysed over a two-year period from June 2016 to June 2018. Results showed that the behavioural inserts had a continued impact on water conservation even after the inserts were no longer sent to households. Meaningful differences between treatment and control groups were still found two years after the messages were no longer sent. Particularly the social norm treatment and the graph treatment still significantly influenced consumption. Households in the social norm group consumed on average 2.1% less water than the control group. The average treatment effect over the 2-year period after the messages were no longer sent (June 2016-June 2018) was 1%.

Background

Policy designers aim to create effective policies that change people's lifestyle behaviour but nudges are commonly only offered on a short-term basis. Despite empirical evidence showing the success of behavioural nudges in the short term, few research has been done on whether habit changes persist once behavioural interventions are discontinued. However, assessing whether nudging interventions are effective in the longer term is equally important as assessing their effectiveness in the short term. At very little costs, such programmes have the potential to provide longer term benefits, increasing welfare at high cost effectiveness.

Previous longer term assessments of behavioural change studies have shown that treatment effects rarely persist in the longer run and in case treatment effects do persist, they decline quickly. Empirical evidence on long-term effects of nudging interventions has been collected in the context of exercising (Charness and Gneezy, 2009), in weight loss programmes (Volpp et al., 2008), smoking cessation programmes (Cahill and Perera, 2009) but also in relation to water conservation (Ferraro, Miranda and Price, 2011; Ferraro and Price, 2013). Charness and Gneezy (2009) assess the effectiveness of extrinsic incentives to improve gym attendance by paying study participants to go to the gym. They evaluated what happens to participant's gym attendance when the incentives were removed and found that the payment scheme created a positive habit of attending the gym more often for people who did not attend the gym before the introduction of the programme. Paying people who already exercised was found to

potentially have undesired effects once the programme was stopped. Volpp et al. (2008) analyse the effectiveness of using a financial incentive system to encourage participants to lose weight. It was found that weight was regained between the end of the weight loss programme and the follow-up meeting. Maintaining weight loss achieved during the programme over a longer period after the programme stopped proved to be challenging. Cahill and Perera (2008) showed in their meta study of smoking cessation programmes that the effectiveness of most initiatives does not reach beyond six months from the start of the study. When incentives are no longer offered, treatment effects disappear.

Ferraro, Miranda and Price (2011) examine the long-run impact of behavioural nudges on residential water consumption and find that the treatment group that received a social comparison message was found to have decreased consumption in comparison to the control group even two years after the messages were sent. Messages with pro-social appeals did not have the same effect – they only affected short-term water use. The researchers concluded that when policy makers are interested in encouraging behavioural change in the short- as well as in the long-term, they should use social comparison messages.

The home energy report company OPOWER used behavioural messages with social norms across the United States and was able to achieve an average decrease of 2% in energy consumption consistent over a two-year period (Allcott, 2011). Around 600,000 households received information on their monthly energy consumption and how it compared to their most efficient neighbour as well as to the average household usage in their neighbourhood. Households additionally received a historical comparison over 12 months and personalised tips on how to conserve energy (Allcott and Mullainathan, 2010; Allcott, 2011; Ayres et al., 2013; Allcott and Rogers, 2014). Allcott and Rogers (2014) found that when messages were discontinued to households after two years, treatment effects still persisted but decayed at 10-20 percent per year. Households were randomly assigned to continued or discontinued treatment allowing the researchers to assess the post-intervention persistence of the treatment. After households no longer receive treatments, average usage reduction was still around 2 percent. Allcott and Rogers (2014) attribute this persistent change in consumption to habit formation.

However, Brandon et al. (2017)'s study of the same OPOWER sample shows that technology investments play a large role in persistent reduction in electricity usage. They find that 35 to 55 percent of the reductions seen throughout the behavioural nudges intervention persist once households no longer receive any communication. They find that the persistence in behaviour change seems to be primarily driven by investment in physical capital (energy efficient technology) rather than new habit formation. Brandon et al. (2017) suggest that if behavioural

nudges induce investment in efficient technologies, the cost effectiveness of such programmes needs to be re-evaluated as technology adoption costs need to be included in the calculations. Their research suggests that while social nudges might not have the hoped effect on habit formation, they do motivate households to adopt new technologies needed for changes in habits.

This analysis aims to add an important element to the existing literature because so far, there has been a lack of long-term analysis of behavioural nudging studies – particularly in the context of water conservation and especially so in a developing country context.

Method and Approach

As previously stated, Difference-in-Difference (DID) was used for all nudge study analyses, including the long-term analysis.

Data and Analysis

It was looked into the effect of the nudges over the 6-month, 1-year, 1.5-year and 2-year post intervention period after treatments were no longer sent to households. For the 6-month assessment, comparisons were made between June 2014-November 2014 to June 2016-November 2016 (Table 8, column 1). For the 1-year post intervention assessment, the study looked at June 2014-May 2015 and June 2016-May 2017 (Table 8, column 2). The 1.5-year post-intervention treatment compared consumption between June 2014-November 2015 to June 2016-November 2017 (Table 8, column 3). Finally, the 2-year period looked at consumption between June 2014-May 2016 and June 2016-May 2018 (Table 8, column 4).

Average treatment effect for all treatments in the 6-month post treatment period was -0.145 kl which translates into an average reduction of 0.74% (average pre-intervention period consumption for the 6-month period was 19.48 kl). The financial loss (-0.211***) and social norm (-0.170**) treatment had the largest impacts in the six-month period after the behavioural study ended (Table 8, column 1).

Over the one-year period after the end of the study, the behavioural nudges on average reduced consumption by -0.210 kl compared to the control group. This absolute average reduction is equivalent to a 0.95% reduction in consumption that can be attributed to the behavioural insights intervention (average water consumption in the pre-intervention period for the 12-month period was 22.22 kl). With the graph treatment (-0.271***), the financial loss (-0.250***), and the social norm (-0.216**) treatment showing the strongest treatment effects.

Over the 1.5-year period, the behavioural nudges had an average treatment effect of -0.224 kl or an average reduction of 1.1% (1.5-year average water consumption in the pre-treatment period was 20.96 kl). Assessing the different treatments over a 2-year period shows that the graph treatment is the most successful (-0.307***), with the financial loss (-0.235***) and the social norm (-0.222***) treatment showing equally strong treatment effects. The average effect of the treatments is -0.210 kl which is equivalent to a 1% consumption reduction over the 2-year period (2-year pre-intervention consumption was on average 21.13 kl).

Table 8: Treatment effects after cessation of behavioural nudges

Average Treatment Effects After behavioural messages were no longer sent (6-months period, 1-year period, 1.5-year period, 2-year period)

	6 months-period	1-year period	1.5-year period	2-year period
	nudge6_14	nudge12_14	nudge18_14	nudge24_14
Post	-1.945***	-5.064***	-5.137***	-5.928***
	0.087	0.21	0.185	0.195
TipsxPost	-0.075	-0.157**	-0.157**	-0.177***
	0.072	0.079	0.067	0.062
GraphxPost	-0.133*	-0.271***	-0.308***	-0.307***
	0.08	0.079	0.067	0.06
GainxPost	-0.134*	-0.158**	-0.152**	-0.109*
	0.072	0.077	0.066	0.062
LossxPost	-0.211***	-0.250***	-0.257***	-0.235***
	0.079	0.083	0.069	0.063
Social NormxPost	-0.170**	-0.216**	-0.244***	-0.222***
	0.085	0.084	0.069	0.068
Period days	0.530***	0.607***	0.570***	0.562***
	0.018	0.008	0.009	0.007
Indigent	0.206*	1.587***	1.430***	1.640***
	0.11	0.189	0.171	0.197
Summer	0	-3.938***	-4.906***	0
	.	0.166	0.193	.
Autumn	1.798***	-2.412***	-3.676***	-1.806***
	0.087	0.111	0.131	0.045
Winter		0	0	-3.679***
		.	.	0.173
Spring		-1.651***	-1.680***	-2.109***
		0.047	0.048	0.112
Constant	2.539***	5.950***	7.263***	6.344***
	0.541	0.188	0.184	0.143
R-squared	0.086	0.169	0.173	0.185
Observations	1165470	2467294	3538838	4604536
Treated	966034	2044405	2932642	3816902

Treat1	206055	436775	625880	814458
Treat2	208002	439619	630530	820444
Treat3	205569	434965	623768	812188
Treat4	206849	437972	628421	817852
Treat5	139559	295074	424043	551960
Control	199436	422889	606196	787634
Clusters	646	646	646	646
Fpvalue	0.116	0.011	0	0

Conclusion

The empirical estimates show that the behavioural messages still affect water consumption in the same period two years after the initial messages were sent. There is no crowding out effect and reductions in consumption due to the nudges are on top of what tariff and restrictions have achieved. Particularly the graph and social norms messages still significantly decrease the treatment groups water consumption two years later. It is found that the total average treatment effect of the messages after the treatments were no longer sent to households is a consistent 1% reduction compared to the control group. Assessing the different treatments over a 2-year period shows that the graph treatment, the financial loss, and the social norm treatment show the strongest treatment effects. Behavioural messaging can hence be a viable addition to policy maker's toolbox when interested in affecting longer term behavioural changes.

Recommendations

The results of this study show that most behavioural messages had a persistent effect on water usage, particularly the graph and the social norm messages. The persistence of the social norm treatment is in line with previous findings by Ferraro et al. (2011). Behavioural nudges hence provide a strategy for policy makers to effectively promote environmental conservation in the shorter as well as in the longer term.

The results show that the graph treatment became more significant and had a stronger treatment effect over time. It therefore raises the question if the graph treatment helped households to better understand the tariff structure during price increases in the future and whether receiving the graph treatment enabled households to respond better to increased tariff prices. It would hence be interesting to further assess the educational aspect of the behavioural nudges study.

The long-run persistence of the treatments furthermore raises the question of what treatment mechanisms were at play. Did the treatments motivate households to invest in water saving

technologies or did households purely adjust their behaviour? Identifying the type of changes that households made to reduce their water consumption would help in better understanding the long-term impacts of the behavioural study as well as the welfare implications.

Impact of Nudges on Indigent Households

Introduction

Cape Town is one of the most unequal cities in the world (Gini coefficient of 0.67 based on consumption according to the UN-Habitat report 2011). In highly heterogeneous and unequal societies there is a need for demand management that takes demography and behaviour of various groups within the population into account because those groups can be affected by policies in different ways. Preliminary findings from previous behavioural interventions indicate that responses differ systematically across income groups (Brick, De Martino and Visser, 2017). In particular, the indigent population was found to be very unresponsive to behavioural nudges aimed at motivating water savings. Households are classified as indigent if they lack access to fundamental goods and services to survive and can apply for indigent support and rates relief depending on total monthly household income (Department of Provincial and Local Government Republic of South Africa, 2005). Around a third of the City of Cape Town's overall domestic consumers are classified as indigent households (34%); it is hence vital to understand this large part of citizens who are unresponsive to behavioural messages.

Various behavioural interventions have been implemented in developed countries, however little work has been done on the use of nudges for natural resource conservation in developing countries – particularly in countries as heterogeneous as South Africa. This analysis adds an important element as it aims to unpack the non-responsiveness and, in particular, undesired and unanticipated behaviour amongst low income groups to behavioural nudges. The findings indicate that amongst indigents it was specifically those that consumed in the highest decile that increased their consumption in response to social norm messaging. Moreover, it was found that conscientious payment of utility bills was also indicative of responsiveness to nudges.

It is acknowledged that while the study was able to analyse and interpret the quantitative data available, further qualitative research is necessary to understand the complex societal and personal forces at play in driving the reactions that were observed.

Poverty, Basic Rights and Indigent status in delivery of utility services in South Africa

Eliminating poverty and reducing inequality has been one of the main objectives of the South African government since the end of apartheid. A major factor of poverty reduction is improving living conditions and reducing the cost of living for poor households. Economic exclusion, as a result of inequitable economic development policies in the past, has resulted in the exclusion of poor households from basic service access, contributing to their poverty. To improve the welfare of South African households and address the disparities in basic service access inherited from apartheid, special emphasis has been put on local government (supported by national and provincial government) to effectively address the needs of poor households and provide a package of basic municipal services to them. The indigent policy aims to eliminate the elements of poverty that local government has control over and ensure inclusion of the poor guaranteeing their access to affordable basic services including free basic water and sanitation, free municipal solid waste services, free basic electricity, and zero-rating of low value properties (Department of Provincial and Local Government Republic of South Africa, 2005).

As noted previously, an individual or household is classified as indigent if they lack access to or are unable to pay for fundamental goods and services to survive, such as sufficient water and basic energy supply, basic sanitation, refuse removal, environmental health, health care, housing, food and clothing (Department of Provincial and Local Government Republic of South Africa, 2005). In the City of Cape Town, in 2018, residential households were classified as indigent through two procedures (1) they were automatically classified as indigent if the municipal value of their property was less than R400,000 or (2) if a household applied for indigent status because their property value was higher than R400,000 but the household had an income below R6,000 per month.

The benefits households that are classified as indigent receive vary. The South African government, after the first democratic elections in 1994, wrote into the constitution that every household in South Africa should have the right to a monthly allowance of water for free. The government consequently implemented the “Free Basic Water Policy” in 2001 according to which every household in South Africa (independent of household size or monthly household income) receives a free water allowance of 6 kl, equal to the WHO’s recommended minimum. Households also receive 4.2 kl of free sanitation service. Indigent households additionally receive 4.5 kl of water and 3.15 kl of sanitation service for free. During the water crisis, the “Free Basic Water Policy” was lifted (in the beginning of February 2018) for all households that are not classified as indigents, indigent households still receive the free allocation of 10.5 kl of water per month. Similarly, indigent electricity customers receiving less than

250 kWh per month receive a free basic supply of 60 kWh, with those receiving between 250 kWh and 450 kWh per month receiving a free basic supply of 25 kWh per month. Refuse removal and property rates depend on the indigent household's property value (City of Cape Town, 2016).

Table 9: Indigent benefits based on property value

Property value	**Property rates rebate**	**Refuse removal rebate**	**Water**	**Sanitation**	**Electricity**
<R100,000	100%	100%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh
100,001-150,000	100%	75%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh
150,001-200,000	100%	50%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh
200,001-300,000	no rates on the first R200,000	50%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh
300,001-350,000	no rates on the first R200,000	50%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh
350,0001-400,000	no rates on the first R200,000	25%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	max. 60 kWh

Households can also apply for indigent support or indigent rates relief depending on total monthly household income. By way of comparison to the support offered based on property value, any household that earns less than R4,000 per month can apply for indigent status to receive the same benefits as a household with a property that is valued R100,000 or less. As monthly household income increases, households receive lower rates relief for property rates and refuse removal. Water, sanitation and electricity benefits remain the same.

Table 10: Indigent benefits based on monthly household income

Gross monthly household income	**Property rates rebate**	**Refuse removal rebate**	**Water**	**Sanitation**	**Electricity**
<R4,000	100%	100%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	50 kWh
R4,001-R5,000	75%	75%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	50 kWh
R5,001-R5,500	50%	50%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	50 kWh
R5,501-R6,000	25%	25%	6 kl + 4.5 kl	4.2 kl + 3.15 kl	50 kWh

Since very little to no revenue is raised from the indigent consumer, costs incurred to provide the services need to come from other sources. Services to indigent households are financed through cross-subsidisation (from high-income consumers who generally consume in higher tariff blocks), revenue from other municipal administration (such as property rates) and subsidies from national government.

These value driven rebates are allocated automatically by the billing system when the invoices are produced.

Behavioural inserts and heterogeneous responses

Non-price based signals can have heterogeneous effects across the population, one therefore needs to consider the contextual nature of such a signal. Previous research has found that neighbourhood comparison interventions are most effective on high-consumption households (Datta et al., 2015), that wealthier, owner-occupied households and those that use more water are more responsive to behavioural messaging (Ferraro & Miranda, 2013), and that households show different effects to treatment across political affiliations (LaRiviere et al., 2014).

Understanding heterogeneous treatment effects would allow policy makers to avoid wasting resources sending information to non-responsive subgroups or subgroups that would react in ways contrary to the policy objective. Analysing heterogeneous responses across a population could enable researchers to make results more generalizable to different target groups. While it could be problematic to generalise results from one population to another, a subsample of two different populations might have more similar observable characteristics and be more comparable. Finally, understanding heterogeneous treatment effects in a population also helps to understand why a treatment is effective.

Method and Approach

Experimental Design: Sample

The total sample in this analysis consisted of around 272,000 residential households in Cape Town, South Africa, living in free-standing houses. Of these, 41.7% were indigent households and 58.3% non-indigent households (Table 11). There were around 48,000 households in the control group and each treatment group consisted of between 32,000 and 46,000 households. All participating households were domestic water users, had access to piped water, unrestricted water supply and a conventional credit meter.

Table 11: Number and percentage of indigents/non-indigents in the sample

	Freq.	Percent
Non-indigent households	158,579	58.3%
Indigent households	113,424	41.7%
Total	272,003	100

Most indigent households (98.7%) in this study sample were in property value quintile (QPV) 1 and 2 with houses of a value of up to R400,000 (Table 4). Most indigent households were hence automatically classified as such due to their property value, while only 1.3% of households applied for indigent status based on a household income of less than R6,000 a

month. Non-indigent households had properties that were mainly (87%) in property value quintiles QPV3 to QPV5. The average water consumption between indigent and non-indigent households in each property quintile did not differ much (except for QPV5). Average non-indigent water consumption was only slightly higher in each quintile.

Table 12: Overview of non-indigent and indigent sample's number of households per property value quintile and average monthly consumption per quintile

Property Quintiles (property value in Rand)	**Non-indigent households**		**Indigent households**	
	Number of households (and percentage of total sample)	Mean monthly consumption (in kilolitre)	Number of households (and percentage of total sample)	Mean monthly consumption (in kilolitre)
QPV1 (R1,000-R214,000)	1,331 (1%)	19.67	67,709 (61%)	17.86
QPV2 (R214,320-R400,000)	17,357 (12%)	18.13	41,716 (38%)	17.91
QPV3 (R400,500-R661,000)	41,629 (28%)	19.58	1,049 (1%)	19.23
QPV4 (R661,400-R1,160,000)	43,027 (29%)	22.99	304 (<1%)	22.25
QPV5 (R1,160,510-R45,000,000)	43,492 (30%)	32.36	77 (<1%)	27.38
Total	146,836		110,855	

Data and Analysis

Low income households were less responsive to behavioural inserts than high income households

The average treatment effect was analysed using Difference-in-Difference. Table 13 presents the overall treatment effects of the different behavioural billing inserts on residential household's monthly water consumption for the non-indigent and indigent population. The study examines the non-indigent and indigent populations in property value quintile 1 and 2 (QPV1 and QPV2) in more detail to get a more nuanced perspective of the drives for consumption and behavioural change amongst the poor.

Table 13: Average treatment effects non-indigent and indigent population

VARIABLES	Non-indigent sample	Non-indigent (QPV2)	Indigent sample (QPV2)	Indigent sample (QPV1)
tips	0.105	0.15	-0.290**	-0.00515
	-0.104	-0.201	-0.124	-0.168
socialnorm	0.135	0.0517	-0.236*	-0.168
	-0.114	-0.314	-0.137	-0.159
intrinsic	0.166	0.145	-0.13	0.167
	-0.114	-0.238	-0.178	-0.164
sroNOU	0.250**	0.019	-0.246	-0.0364
	-0.112	-0.219	-0.176	-0.146
sroOU	0.149	0.162	-0.202	0.17
	-0.102	-0.248	-0.165	-0.157
pg	0.198**	-0.0509	-0.298**	0.0149
	-0.1	-0.209	-0.139	-0.154
Post	2.093***	1.127***	1.301***	0.851***
	-0.163	-0.2	-0.209	-0.222
tips_x_Post	**-0.175****	-0.256	0.142	0.0613
	-0.085	-0.177	-0.139	-0.198
socialnorm_x_Post	**-0.275*****	-0.275	0.324**	**0.286***
	-0.0965	-0.225	-0.164	-0.158
intrinsic_x_Post	**-0.324*****	-0.257	0.13	-0.0632
	-0.0926	-0.263	-0.148	-0.161
sroNOU_x_Post	**-0.362*****	-0.15	**0.332***	0.102
	-0.0904	-0.229	-0.198	-0.165
sroOU_x_Post	**-0.295*****	**-0.476****	0.212	-0.107
	-0.0843	-0.212	-0.156	-0.216
pg_x_Post	**-0.203****	-0.0276	0.418***	-0.0115
	-0.0857	-0.201	-0.161	-0.171
trend	-0.607***	-0.232***	-0.244***	-0.124***
	-0.0257	-0.0225	-0.0245	-0.0376
period_days	0.704***	0.567***	0.597***	0.519***
	-0.0105	-0.0102	-0.00821	-0.0142
_ITB_baseli_3	5.650***	4.681***	4.765***	4.163***
	-0.0805	-0.0912	-0.06	-0.0842
_ITB_baseli_4	15.45***	13.07***	13.16***	12.38***
	-0.142	-0.151	-0.131	-0.178
_ITB_baseli_5	27.00***	22.44***	22.11***	21.49***
	-0.251	-0.538	-0.369	-0.398
_ITB_baseli_6	37.81***	31.26***	29.30***	30.34***
	-0.335	-1.148	-0.978	-0.524
Constant	-2.307***	-3.725***	-4.785***	-2.836***
	-0.289	-0.321	-0.337	-0.4
Observations	1,178,067	122,032	282,939	419,273
R-squared	0.477	0.423	0.41	0.343

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

In line with research in developed countries, such as the US, the traditional difference-in-difference model suggests that in the higher income groups, all treatments significantly

decreased consumption. Messages which promoted water conservation via social incentives and appeals to the public good (social norm, intrinsic motivation, social recognition, public good) were particularly successful. The social recognition (no opt-out) had the strongest impact on higher income residential household's water consumption with an average treatment effect of -0.362***.

The results show however that low income households were less responsive to behavioural inserts than high income households. Households in the non-indigent sample that were most comparable to the indigent households were households that were in QPV1 and QPV2. There were a total of around 17,000 households not classified as indigent (yet) in QPV2 – these households constituted 12% of the entire non-indigent population. In comparison there were around 42,000 indigent households (38% of all indigents) in QPV2. This category was therefore used when making comparisons to the indigent subsample. Even though indigent households received an additional 4.5 kl of water for free, average consumption was very similar between indigents and non-indigents in QPV2: average consumption for indigents in QPV2 was 17.91 kl (stdv: 10.99 kl) while average consumption for non-indigents in QPV2 was 18.13 kl (stdv: 10.92 kl)). The behavioural inserts in this study did not have any financial messages and it should therefore not impact the results.

When analysing what effect the behavioural messages had on households with low income that are not officially classified as indigent (yet), it can be seen that all coefficients were negative but most of them insignificant. Only the social recognition "opt-out" treatment was significant at a 5% level (-0.476**). However, the results of the indigent subsample look very different: none of the treatments significantly reduced water consumption and the social norm treatment even significantly increased water consumption for QPV1 (0.286*) and for QPV2 (0.324**). This perverse reaction to the nudge was also seen in the response to the social recognition treatment (no opt-out) amongst the indigent QPV2 subsample, where the average treatment effect (0.332*) was positive and significant. Finally, there was also a positive and significant treatment effect amongst the public good treatment in QPV2, but again due to imbalances between the sample and the control group, this result was disregarded.

It was unpacked why lower income households were relatively unresponsive compared to higher income households and why they, at times, showed an undesired response to behavioural nudges. The analysis considered the extent to which average pre-intervention or baseline consumption levels of households were correlated with their responses to the nudges. Analysis was also done to establish the extent to which payment for utility services was an indicator of responsiveness to nudging. It was found that cooperative behaviour (and

conversely free-riding) was a three edged sword in securing sustainable utilities delivery. Amongst the lower income group that were unresponsive to nudging: indigent households ***who consumed more to start with***, were less responsive to nudges (aimed at conserving water). Conversely, households that tended to ***pay their bills more often*** tended to also have ***lower pre-intervention consumption values*** and were similarly ***more responsive to nudges***.

Positive and significant (perverse) responses were driven by indigent households with (very) high pre-consumption levels

Treatment effects can show significant heterogeneity across the distribution of baseline water consumption, therefore it is important to assess how households with different baseline water use adjusted their consumption after receiving the behavioural insert. Baseline deciles were calculated by taking the average pre-treatment household usage across all households for a specific subsample and ordering it into equally sized groups of ten. Higher deciles of baseline usage relate to higher water consumption, thus the 10th decile of baseline consumption consisted of households that had the highest water consumption in the distribution.

Conditional Average Treatment Effects for households in different percentiles of their distribution of baseline usage were estimated by interacting the treatment effect with dummy variables for decile of baseline water consumption, following, for example, Allcott (2011) and Brent, Cook and Olsen (2014):

Equation 2: Baseline Water Consumption

$$Y_{dt} = \propto + \beta_d \sum_{d=1}^{10} (Post\ x\ D_d) + \gamma_d \sum_{d=1}^{10} (Social\ Norm * Post_t * D_d) + \delta X_t + \varepsilon_t$$

It was found that the significant increase in average consumption in the QPV1 indigent sample, social norms treatment, came from the higher pre-treatment consumption deciles. The largest conditional treatment effect was seen for the QPV1 indigents in the 10th decile of pre-consumption where an increase in water consumption of 2.139** Kl occurred at a 5% significance level.

Low income households (non-indigent and indigent) with very high pre-consumption tend to not pay their bills

High occurrence of non-payment for services is a wide-spread complex problem in South Africa that arises for various reasons such as expectations of services to be free, lack of understanding of the importance of paying for received services, dissatisfaction with current services (such as poor and inadequate sanitation), or because there are very little punitive

actions (such as cutting off services) taken against households that do not pay their bills (Department of Water Affairs and Forestry, 2001). However, poverty remains the dominant factor behind non-payment (Department of Water Affairs and Forestry, 2001). Limited financial means force households to prioritise what they want to spend their money on. A large portion of poor households do not register for indigent support because registration is too complicated or because they do not have enough information about the policy.

While there is not a big difference between a household's consumption history and their payment pattern for middle and higher income households, lower income households on the extremes, consuming either very high or rather low volumes, seem to pay their bills less often (Table 14). Households in the lowest pre-consumption deciles (1,2,3) and in the highest decile (10) show highest percentages of non-payment (ranging from 95.9-62.6% amongst deciles 1-3 and 93.8-64.0% in decile 10 for the indigent subsample and from 48.2-44.9% in deciles one and two and 46.5% in decile 10 for the non-indigent subsample).

Significant responses to behavioural nudges were driven by households that paid their bills

The undesired indigent effect of increasing consumption in response to the nudge in QPV2 was driven by those who did not pay a substantial amount of their monthly utility bill. These households would have received the message but were non-cooperative. This effect for QPV2 disappeared when only considering households that paid at least 50% of their bill. Indigent households in QPV1 that paid more than 50% of their bill significantly decreased their consumption – the results were significant for intrinsic motivation and social recognition (opt-out) (Table 14, column 6). The undesired effect among some indigent households in QPV1 that increased their consumption as response to the behavioural messages disappeared when only analysing households that paid their bills conscientiously (at least 50% of the amount).

Table 14: Difference-in-difference results for indigent households paying more than 50% of their bill

	Indigent Households			
	QPV2		QPV1	
VARIABLES	(5) Zero	(6) More than 50%	(7) Zero	(8) More than 50%
tips	-0.277	-0.311*	-0.0114	-0.133
	-0.183	-0.173	-0.186	-0.345
socialnorm	-0.255	-0.116	-0.136	-0.416
	-0.198	-0.206	-0.181	-0.32

	Indigent Households			
	QPV2		QPV1	
intrinsic	-0.0897	0.0284	0.182	0.526
	-0.241	-0.173	-0.173	-0.353
sroNOU	-0.217	-0.023	0.0179	-0.269
	-0.204	-0.247	-0.159	-0.346
sroOU	-0.135	-0.00012	0.162	0.317
	-0.233	-0.198	-0.176	-0.386
pg	-0.154	-0.295	0.0115	0.00244
	-0.206	-0.18	-0.168	-0.363
Post	1.287***	1.759***	0.797***	2.041***
	-0.241	-0.281	-0.233	-0.259
tips_x_Post	0.204	0.113	0.103	-0.243
	-0.206	-0.187	-0.218	-0.371
socialnorm_x_Post	**0.543****	-0.0708	0.268	0.0408
	-0.234	-0.242	-0.171	-0.33
intrinsic_x_Post	0.0913	-0.115	-0.0685	**-0.926****
	-0.193	-0.196	-0.174	-0.347
sroNOU_x_Post	0.286	-0.0507	0.0589	0.475
	-0.255	-0.224	-0.179	-0.356
sroOU_x_Post	0.212	-0.225	-0.112	**-0.748***
	-0.223	-0.196	-0.241	-0.382
pg_x_Post	0.321	0.21	0.0107	-0.405
	-0.213	-0.202	-0.182	-0.319
trend	-0.204***	-0.316***	-0.110***	-0.308***
	-0.0288	-0.0291	-0.0405	-0.0255
period_days	0.594***	0.583***	0.513***	0.557***
	-0.0101	-0.0078	-0.0147	-0.0101
_ITB_baseli_3	4.775***	4.619***	4.134***	4.066***
	-0.0711	-0.0842	-0.0856	-0.119
_ITB_baseli_4	13.44***	12.45***	12.38***	11.78***
	-0.184	-0.191	-0.184	-0.298
_ITB_baseli_5	22.91***	19.42***	21.50***	19.57***
	-0.367	-0.916	-0.402	-0.978
_ITB_baseli_6	29.82***	26.46***	30.51***	22.24***
	-0.878	-4.563	-0.52	-3.203
Constant	-5.091***	-4.277***	-2.762***	-3.235***
	-0.391	-0.33	-0.408	-0.45
Observations	160,185	78,121	367,066	24,990
R-squared	0.407	0.458	0.341	0.431

Conclusion

This analysis focused on the behaviour amongst low income domestic free-standing households in a sample of about 272,000 households in the City of Cape Town. Previous work in nudges in Cape Town (Brick et al., 2017) has indicated that behavioural messaging is

successful in curbing consumption amongst middle and high income groups – in a similar manner that nudges have evoked savings in other developed countries. This research found that for low income households, this pattern hardly persists and that behavioural responses of the indigent subsample may in some case even be considered undesired.

Generally, the municipality is more concerned with changing the behaviour of the wealthier part of the population since they tend to consume most of the CoCT's water and are responsible for the largest share of payments by far. It is however important to consider that the low income group in the city constitutes more than a third of the entire population and that on average households in property value quintile 2 consume only 4 kl less than their neighbours in QPV3 and QPV4. Missing social institutions amongst this substantial subsample of the population therefore does not bode well for longer term sustainable management of an increasingly scarce resource.

It was found that cooperative behaviour (and conversely free-riding) is a three edged sword in securing sustainable utilities delivery with average consumption levels, payments for services, as well as response to behavioural nudges influencing each other. The lower income groups are unresponsive to nudging or responded perversely with an increase in consumption. Indigent households who consume more to start with increased their consumption in response to social norm and social recognition messaging. This behaviour is not observed in a similar manner amongst non-indigents in the lower income quintiles and raises the question whether officially being registered as indigent has an effect on willingness to pay for services and feeling of entitlement to free-ride. At the same time, households with higher pre-intervention consumption values tend to pay their bills less often. In turn, conscientious payment of utility bills is also indicative of responsiveness to nudges with those households paying more of their bills being more responsive.

While cooperative citizens tend to 1) pay their bills 2) they also consume less and 3) they are more responsive to nudges to conserve water. Conversely those with free-rider mentality tend to use more water, not pay their bills and are likewise nonresponsive to nudges – revealing an attitude of "*moral licencing*" for uncooperative behaviour.

Wide-spread non-payment for services is a complex problem in South Africa. During the apartheid era, non-payment of rates, fees and service charges was a form of protest against the regime and used as tool to weaken the apartheid system. However, after the end of apartheid, the culture of non-payment is still widespread and seen as "norm" in many areas. The causes for non-payment are complex and variation on payment compliance exists within

poor communities and between communities with similar characteristics. The Centre for Development Support (2001) and Johnson (1999) show that non-payment is not only depending on inability to pay or a culture of non-payment. Households that have the finances to pay for their bills opt to free ride. Fjeldstad (2004) shows that compliance behaviour is linked to whether people perceive that the local government is acting in their interest but that level of payment is also depending on the relationship between citizens within a community. Trustworthiness of the government and trust in other citizens hence play an important role in contribution to the public good. Payment was found to be affected by (1) whether citizens trust the local government to use revenues to provide services, (2) whether service delivery and revenue collection is distributed fairly within the population, and (3) whether other people in the neighbourhood are paying their share. This suggests that local government institutions need to move from low trust to high trust situations and that social norms of behaviour and conventions are powerful tools to influence compliance (with payments).

Recommendations

Leveraging behavioural change via green nudges has proven to be an effective tool alongside traditional DSM instruments for reinforcing government policy, successfully contributing in curbing excessive consumption as the Cape Town drought escalated into a crisis. It is however crucial that more interventions such that the behavioural interventions featured here, are analysed with the view of quantifying and evaluating the impacts – in order to establish its general efficacy in different contexts. It should be specifically encouraged for other South African municipalities to take on similar exercises – given the potential for using such nudges in combination with other traditional Demand Management tools.

6 CONCLUSION AND KEY FINDINGS

6.1 Key Findings

The second phase of the 'Nudging for Water' study was defined as having two core areas of focus – capacity building and deeper analysis into the data from the original intervention.

Capacity Building through Knowledge and Skills Transfer

The primary objective of the study was for the research team to build capacity within the municipality by transferring the information and skills acquired during the design and roll-out of the behavioural study to the CoCT, and in doing so, to help institutionalise nudges within the water demand management context.

To achieve this, a series of local events including staff training, hosting booths at public water expo's, and presentations to local government took place. A BI Masterclass was hosted for local and provincial government over a full day, providing practical training in designing and implementing BI projects, while an international BI conference took place over two days, with the CoCT co-hosting the sustainability track which was focused on water.

Guidelines on how to design, implement and roll-out a behavioural intervention were provided, taking the "Behavioural nudges for water conservation for Cape Town" study as an example. Insights into the processes that the research team went through during the different stages of the project were given and all the technical and logistical issues experienced throughout the lifecycle of the study were explained.

The use of a case project as a means to transfer skills and initiate the foundational work on how to make use of include BI within the CoCT's water demand strategy was effective, and should be heralded as a good example of how a flexible approach to project structures can enable municipal and academic stakeholders to achieve real impact. Within the formulation of strategy around institutionalising behavioural nudges, a number of key themes emerged. Barriers to implementation were identified, including a lack of management understanding and buy-in, limited funding available to dedicate to special projects and an inhibited capacity to implement changes due to other higher priority projects.

The importance of strong stakeholder and project management skills was identified as being vital in collaborative ventures of this nature. Likewise, the necessity of designing interventions in such a way as to enable robust, meaningful data to be collected was highlighted. Without these considerations around the requirements for future monitoring and analysis taking place

in the initial design of the project, evaluating the cost-benefit of nudges against other forms of intervention is not possible.

Having jointly shared the running of the water map project, the CoCT will be well placed to take the lessons learnt through the process, and continue on this path to embed Behavioural Insights both into their water demand strategy, as well as other utility services. The project was a useful learning opportunity for all stakeholders involved, with a number of valuable points noted in relation to how future projects may build on the work completed.

Analysis of Nudge Interventions

It was aimed to conduct additional analysis of the original nudges study, as well as two new nudge interventions – the water map and green nudge letters sent to high consumers.

In relation to the green nudge letters, two months after the intervention, treated households had reduced consumption by an additional 1.1 kl relative to control households. This treatment effect remained relatively consistent as the intervention period was extended, and still registered a reduction of 1.1 kl six months after the intervention. At the seventh-month check, treated households had reduced consumption by an average 0.9 kl relative to control households.

The Water Map was an innovative and effective, if controversial, tool to create awareness of water consumption in the city. By making use of and combining existing resources, in terms of the CoCT's data records of water consumption and the GIS platform, as well as the learnings from the previous research project around effective nudges in the city, an entirely new product was created. There are many opportunities available to build upon the design which are explored in detail within the 'Innovation' chapter of the report.

It is unfortunate that the impact on water consumption was not able to be quantified due to the design of the intervention, however high viewership of the website indicates that Cape Town residents were engaged enough in the information to continue to check it, even after the threat of Day Zero had passed.

The empirical estimates show that the behavioural messages from the original set of nudges still affect water consumption in the same period two years after the initial messages were sent. There is no crowding out effect and reductions in consumption due to the nudges are on top of what tariff and restrictions have achieved. Particularly the graph and social norms messages still significantly decrease the treatment groups water consumption two years later.

It is found that the total average treatment effect of the messages after the treatments were no longer sent to households is a consistent 1% reduction compared to the control group. Assessing the different treatments over a 2-year period shows that the graph treatment, the financial loss, and the social norm treatment show the strongest treatment effects. Behavioural messaging can hence be a viable addition to policy maker's toolbox when interested in affecting longer term behavioural changes.

In relation to the analysis done for indigent households included in the original nudges, the analysis focused on the behaviour amongst low income domestic free-standing households in a sample of about 272,000 households in the City of Cape Town. Previous work on nudges in Cape Town indicated that behavioural messaging is successful in curbing consumption amongst middle and high income groups – in a similar manner that nudges have evoked savings in other developed countries. This research found that for low income households, this pattern hardly persists and that behavioural responses of the indigent subsample may in some case even be considered undesired.

It was found that cooperative behaviour (and conversely free-riding) is a three edged sword in securing sustainable utilities delivery with average consumption levels, payments for services, as well as response to behavioural nudges influencing each other. The lower income groups are unresponsive to nudging or responded perversely with an increase in consumption. Indigent households who consume more to start with increased their consumption in response to social norm and social recognition messaging. This behaviour is not observed in a similar manner amongst non-indigents in the lower income quintiles and raises the question whether officially being registered as indigent has an effect on willingness to pay for services and feeling of entitlement to free-ride. At the same time, households with higher pre-intervention consumption values tend to pay their bills less often. In turn, conscientious payment of utility bills is also indicative of responsiveness to nudges with those households paying more of their bills being more responsive.

While cooperative citizens tend to 1) pay their bills 2) they also consume less and 3) they are more responsive to nudges to conserve water. Conversely those with free-rider mentality tend to use more water, not pay their bills and are likewise nonresponsive to nudges – revealing an attitude of "*moral licencing*" for uncooperative behaviour.

6.2 Adapting to the Challenges and Opportunities of the Drought Crisis

The bulk of the research was taking place in the height of the Cape Town water crisis, forcing all participants to adapt in order to accommodate the unique constraints of the context. While

the aims of the project were still met, the means to do so were adjusted following discussion and consensus between all stakeholders.

The results of the adaptation of the deliverables to fit the real-world priorities were overall very positive and should be seen as a model for collaborating in the future. Meaningful value was provided to the CoCT in the form of hands on, consistent access to the research team for assistance in designing, analysing and strategizing water demand responses, while the research team was able to conduct research in an entirely new and unique context.

There were undoubtedly challenges to negotiating the, at times opposing, priorities of conducting academically rigorous research against the need to urgently reduce water consumption due to the crisis. Similarly, the project timelines within the MoU compared with those of the CoCT, and the research team, had to be negotiated to find realistic compromises. While these negotiations were difficult to navigate, they were handled maturely and reasonably by all groups, with a uniting common goal of making a meaningful contribution to the CoCT's drought response. Although the drought crisis is truly an exceptional environment in which to collaborate, some of the lessons learnt through this experience can easily be applied to any form of government-academia collaboration, in that there should always be a focus within academia on producing meaningful real-world research, and in government to delivering interventions based on rational analysis.

The challenges of operating within the drought could, in the end, be viewed as an opportunity and a unifying force within the various stakeholders included in the research project.

6.3 Innovating through Research

Very little behavioural work of this nature has been done in the utilities domain in developing countries. Currently, to the knowledge of the research team, no municipality in South Africa has used behavioural nudges as a core DSM tool. Mainstreaming such interventions at a local municipality is therefore novel in the South African context.

As part of the ongoing collaboration with the CoCT, the research team has had access to big data through the municipality and has become well skilled in the field of big data analytics. An important aspect of the data access agreement has been to develop an interface between municipal data and the research domain, while allowing for greater and more efficient use of municipal data by both the municipalities, researchers and the public. As part of this, the research team has also been supporting the CoCT's data strategy in the Global Future Cities Programme.

The following sections will provide detail on the various innovative tools and techniques employed throughout the second phase of the research project:

The Cape Town Water Savers Map

This is the first website displaying a map of residential properties that met water saving targets during a time of drought. Municipal water consumption billing data has not been used in combination with behavioural insights in this way before. It was part of the general aim of the CoCT to make information about the drought more transparent and motivate households to increase their water saving efforts during time of crisis. The water map was built on the idea of motivating pro-social behaviour by providing public praise as external reward – this has not been done on a city-wide level before. It aimed to show households that complying with the water saving targets is the norm in their neighbourhood and attached honour (in the form of a green dot) to compliant behaviour. Publicly acknowledging water savings behaviour motivated people to increase their efforts.

The water map is an interactive web-based tool that, using latest technology, encouraged engagement and created public awareness of compliance levels across the city. Engagement with the information that the website provided was facilitated by the possibility to easily share information via social media. This also meant that the water map could easily be dispersed in a very short time period. Previous studies have used social norms displaying to individual's what the normative behaviour in a certain context or environment is, other studies have used social recognition to motivate part of a population to perform a desired action – this intervention combined these two principles on a larger city-wide scale. The water map made use of existing resources, such as the GIS platform and the households' monthly consumption data, and simply combined it in a new way. However, this kind of innovation was controversial in terms of privacy and data accuracy.

In terms of the future potential of the water map or similar kind of interventions, the research team believes that it is vital to refine the design of the website to make it more user friendly and as a result more impactful. One could also extend the tool to broadcast other CoCT geographical information such as recycling drop off sites or municipal offices (depending on what information residents are interested in). Another potential avenue for future research would be to investigate how increasing or reducing the target qualifying behaviour to receive a green dot would change the level of compliance among households, for example, to answer the question of whether giving only 10% of households a green dot could increase overall

water savings (due to the exclusivity) or demotivate households and consequently reduce savings (due to it being perceived as unattainable).

Letters to High Usage Households

The letters sent to high usage households are an innovative tool for DSM to target excessive consumption during a time of drought. The letter combined social comparisons with a punitive threat. High water consumers were benchmarked against the rest of the Cape Town population by the letter informing the water guzzlers that most households were only using an average of around 20 kl of water per month. Households were additionally told that if they fail to comply, they will be considered for the installation of a water restricting device.

Firstly, this research was novel in the Cape Town context because the initiative was purely driven by the local government and not an outside research team. The CoCT independently designed and implemented the intervention – without any input from behavioural insights experts.

Secondly, social norms have been used in many different ways before to motivate households to reduce their consumption of natural resources. However, this intervention was novel because it specifically targeted a subpopulation of interest (high consumers with water usage of above 50 kl) as an effort to better manage the looming water crisis. Specifically targeting high usage households meant that the intervention was more effective and cheaper (compared to targeting all residential households) and that the CoCT would receive less negative feedback because the letter was relevant to the households that received it.

However, designing different interventions for different target groups generally means that more work needs to be done in terms of message design and delivery. Also, the letter was not drafted for the purpose of research but efficacy, which meant that two different messages were bundled together in one letter which made it difficult to evaluate the impact of either the social norm or the threat aspect of the letter. In future research, CoCT officials should consider choosing one group that receives a combination of the two messages and one group that receives only one of the messages so that the difference in impact of the different message framings can be assessed. In future work, the CoCT could also put more consideration into refining the thresholds for whether households receive a warning letter or not. The CoCT could also use different methods of communication and instead of letters, use email or SMS.

Indigent Subsample Analysis

Various behavioural interventions have been implemented in developed countries, however little work has been done on the use of nudges for natural resource conservation in developing countries, particularly in countries as heterogeneous as South Africa. Previous studies have analysed heterogeneous treatment effects but not using samples as heterogeneous in terms of observable characteristics, such as income, as this study. This research is novel in a way as it aims to assess the heterogeneous treatment effects across a highly unequal population and understand the contextual nature of behavioural nudges. It adds an important element to the existing literature around behavioural insights as it specifically analyses the impact of behavioural messages on indigent population and unpack the non-responsiveness and, in particular, undesired and unanticipated behaviour amongst low income groups to behavioural nudges. While samples are often split by income or water consumption levels, in this case the sample is split by indigent status (whether a household is officially registered or not).

Having this understanding of the indigent population helps to inform policies that take into account that the indigent population has different responses compared to non-indigent households. This behaviour could not just be in relation to water but any kind of service delivery. It would also be beneficial to know how country or city specific the findings of this research are. It is important to understand similarities and dissimilarities of the indigent population in different cities or countries. More qualitative understanding as to why there is a difference in response is necessary.

Action Research for Skills Transfer and Capacity Building

Capacity building is usually done by providing training sessions to government officials in form of workshops. The way that skills and knowledge was transferred from the research team to the local government during the second phase of this project was more hands-on, experiential and action based than only providing officials with formal training through workshops.

The research team, in collaboration with government officials, decided that they would roll out a new operational water demand management project, making use of the learnings from the original study, and use it as a way of documenting and showing how behavioural insights can be applied in policy making. This provided opportunities for government officials to apply their newly acquired skills and knowledge immediately (“learning by doing”) and they were able to see the usefulness of the information and interventions right away. Doing action based skills and knowledge transfer also meant that the research team was able to meet the project

deliverables while performing new research. This way of skill transfer also maximised the project's relevance and utility for the local government, as it was possible to tailor the project and information to their specific needs. In addition, it meant that the researchers were able to learn more about how the CoCT operates.

However, keeping scientific rigour and adhering to the university's MOU can be at odds with performing an action-based research project and doing ad hoc analysis and consulting for local municipalities. Focusing on creating a practical and relevant project can mean that one runs into the risk of jeopardising what is required from an academic research perspective. It is also much more time consuming than simply holding a work shop to transfer knowledge.

In the broader scope, through the action-based study, the research team managed to build a learning community within departments, but also across departments and the province for effective use of behavioural insights among government officials. It is hoped that this project encourages future collaboration between government and research units and that it becomes the norm for government to interact with researchers on a regular basis and to contact researchers if any questions about the design or implementation of behavioural insights informed policies arise.

7 POLICY RECOMMENDATIONS

From the extensive and varied work completed within this project, and the initial phase of the behavioural nudging study, the following policy recommendations have been formulated.

7.1 Design Considerations for Nudging Heterogeneous Population Groups

It should be taken for granted that there is no “magic bullet” or “one size fits all”, when it comes to nudges.

This study has demonstrated that the responses to nudges differ materially between distinct population groups, in some instances not merely reducing the efficacy, but inducing a backlash of negative behaviour. In a country with as significant variation in living standards, cultures, and access to services as what South Africa has, this is a particularly vital consideration point when designing and implementing any form of nudge.

While traditional characteristics to distinguish between groups for targeting commonly include income, property values, age or gender, our research has highlighted the need to consider alternative qualities – such as “indigent” status households – in the design due to their unique responses to nudges.

7.2 The Value of Monitoring and Working Iteratively

An important principle within designing real-world interventions is to ensure that mechanisms are in place to monitor the actual impact of the solution. This is of particular importance in heterogeneous population groups in order to allow swift identification (and response) to any unforeseen negative responses.

Monitoring and analysis of impact can take many forms, depending on the resources and skills available to do so, the nature of the data, and the overall aims of the evaluation. While the research project detailed in this report has followed a randomised control trial research design, a particularly robust form of assessment, a pragmatic approach can be taken in choosing an appropriate form.

An added benefit to prioritising monitoring of impacts, is that it allows the intervention to be empirically compared and evaluated against alternative intervention options, enabling reasoned policy decision making.

7.3 Beyond Traditional Water Demand Side Management Tools and Techniques

The research analysis indicated that in the case of the Cape Town drought, the impact of price increases on residential water consumption was very low, and that non-traditional means were more effective to induce behaviour change.

There are a wide variety of alternative mechanisms available to change water consumption behaviour, including water restrictions, information campaigns, personalised appeals to high consumption groups, and broad-based nudging in the form of interventions like the Water Map.

7.4 Considering the Value of Small Savings

When compared with alternative solutions for water saving, the impact of nudges can seem marginal or insignificant, typically sitting at around 1-5% reduction in residential consumption. This can make it an easy intervention for governments to overlook in favour of projects promising greater impact. It is important to establish a rational approach to evaluating the impact that nudges can have to establish the costs and benefits of such a project.

In doing so, there are three dimensions to consider that impact on the efficacy of nudges which are frequently overlooked. The first is that nudges have been shown to have a lasting impact on behaviour, even after the nudge is no longer being actively applied. Consumers that received the water-bill based nudges reduced their water consumption during the period of receiving the bills, but continued to habitually use less water for a significant period of time beyond the bills having stopped. Next, nudges can be designed to reach an entire city, maximising the net impact. Finally, nudges can be a cheap intervention compared to alternatives, frequently making use of existing channels of communication or technology.

The cumulative impact of savings across a broad region, when considering water saved per day per household for the duration of the period, can end up more significant and beneficial than the costs involved.

7.5 Collaboration and Partnerships for Common Goals

The formation of partnerships between groups with a mutual aim can be a powerful means to achieve significant impacts in a resource-constrained environment.

Partnerships can take the form of academic researchers and government officials, in which, as for this project, researchers are able to assist in providing guidance as to the design of an intervention and in the analysis of results while government brings a strong contextual

knowledge base. It can also entail partnerships across various tiers of government (provincial and local, for instance) or across departmental boundaries within government.

7.6 The Role of Technology, Data and Innovation

Information and Communication Technologies, or 'ICT's, can be a powerful enabler for nudging, and consideration should be given as to how modern technology may be leveraged to achieve the objectives of nudges.

By way of example, emails, SMSs, social media, WhatsApp, online chatbots and public websites can all provide cheap, flexible channels of communication to citizens that make use of cell phones (or computers). Typically, the costs and complexity of scaling up nudges when using ICT platforms like these is less than that of traditional tangible measures. Smart devices for tracking and communicating also provide opportunities to engage, though may be cost prohibitive.

Another point of consideration is the value of the data stored within government databases, and how this can be used to help either guide or enable an intervention. The Water Map made use of existing data records for household water meter readings in an innovative way.

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APPENDIX A: PROJECT DELIVERABLES LIST

Complete versions of all project deliverables are available on request from the research team.

A1 – Original Project Deliverables

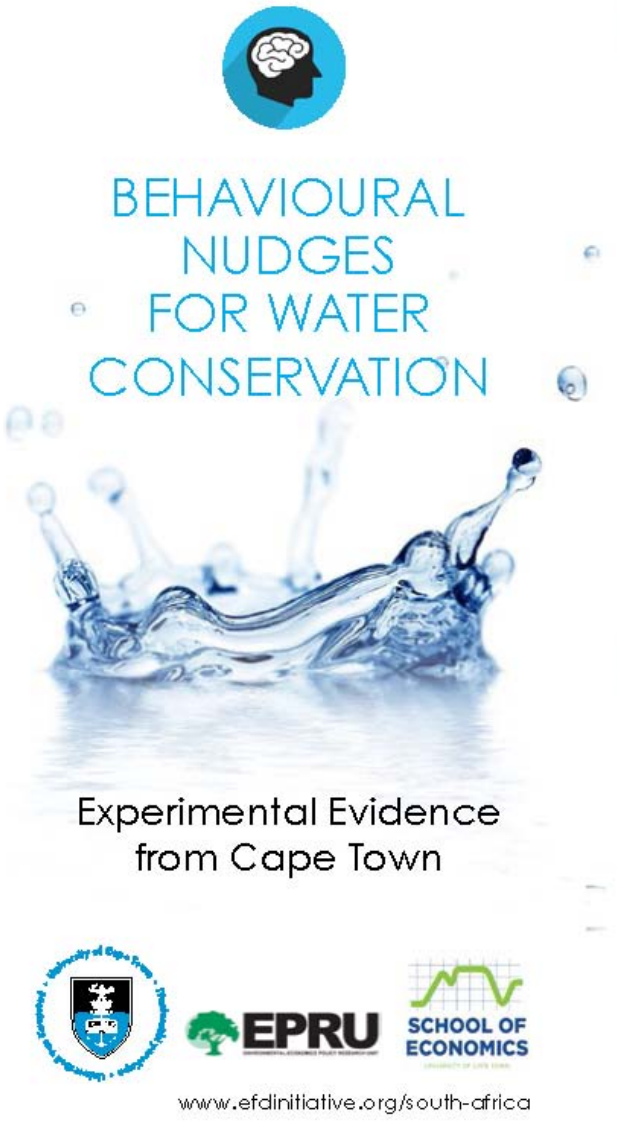
	Deliverable	***Description***
1	Buy-in agreement with COCT	Full buy-in will be obtained from the CoCT in going forward with the study. This will involve that the program is co-funded by the CoCT, and also that the partnership between the CoCT and the researchers be formalised.
2	Technical process report	A report detailing the processes in terms of logistics and technology required to roll-out the interventions used during this study.
3	Local workshop planning, materials development and facilitation	Workshop with staff from different departments within the CoCT to communicate findings from the process report and set in place a plan to facilitate the integration of the necessary processes needed to scale up the findings from this research
4	Strategy for integration and cooperation formulated jointly between research team and CoCT	A plan for ensuring knowledge and skill transfer to integrate the learning from the study will also be initiated and extended. This will be a joint process ensuring extensive inputs from different stakeholders within the CoCT.
5	Pricing vs. Behavioural Instruments as DSM Tools	The paper will analysis the comparative effectiveness of tariff hikes compared to the behavioural nudges as a means of encouraging water savings. The pricing vs. behavioural analysis is included in deliverable 6 and deliverable 5 was changed to two reports detailing additional behavioural initiatives that were undertaken by the CoCT (“Green Nudges in

		the DSM toolkit: Evidence from Drought-Stricken Cape Town" and "City of Cape Town Water Map").
6	Long-run effects of Behavioural Nudges	This paper will assess the long-run impacts of behavioural nudges as a demand side management tool and how these impacts interacted with other restrictions and tariff increases that occurred in Cape Town. The study also separately analysed the impact of nudges on the indigent population ("Heterogeneous responses to behavioural messages: evidence from a large-scale randomised control trial in Cape Town.").
7	National Workshop Facilitation	Knowledge sharing workshop at a national level aimed at disseminating the findings of the broader study and also the learnings from the interaction between CoCT and UCT in partnering to enhance sustainable development and community empowerment.
8	Final Report and Policy Brief	The researchers will submit the final report, providing the results of the full-scale roll-out and drawing policy conclusions.

A2 – Revised Project Deliverables

	Deliverable Change	**New Deliverable Description**
5	~~Pricing vs. Behavioural Instruments as DSM Tools~~ Analysis of subsequent behavioural initiatives the CoCT undertook	"Green Nudges in the DSM toolkit: Evidence from Drought-Stricken Cape Town" "City of Cape Town Water Map"
6	~~Long-run effects of Behavioural Nudges~~ Continuing Analysis of Behavioural Nudges Study	"Heterogeneous responses to behavioural messages: evidence from a large-scale randomised control trial in Cape Town." "Long-run effects of Behavioural Nudges vs Traditional DSM measures: What worked?"

APPENDIX B: BEHAVIOURAL NUDGES FOR WATER CONSERVATION BROCHURE



INTRODUCTION

There are many ways for city utility departments to get people to reduce their water use during a time of drought and water shortages. Traditional demand side management tools usually include water price hikes and tiered tariff structures, or water restrictions. Non-price approaches include methods such as information and education campaigns or 'behavioural nudges' to drive greater water-wise behaviour. Behavioural nudges are low-cost, non-price information strategies incentivising behavioural changes.

The City of Cape Town has been working with behavioural economists from the Environmental Policy Research Unit (EPRU) at the University of Cape Town to find an evidence-based answer to which methods are most effective in encouraging more prudent water use by the public. The results assist the municipality to design policy that will help manage the city's water supplies in an increasing climate change-stressed future. The study focuses on identifying which incentives best motivate households of different income levels to reduce their consumption.

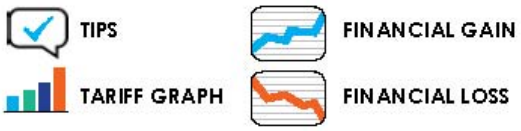
STUDY DESIGN

A large scale randomised control trial was implemented to test nine different behavioural inserts in monthly municipality bills on over 400,000 households over six months. Households in the control group did not receive a message.

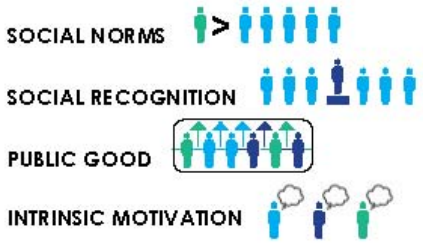
Figure 11: Behavioural Nudges for Water Conservation Brochure, Page 1

The messages, sent with people's monthly utility bills, were framed in different ways: some had a financial threat to them, notifying people about how much money they would save through cutting their water use, or how much it would cost them if they didn't. Some messages offered water-wise tips. Other messages compared people's consumption to that of their neighbours'. Others tapped into intrinsic values and rallied people together under a 'common good' value system by appealing to people to save water for everyone's benefit.

The first category of messages addresses informational failures around price and usage of water:



The second category of messages promotes water conservation via social incentives and appeals to the public good:



RESULTS

All treatments successfully induced a reduction in household consumption. Reductions ranged from 0.57% (159 litres per month) for the tips treatment to 1.86% (467 litres per month) for the social recognition treatment.

The message that consistently produced the greatest water reduction behaviour was the one which advised people that the names of the top water savers would be published on the city's website (social recognition treatment).

For this specific intervention, people responded by reducing their water use by nearly 2%. This was particularly true in wealthier households, where people don't feel price increases of water as noticeably. Wealthier households are most responsive to social incentives – such as the social recognition, social norm and public good messages. Less wealthy households are unresponsive to social incentives.

Evaluating the practical impact of achieving savings of 0.57%-1.86% over the study period is important in the context of the current water crisis with the City of Cape Town. Converting these savings on average to total water savings over the study period for the 400,000 households involved, we can infer that the behavioural nudges resulted in total savings of between 57,205 kl (tips treatment) to 186,669 kl (social recognition treatment) of water over the six-month study period.

OUTLOOK

These results have wider implications than just for the water sector, researchers say, and can be used by city utility managers to drive other behaviours relating to waste reduction, recycling, and cutting back on energy use.

EPRU researchers now hope to work with other municipalities around the country, to see if they can engage in similar mutual learning processes. This will be through national workshops where big municipalities will be invited to see how they, too, can incorporate these evidence-based ideas into their policies.

The research was funded jointly by the South African National Research Foundation, the Norwegian Research Council, Environment for Development, and the Water Research Commission. Prof Martine Visser, Dr Kerri Brick and Johanna Brühl are behavioural economists at the University of Cape Town's Environmental Policy Research Unit. The EPRU team was supported by Samantha De Martino from Sussex University, and Jorge Garcia from Cicero in Norway.

Figure 12: Behavioural Nudges for Water Conservation Brochure, Page 2

APPENDIX C: THINK WATER EXHIBITION

C1 – Think Water Exhibition Poster

Figure 13: Think Water Exhibition Poster

C2 – Event photographs

Figure 14: Event photographs from Think Water exhibition

Figure 15: EPRU/iComms/BridgIoT stall at the Think Water exhibition

APPENDIX D: PRESENTATION AT SMART LIVING CITY TRAINING SESSION

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

Smart Living Training

Date: 7th June 2017

Venue: 10th Floor, Paul Sauer Building, 1 Adderley street

Trainer: Grace Stead from Steadfast Greening

Proposed agenda:

8:30 – 9:00	Registration with coffee / tea on arrival
9:00 – 10:30	**Session 1:** Big picture and water-energy-nexus
10:30 – 11:00	Tea time
11:00 – 12:30	**Session 2:** What's what – where are we at?
12:30 – 13:00	Lunch
13:00 – 13:30	**Session 3:** Behavioural nudges by Johanna and Megan from UCT
13:30 – 14:00	**Session 4:** Unpacking the Smart Living Boxes - review the water box and do training on other Smart Living Boxes
15:00 – 14:45	Tea
15:15 – 16:00	**Session 5:** Evaluation (plus onsite assessment first week of June)

Purpose:

- To provide staff with a better understanding around **climate change** and how this impacts on water and energy resources.
- To unpack the current **opportunities and concerns** around promoting water conservation within Cape Town, and the water-energy-nexus.
- To understand how best to enable **behavioural change**.
- To gain an understanding around the **Smart Living mobile exhibition** and how this can be used to engage.

Making progress possible. Together.

Figure 16: Training Schedule

APPENDIX E: OVERVIEW OF WORKSHOPS/MEETINGS HELD WITH THE CITY OF CAPE TOWN

Date	**Tuesday, 14 March 2017**
Place	Goodwood Municipal Offices 2nd Floor Room 69 – Technical Boardroom
Attendance list	CoCT Water Demand Management and UCT

Overview of the meeting	**Phase 2 Project Inception Plan Meeting**
	• Presentation of the Phase 1 behavioural nudges study findings
	• Discussion of Phase 2 of the behavioural nudges study
	  ○ Process/technical report
	  ○ Other ways of communicating with citizens to reduce water consumption
	  ○ Analysis of top 20,000 households consuming above 50 Kl
	  ○ Incentivising uptake of smart water meters
	  ○ Capacity building within the City, UCT team to host workshop

Date	**Friday, 31 March 2017**
Place	EPRU Meeting Room, 2nd floor, School of Economics, University of Cape Town
Attendance list	Project Reference Group
Overview of the meeting	**CoCT & UCT Research Discussion** • Presentation of the behavioural nudges study findings • Drop Drop app presentation • Geasy presentation • Discussion of how to move forward with the research project

Date	**Wednesday, 26 April 2017**
Place	Goodwood Municipal Offices 2nd Floor Room 69 – Technical Boardroom
Attendance list	CoCT Water Demand Management and UCT

Overview of the meeting	**Workshop Conceptualisation Meeting**
	• Strategies on user behaviour and behaviour change
	• Discussion around how to integrate the UCT team into the CoCT's workshops and campaigns:
	  ○ Water Indaba
	  ○ Smart Living Week
	  ○ Festival of Ideas

Date	**Wednesday, May 3 2017**
Place	1 Adderley St, Cape Town City Centre, Cape Town, 8000, South Africa
Attendance list	CoCT and UCT
Overview of the meeting	**Behavioural Nudges Study Process Validation** • Improving communication between UCT and CoCT • Presentation and discussion of process flows during the behavioural nudges study

Date	**Thursday, July 27 2017**
Place	Goodwood Municipal Offices 2nd Floor Room 69 – Technical Boardroom
Attendance list	CoCT Water Demand Management and UCT
Overview of the meeting	**UCT/CoCT Research Strategy – Behaviour Change** • Presentation of latest research findings from the behavioural nudges study, for example tariff vs nudges • Discussion around how to proceed in terms of the WRC deliverables, and the next steps in terms of growing the impact and understanding of how to drive behaviour change by rolling out wider scale technology-driven projects • Presentation of the 1) Blue drop water savers map 2) Smart water meters for high water consumers 3) Drop Drop app for e-billers

Date	**Monday, 11 August 2017**
Place	Training Centre Boardroom, Water & Sanitation training centre, Maitland
Attendance list	CoCT Utilities and UCT
Overview of the meeting	**Strategy Meeting 1: UCT Proposal for Behaviour Change Project** The following topics were discussed during the meeting: • Letter sent to households consuming more than 50 kl • Water management devices for high users • Seasonal reductions in consumption and restrictions

Date	**Monday, 28 August 2017**
Place	Civic Centre, Media boardroom 3rd floor
Attendance list	Hero, CoCT Water Demand Management and Communications, UCT
Overview of the meeting	**Strategy Meeting 2: UCT Proposal for Behaviour Change Project** • Presentation of the behavioural nudge study and most recent findings • Presentation of the strategy proposal with a focus on the 'blue drop water savers map' website concept • Discussion & way forward

APPENDIX F: MAKING A REAL DIFFERENCE: NUDGING FOR POLICY CHANGE

F1 – A list of conference attendees

Role	Organisation	Country
Assistant Professor of Management Decision Making and Leadership	Al-Imam Mohammad Bin Saud University	Saudi Arabia
Deputy Director	DEDAT	South Africa
Head of International Advisory	Brazilian National School of Public Management	Brazil
Editor-in-Chief: Marketing and Media	Bizcommunity	South Africa
Senior Consultant	Aboab & Co.	Saudi Arabia
Assistant Policy and Strategy Researcher	Western Cape Government	South Africa
Associate Director	Crown Prince Court	United Arab Emirates
VP Communications	Nudge Lebanon	Lebanon
GM: Active Disease Risk Management and Head of AfA (Aid for AIDS)	Medscheme	South Africa
CFO	WCG	South Africa
assistant director	T2P	SOUTH AFRICA
Senior Associate	ideas42	USA
behavioural insights team	Flemish Government	Belgium
Chief Director	Department of Energy	South Africa
Executive Manager	Water Research Commission	South Africa
SENIOR MANAGER	MALAYSIA PRODUCTIVITY CORPORATION	MALAYSIA
Assistant Director: Human Rights	Western Cape Government	South Africa
DEPUTY DIRECTOR	MALAYSIA PRODUCTIVITY CORPORATION	MALAYSIA
DIRECTOR	ECONOMIC PLANNING UNIT	MALAYSIA
Policy Researcher	Provincial Government of the Western Cape	South Africa
Behavourial content and M&E lead	YES	South Africa
Acting CD	Western Cape Government	South African
CEO	Western Cape Economic Development Partnership	South Africa
SENIOR POLICY ADVISOR	MINISTRY OF TRADE	TURKEY
Junior Research Fellow	EPRU	South Africa
Economist	Dept. of Economic Development	South Africa
Manager of Regulatory Process	Brazilian Health Regulatory Agency	Brazil
Decision Scientist	Independent	South Africa
Operations Executive	WCEDP	South Africa
Director: Policy and Planning	City of Cape Town	South Africa
Circuit Manager	WCED	South Africa

Director: Business Strategy and Stakeholder Management	WCED	South Africa
Chief Economist	City of Cape Town	South Africa
Data Analyst	Western Cape Government	South Africa
City Planner	Western Cape Economic Development Partnership	South Africa
Policy and Strategy Researcher	Western Cape Government	South Africa
Director	Western Cape Government	South Africa
Communications Officer	WCG	South Africa
CEO	Community Chest	South Africa
Chief Director: Green Economy	Western Cape Government	South Africa
Deputy Director	WCED	RSA
senior scientist	Flemish administration	Belgium
Deputy Director	Western Cape Government	South Africa
Director	WCG	South Africa
Director	Department of Community Safety	South Africa
Deputy Director	Western Cape Government Health	South Africa
Analyst	Western Cape Government	South Africa
Dubihlela	Head of Department	Cape Peninsula University of Technology
Lecturer	CPUT	South Africa
Researcher	General Authority for Investment	Egypt
UX Team Lead	Western Cape Government	South Africa
Economist	PwC	South Africa
Project Manager	Youth Employment Service	South Africa
Professor	North Carolina State University	USA
Specialist Youth Stakeholder Engagement	Department of Planning, Monitoring and Evaluation	South Africa
Personal Assistant	Western Cape Government	South Africa
Chief Director	Western Cape Government	South Africa
Executive Policy Research	SARS	South Africa
Director Departmental Strategy	Western Cape Government	South Africa
Health Communication Expert	Various	South Africa
Provincial Manager: Positive Behaviour Programme	WCED	South Africa
Acting Director	Western Cape Government	South Africa
Regulation Specialist	ANATEL	Brazil
Lead, Public Innovation Team (EiP)	National Planning Department (DNP)	Colombia
Senior Adviser	The Norwegian Tax Administration	Norway
co-founder	Nudge Lebanon	Lebanon
Director: ECD and Partial Care	Department of Social Development	South Africa
Deputy Director	After School Game Changer	South Africa
Chief Director Policy and Strategy	Western Cape Government	South Africa
Deputy Director General	People Management	South Africa

Research Manager	J-PAL Africa	South Africa
Junior Economist	Western Cape Government	South Africa
Director for Youth Development	DPME	South Africa
Deputy Director	WCG	South Africa
PAVE/Innovation/youth Officer	UNDP	Sudan
CHIEF DIRECTOR	WESTERN CAPE GOVERNMENT	SOUTH AFRICA
Senior Professional Officer	City of Cape Town	South Africa
Senior Lecturer	University of Cape Town	South Africa
Senior behavioural researcher	Australian Securities and Investments Commission	Australia
DDG	Western Cape Government	South Africa
Programme Manager	CITY OF CAPE TOWN	South Africa
Senior Economist	City of Cape Town	South Africa
Behavioural economist	Old Mutual	South Africa
Director	Western Cape Government	South Africa
Deputy Director	Western Cape Human Settlements	South Africa
Senior Policy Advisor	Ministry of Trade	Turkey
Kannemeyer	Senior Professional Officer: Research Analyst	City of Cape Town
Deputy Director	Western Cape Government	South Africa
Senior Consultant	PwC	South Africa
Deputy Director General	Western Cape Government	South Africa
Economist	Western Cape Government	South Africa
EGovernment Team Leader	Western Cape Government	South Africa
Director: Skills Incentives	Dept. Economic Development and Tourism	South Africa
Researcher	University of the German Federal Armed Forces	Germany
Behavioral Researcher, President (BI Global), and Fellow (Max Planck)	Behavioral Insights Global	USA
Green Economy Coordinator	Western Cape Government	South Africa
Founder and Director	Nudge Lebanon	Lebanon
Senior Analyst	Centre for Financial Regulation and Inclusion	South Africa
Senior Lecturer	CPUT	South Africa
Deputy Director	Department of Economic Development & Tourism	South Africa
ATTORNEY OF THE NACIONAL TREASURY	OFFICE OF THE ATTORNEY GENERAL OF THE NATIONAL TREASURY	BRAZIL
Natural Resource management coordinator	South African National Biodiversity Institute	South Africa
Director: Policy, Research and Analysis	Department of the Premier	South Africa
director	yellowwoods social investments	South Africa
Senior Researcher	University of Cape Town	South Africa
Behavioural Analyst	Genesis Analytics	South Africa
Research Analyst	UCT	South Africa

Creative Director	Treeshake	South Africa
Behavioral Scientist	Nudge Lebanon	Lebanon
Post-Doctoral Researcher	University of Cape Town	South Africa
Doctoral Fellow	Behavioral Insights Global	South Africa
Office Manager	Department of Economic Development and Tourism	South Africa
Project Coordinator	Western Cape Government	South Africa
Head: Water Demand Management and Operational Implementation	City of Cape Town	South Africa
Coordinator	Anatel – National Telecommunications Agency	BRAZIL
Deputy Director	western cape government	South Africa
Project Developer at RISE – Research Institutes of Sweden	Water Research Commission	South Africa
International Coordinator	Department of Energy	South Africa
Economist	Department of Economic Development and Tourism	South Africa
Policy Analyst/Deputy Director	Western Cape Government	South Africa
CEO	Centre for Communication Impact	South Africa
Chief Director	Government	South Africa
Policy and Strategy researcher	Western Cape Government	South Africa
Economist	DNA Economics	South Africa
Chief Director	Western Cape Government	South Africa
Associate Professor	University of Cape Town	South Africa
Head: Organisational Research	City of Cape Town	South Africa
Senior Professional Officer	City of Cape Town	South Africa
Policy and Strategy Analyst	Department of the Premier	South Africa
Deputy Director	Western Cape Government	South Africa
Principal Advisor	GTAC	SOUTH AFRICA
Lecturer	Cape Peninsula University of Technology	South Africa
Chief Director	Western Cape Government	South Africa
Communication Officer	City of Cape Town	South Africa
Consultant	Rosa Burns Ntsekhe Consulting	South Africa
Deputy Director	Policy and Strategy	South Africa
Policy Advisor	Flemish Government	Belgium
Social Media Manager	Treeshake	South Africa
Research Associate	Research Unit in Behavioural Economics and Neuroeconomics	South Africa
Senior Sector Expert	National Planning Commission	South Africa
Assistant Director	WCG	South Africa
Consultant	YPO (Young President's Organization)	South Africa
Chief Director: Environmental Sustainability	Western Cape Government	South Africa
Associate Professor	Luis Guido Carli	Italy
Associate	ideas42	USA

Behavioural Economist	Old Mutual	South Africa
Director	Western Cape Government	South Africa
Operational Development Facilitator	City of Cape Town	South Africa
Strategic Coordinator	Western Cape Government	South Africa
EoDB Research	WC Province	SA
Snr Manager	WCG, DotP	South Africa
Director: Economic Strategy	Western Cape Government	South Africa
Founder / PhD Candidate	Norwegian Nudging Network / OsloMet	Norway
Lead, eLearning and After School Game Changers	WCG	South Africa
Research and Innovation Development Manager	Keep Britain Tidy	UK
Director	Gravity Ideas	South Africa
Director	Turkish Ministry of Trade	Turkey
deputy head of department	Ministry of Finance	Hungary
Specialist in Cooperative Extension	University of California, Davis	USA
Senior M&E Officer	Western Cape Government	South Africa
Analyst	Tax Norway	Norway
Research Analyst	Genesis Analytics	South Africa
Scientific Officer	European Commission	Spain
Economist	Western Cape Government	South Africa
Economist	Western Cape Government	South Africa
Chief Director	Economic Development and Tourism	South Africa
Manager International Relations	City of Cape Town	South Africa
Environmental Management	Western Cape Government	South Africa
Deputy Director	DEDAT	RSA
Senior Policy Advisor	Kingdom of the Netherlands Consulate General	South Africa
Attaché Development Cooperation	Government of Flanders	South Africa
Regulatory specialist	Anatel	Brazil
Director Communications	Western Cape Government	South Africa
DIRECTOR	UNIVERSITY OF JOHANNESBURG	South Africa
Principal State Law Adviser	Legal Services	South Africa
Programme Director	Safe-Hub	South Africa
Energy Security Game Changer Manager	Western Cape Government	South Africa
State Law Advisor: Legislation	Western Cape Government	RSA
Special Advisor	WCG	South Africa
Director	Western Cape Government	South Africa
Analyst Intern	German Investment Corporation	Germany
Director: Enterprise Development	Department of Economic Development and Tourism	South Africa
Delivery Support Unit: Manager	Western Cape Government	South Africa
Policy Researcher	Western Cape Government	South Africa
Manager Research	City of Cape Town	South Africa

Head of MIS	LEAP PROGRAMME	GHANA
Manager/Strategy Planning and Collaboration	Health Promotion Board	Singapore

F2 – The official conference programme appears in the CD enclosed at the back of this report.

F3 – Photographs from the conference

Figure 17: Event photographs from the BI Conference

APPENDIX G: BEHAVIOURAL INSIGHTS MASTERCLASS

Figure 18: Event photographs from BI Masterclass

APPENDIX H: MUNICIPAL BILL INSERT DESIGN

Are you a water saving champion during this extreme crisis?

Take a look at our water savers map www.map.city to see if you are complying with the City's restrictions around water use! You can also check how others in your community are doing!

Figure 19: Positive Framing of Insert (draft)

Are you failing at saving water during this extreme water crisis?

Take a look at our water savers map www.map.city to see if you are complying with the City's restrictions around water use! You can also check how others in your community are doing!

Figure 20: Negative Framing of Insert (draft)

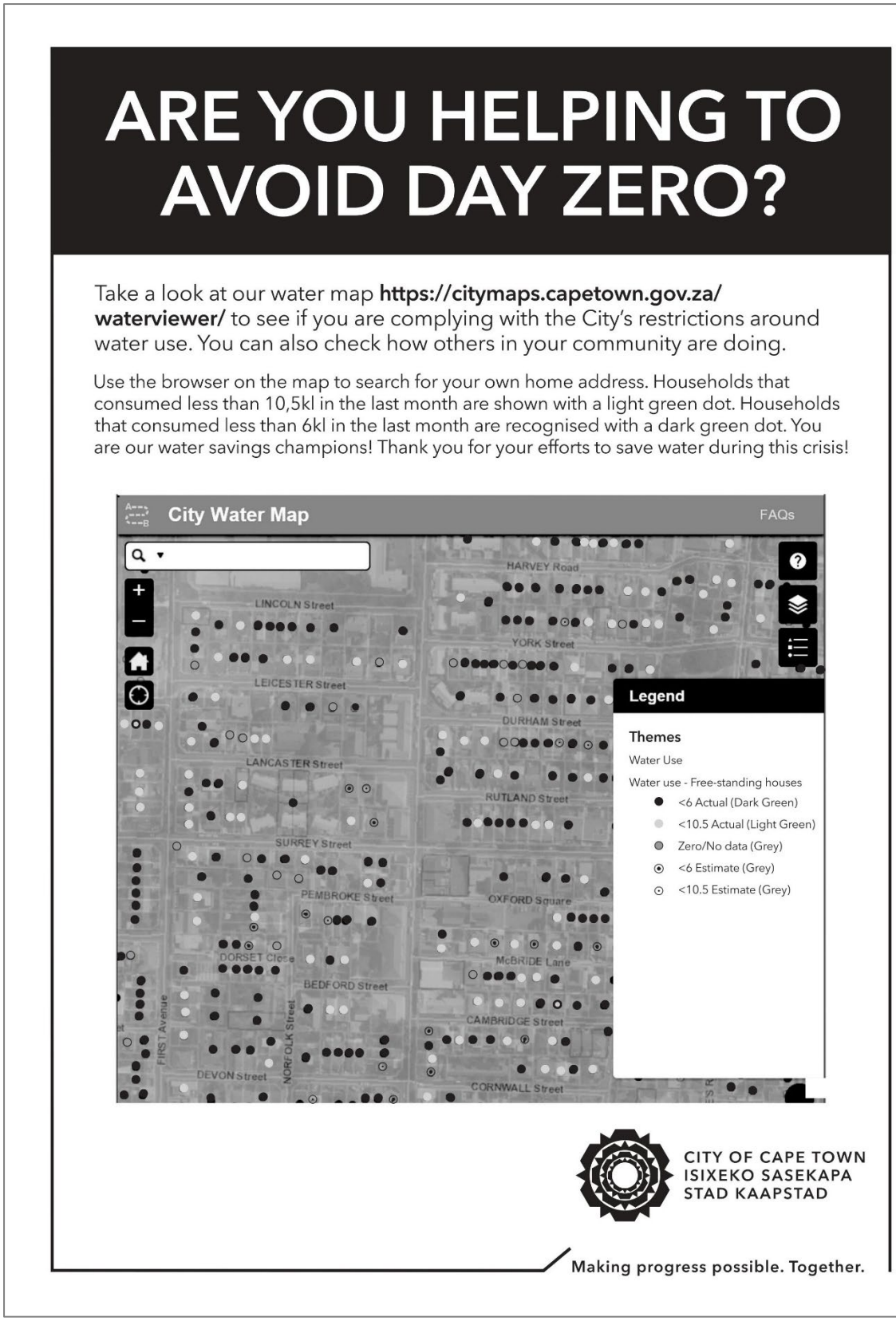
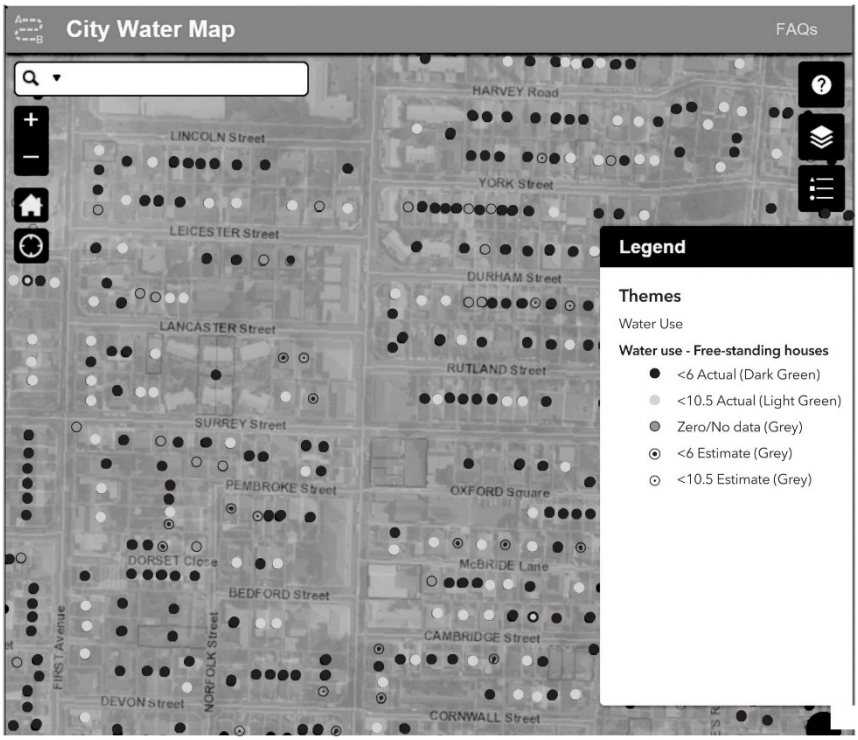


Figure 21: Final Billing Insert Design (groups 11 and 12)

ARE YOU HELPING TO AVOID DAY ZERO?

Take a look at our water map **https://citymaps.capetown.gov.za/waterviewer/** to see if you are complying with the City's restrictions around water use. You can also check how others in your community are doing.

The City is recognising households who are actively helping to save water and avert Day Zero! If you live in a free-standing house, you can use the browser on the map to search for your own home address. Households that consumed **more than 10,5kl in the last month** are not recognised on this map. Households that consumed **less that 10,5kl in the last month** are recognised with a light green dot. Households that consumed **less that 6kl in the last month** are recognised with a dark green dot. **You are our water savings champions!** Thank you for your efforts to save water during this crisis!

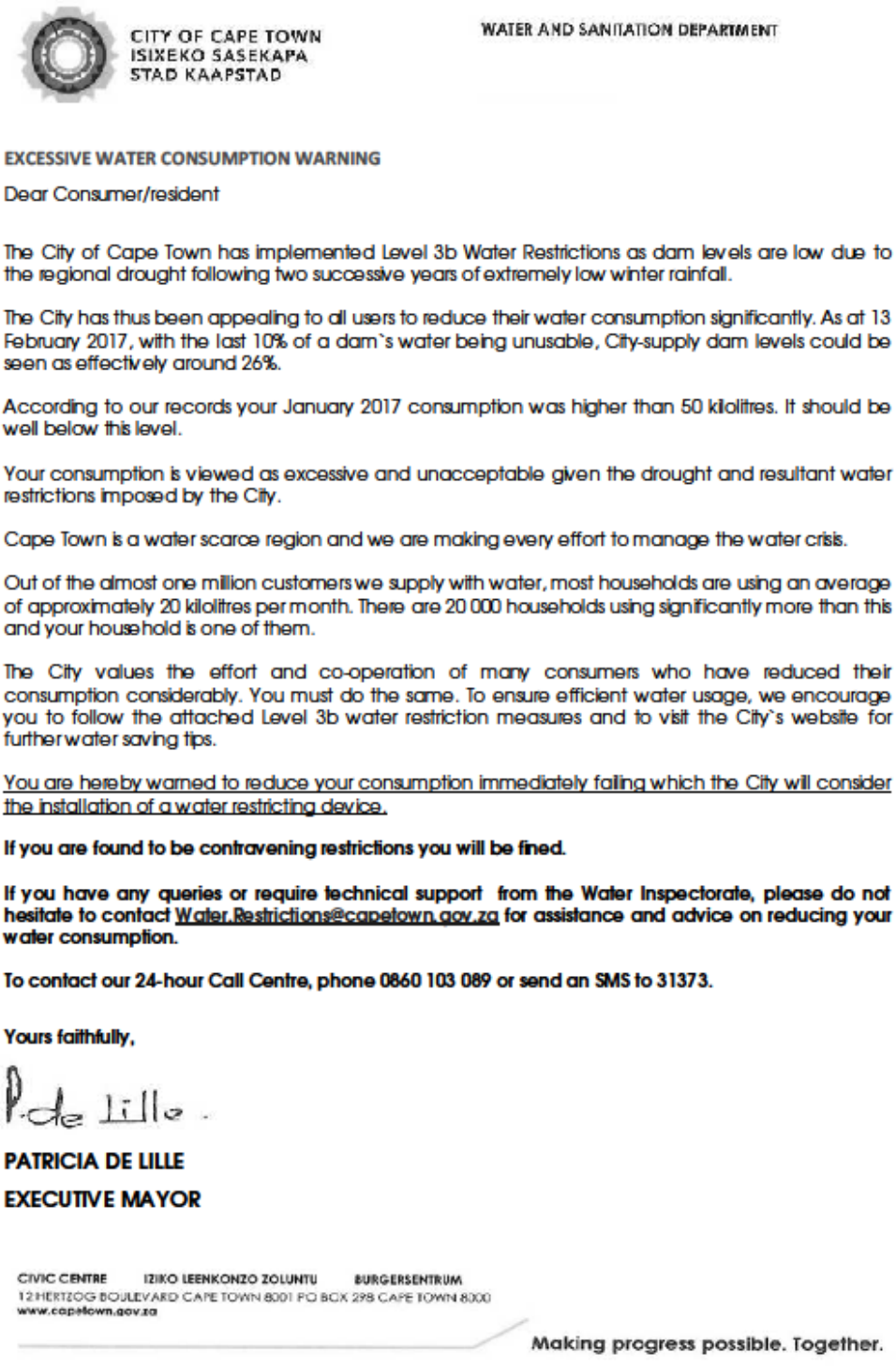


CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

Making progress possible. Together.

Figure 22: Final Billing Insert (all other portions)

APPENDIX I: LETTER TO HIGH CONSUMERS



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

WATER AND SANITATION DEPARTMENT

EXCESSIVE WATER CONSUMPTION WARNING

Dear Consumer/resident

The City of Cape Town has implemented Level 3b Water Restrictions as dam levels are low due to the regional drought following two successive years of extremely low winter rainfall.

The City has thus been appealing to all users to reduce their water consumption significantly. As at 13 February 2017, with the last 10% of a dam`s water being unusable, City-supply dam levels could be seen as effectively around 26%.

According to our records your January 2017 consumption was higher than 50 kilolitres. It should be well below this level.

Your consumption is viewed as excessive and unacceptable given the drought and resultant water restrictions imposed by the City.

Cape Town is a water scarce region and we are making every effort to manage the water crisis.

Out of the almost one million customers we supply with water, most households are using an average of approximately 20 kilolitres per month. There are 20 000 households using significantly more than this and your household is one of them.

The City values the effort and co-operation of many consumers who have reduced their consumption considerably. You must do the same. To ensure efficient water usage, we encourage you to follow the attached Level 3b water restriction measures and to visit the City`s website for further water saving tips.

You are hereby warned to reduce your consumption immediately failing which the City will consider the installation of a water restricting device.

If you are found to be contravening restrictions you will be fined.

If you have any queries or require technical support from the Water Inspectorate, please do not hesitate to contact Water.Restrictions@capetown.gov.za for assistance and advice on reducing your water consumption.

To contact our 24-hour Call Centre, phone 0860 103 089 or send an SMS to 31373.

Yours faithfully,

P. de Lille

PATRICIA DE LILLE

EXECUTIVE MAYOR

CIVIC CENTRE IZIKO LEENKONZO ZOLUNTU BURGERSENTRUM
12 HERTZOG BOULEVARD CAPE TOWN 8001 PO BOX 298 CAPE TOWN 8000
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Making progress possible. Together.

Figure 23: Copy of letter sent to high water consumers

APPENDIX J: PROJECT DELIVERABLES

Interventions and Analysis Performed

Over the two-year period of this research project, a wide variety of interventions, reports and direct engagements were completed which have been detailed in this report:

- ***Reports Submitted***
  - **The Process Report** aimed to transfer both the information and skills acquired during the design and roll-out of the original behavioural study, to staff within the CoCT
  - **The Strategy Report** outlined the approach to integrate nudging into the drought intervention in the form of the Water Map
- ***Local and National Workshops, and Other Knowledge Sharing Events***
  - **The Local Workshops** deliverable took the form of a series of local events including staff training, hosting booths at public water expo's and presenting to local government
  - **BI Masterclass** was hosted for local and provincial government over a full day, providing practical training in designing and implementing BI projects
  - **BI Conference** was an international event taking place over two days, with the CoCT co-hosting the sustainability track which was focused on water.
- ***Drought Crisis Interventions:***
  - Beyond the original billing study, additional interventions were put in place to reduce water consumption in the form of the **Water Map website**, a corresponding **billing insert campaign**, and **letters sent to high-water consumers**.
  - Ad-hoc analysis and consulting was done as required from the CoCT

Research Papers

Based on the above and the original study, four research papers have been produced to deal with various aspects of water-related nudges:

Table 15: Research articles produced within the second phase of the project

Article Name	**Description**	**Status**
The Cape Town Water Map	Jointly written by the CoCT and the University of Cape Town, about the considerations and responses to the Cape Town Water Map website	Published in AWWA
Long-run effects of Behavioural Nudges vs Traditional DSM measures: What worked?	Analysis of the long-term impact on water consumption behaviour of the billing insert nudges, compared with other DSM measures (e.g. tariff increases)	Working paper
Impact of Green Nudges to Reduce Water Use Amongst Top Consumers	Analysis of impact of personalised letters sent to high water consumption households	Working paper
Impact of Nudges on Indigent Households	Analysis of the unique response to billing insert nudges by households registered as 'indigent'	Working paper

MAKING A REAL DIFFERENCE:

NUDGING FOR POLICY CHANGE

PROGRAMME

BEHAVIOURAL INSIGHTS CONFERENCE,
CAPE TOWN, SOUTH AFRICA
27-28 SEPTEMBER 2018

#BI4Gov

Western Cape Government
BETTER TOGETHER.

OECD

DAY 1: Promoting inclusion and sustainability through behavioural insights: Fostering global partnerships

27 September 2018

Cape Town International Convention Centre

Behavioural insights (BI) has gone beyond the "disruption" phase in public bodies with over 200 government units, initiatives, capacities and partnerships established globally in every continent. The application of BI to date has largely focused on improving implementation and the delivery of alternatives to regulation, as well as enhancing policy delivery, in particular through strengthening the information available to citizens and businesses to make better choices. There is further potential to use BI in identifying the challenges that governments seeks to address. Focusing on inclusion, sustainability and social outcomes, the first day of the conference will explore innovative ways to address complex policy problems with policy makers, academics, private sector, and civil society. This includes both developed and emerging economies, as well as national, sub-national and local governments. The interactive discussions with lead behavioural practitioners, policy makers and academics explore together the new frontiers in applying BI to public policy.

08:00 **Registration and Tea/Coffee**

09:00-09:15 **Welcome (Plenary, 2nd Floor, Room 2.41-2.46)**

- **Ammaarah Martinus,** Director of Policy, Research and Analysis, Department of the Premier, Western Cape Government, South Africa
- **Nick Malyshev,** Head of the Regulatory Policy Division, Public Governance Directorate, OECD

09:15-09:30 **Opening remarks (Plenary, 2nd Floor, Room 2.41-2.46)**

- **Helen Zille,** Premier of the Western Cape, South Africa

09:30-11:00 **Panel Discussion: Promoting inclusion and sustainability through behavioural insights (Plenary, 2nd Floor, Room 2.41-2.46)**

Public bodies across the world are confronted with increasing demands for greater and better inclusion of different parts of societies while addressing global challenges related to the use of resources and the impact of climate change. Can behavioural insights help?

The panel will kick off the discussion with leading practitioners and thinkers from regional and local governments, academia, civil society and international organisations from both developed and emerging economies. Topics for discussion will include:

- How to expand the use of BI to address complex policy problems related to inclusion and sustainability;
- Elements of inclusion and sustainability that are amenable to use BI applications;
- How to develop data, processes and methods that would help apply BI

to inclusion and sustainability in a wide range of contexts, including resource-constrained developing regions.

Moderator:

- **Faisal Naru**, Head of Strategic Management and Coordination, Executive Directorate, OECD

Panel:

- **Alan Winde**, Minister of Economic Opportunities, Western Cape Government, South Africa
- **David Yokum**, Director, The Lab@DC, Executive Office of the Mayor, Government of the District of Columbia, United States
- **Justine Burns**, Associate Professor, School of Economics, University of Cape Town
- **Saugato Datta**, Managing Director, ideas42
- **Pete Lunn**, Senior Research Officer and Head of the PRICE Lab, Economic and Social Research Institute, Ireland
- **Dilip Soman**, Canada Research Chair in Behavioural Science and Economics Professor of Marketing, Rotman School of Management, University of Toronto

11:00-12:00 **Unconference: Innovative approaches to applying behavioural insights**

- Breakout 1: 1st Floor, Room 1.42
- Breakout 2: 1st Floor, Room 1.44
- Breakout 3: Plenary, 2nd Floor, Room 2.41-2.46
- Breakout 4: 1st Floor, Room 1.43

This session would 'set the scene' for the afternoon breakouts through lightning talks and "world café" discussions. Following a fist 5' 'elevator pitche' from practitioners who have been applying BI to education and youth policies, public safety, participants will split into small breakout groups for reactions, discussions and follow-up questions before the next 'elevator pitch. Experiences and applications will come from across the world and include subnational and emerging economy experiences.

Facilitators:

- **Cameron Cyster**, Research and Analysis, Department of the Premier, Western Cape Government, South Africa
- **Bridget Hannah**, Deputy Director: After School Game Changer, Department of Cultural Affairs and Sport, Western Cape Government, South Africa
- **Taryn van de Rheede**, Deputy Director, Department of Provincial Treasury, Western Cape Government, South Africa
- **James Drummond**, Junior Policy Analyst, Regulatory Policy Division, Public Governance Directorate, OECD

12:00-13:00 **Lunch break**

13:00-14:30 **Breakout 1: Improving education and youth policies (1st Floor, Room 1.42)**

Only recently has BI been applied to education and youth policies. Applications include "nudging" parents to support their children's learning or motivating students and young people to take full advantage of education opportunities. Opportunities exist to go further and use BI to improve education outcomes at both the individual and systemic level. BI could, for example, help identify the cognitive barriers to improving a school system, increasing socio-emotional skills of young people; and be applied to the design of teachers' professional learning and development.

Following from the morning session, this breakout group will focus on current and potential applications of behavioural insights towards improving education outcomes, youth policies and implementation plans and overall social inclusion.

Moderator:

- **Bernice Hlagala,** Director: Youth Development, Department of Planning, Monitoring and Evaluation, South Africa

Speakers:

- **Rebecca Metz Ross**, Deputy Director: Policy, Research and Analysis, Policy and Strategy, Chief Directorate, Department of the Premier, Western Cape Government, South Africa
- **Maha Haidar-Makki,** Co-Founder and Board Member, Nudge Lebanon
- **Zhi Soon**, Director of Youth, Education and Skills, Behavioural Insights Team, United Kingdom
- **Samantha de Martino**, Economist, The World Bank

Breakout 2: Creating safer communities and environments (1st Floor, Room 1.44)

Applications of behavioural insights to public safety have included testing tools for better policing like the use of cameras, diversifying recruitment in police forces and help young people choose safe weekend and evening activity options. However, this is an area that is still relatively unexplored and where there could be potential to develop new approaches to address issues that are of particular concern for citizens and communities.

Continuing the conversation from the morning session, this breakout will provide an opportunity to hear from those institutions that have been at the forefront in applying BI to public safety, especially from local and subnational governments, and discuss ways of exploring and scaling up potential applications.

Moderator:

- **John Cartwright**, Research Associate, Centre for Criminology, University of Cape Town

Speakers:

- **David Yokum,** Director, The Lab@DC, Executive Office of the Mayor, Government of the District of Columbia, United States
- **Saugato Datta**, Managing Director, ideas42
- **Guy Lamb,** Director, Safety and Violence Initiative, University of Cape Town
- **Umar Taj,** Research Fellow, Behavioural Science Group, Warwick Business School

Breakout 3: Making better choices in water, energy and transport (Plenary, 2nd Floor, Room 2.41-2.46)

Human beings' footprint is 1.5 times the earth's total capacity to provide renewable and non-renewable resources. Today, the world population consumes three times the amount of resources consumed in 1970 – and this is expected to double again by 2050. Individual and organisational choices and behaviour matter for the use of energy, water and transport, and so does the regulatory and institutional framework that needs to reflect and facilitate these choices. In addition, new technologies are providing opportunities and challenges for adapting the provision of key public utilities to citizens and businesses. Beyond resource conservation, there might be also opportunities to better reflect the behaviour of end -users in the design and provision of these services and thereby increasing resilience of the system

This session will explore the application of BI to the design and implementation of policies and regulation related to key public utilities.

Moderator:

- **Karen Shippey,** Chief Director: Environmental Sustainability, Department of Environmental Affairs and Development Planning (DEA&DP), Western Cape Government, South Africa

Speakers:

- **Peter de Smedt,** Senior Scientist, DKB Behavioural Insights Team, Flanders regional government administration, Belgium
- **Anjali Chainani,** Director of Policy, Office of the Mayor, City of Philadelphia, United States
- **Priya Reddy**, Director of Communications, City of Cape Town, South Africa
- **Alan Sutherland,** Chief Executive, Water Industry Commission for Scotland, United Kingdom
- **Peter Peacock,** Chair, Customer Forum, Scotland, United Kingdom
- **Martine Visser,** Professor, University of Cape Town

Breakout 4: Delivering better health services and results (1st Floor, Room 1.43)

BI has been applied to address a wide range of health and wellbeing issues, ranging from alcohol and tobacco use to the prevention of heart disease, cancer, and obesity. BI has also been applied to the delivery of health care

services, from preventing over-prescription of antibiotics to reducing infections in health care establishments.

This session will take stock of the current applications of BI to improving health outcomes and identify ways forward to ensure that behavioural choices are reflected in the design of health policies and services.

Moderator:

- **Justine Burns**, Associate Professor, School of Economics, University of Cape Town

Speakers:

- **Fadi Makki,** Head, Qatar Behavioural Insights Unit, Qatar
- **Shyamala Thilagaratnam,** Group Director, Regional Health & Community Outreach Division, Health Promotion Board, Singapore
- **Msokoli Qotoli**, Deputy Director: HIV/AIDS, Department of Public Health, Western Cape Government, South Africa
- **Nicholas Owsley**, Research Associate, The Busara Centre for Behavioural Economics

14:30-15:00 **Networking break and afternoon tea**

15:00-16:00 **Panel Discussion: Public Sector response: Key insights and lessons learned (Plenary, 2nd Floor, Room 2.41-2.46)**

What to do next? Building on the discussion in the breakout sessions, the panel composed of breakout leads will present and discuss ideas on how to take the agenda forward and help 'connect the dots' to solve complex policy problems through the application of BI.

Moderator:

- **Jacqui Boulle,** Chief Director and Programme Director, Department of Cultural Business and Sports, Western Cape Government

Panel:

- **Safety: Guy Lamb,** Director, Safety and Violence Initiative, University of Cape Town
- **Education: Nicholas Owsley**, Research Associate, Busara Centre for Behavioural Economics
- **Sustainability: Karen Shippey**, Chief Director: Environmental Sustainability, Department of Environmental Affairs and Development Planning (DEA&DP), Western Cape Government, South Africa
- **Health: Pelle Hansen,** Director of The Initiative of Science, Society & Policy at Roskilde University and University of Southern Denmark, Chief Executive of iNudgeYou

16:00-17:00 **Keynote address and Q&A (Plenary, 2nd Floor, Room 2.41-2.46)**

What's next? How can behavioural insights help? The end note address will offer an opportunity to connect the dots and distill lessons and insights from a day of discussions on current and future applications of behavioural insights to address some of these complex problems.

- **Dilip Soman**, Canada Research Chair in Behavioural Science and Economics Professor of Marketing, Rotman School of Management, University of Toronto

17:00 **Closing remarks (Plenary, 2nd Floor, Room 2.41-2.46)**

- **Marcos Bonturi,** Director, Public Governance Directorate, OECD

18:00 **Dinner (Bungalow Restaurant and Lounge, Camps Bay)**

Please join us for an evening of good music and great food at the conference gala dinner at 18:30 on 27 September 2018. The dinner will be hosted at the Bungalow Restaurant and Lounge in Clifton - a beautiful Cape Town venue overlooking the sea. Well-known South African musicians will be there to entertain you during the evening and buses will be provided from the conference venue to the dinner and back.

DAY 2: Mainstreaming behavioural insights across governments

28 September 2018

Cape Town International Convention Centre

Participation in Day 2 is restricted to confirmed participants only

As behavioural insights (BI) is becoming more widely applied in major policy agendas, governments face challenges in "how to" apply BI as well as ensuring that the science is applied responsibly. Following the seminal OECD Seminar on Behavioural Insights held in January 2015 and the OECD Nudging for Good Seminar held in May 2017, this second day will provide an opportunity for public policy officials and BI practitioners to discuss a policy making toolkit and ethical framework to support governments at all levels to implement behaviourally-informed approaches. This will be followed by a discussion about mainstreaming the application of behavioural insights within government.

08:30 — **Arrival and refreshments**

09:00-09:30 — **Opening remarks (Plenary, 2nd Floor, Room 2.41-2.46)**

- **Marcos Bonturi**, Director, Public Governance Directorate, OECD
- **Anthony Hazell**, Chief Director - Policy and Strategy, Department of the Premier, Western Cape Government, South Africa

09:30-12:15 — **How to apply behavioural insights effectively and responsibly: The Draft Behavioural Insights Toolkit & Ethical Framework (Plenary, 2nd Floor, Room 2.41-2.46 and then move to various indicated breakout rooms)**

At the OECD Nudge for Good Seminar in May 2017, there was a strong call from public officials and BI practitioners for guidance on how to apply BI along the policy cycle, while also addressing ethical and transparency concerns. The OECD in partnership with Roskilde University in Denmark has been developing a practitioner's toolkit & ethical framework. In the spirit of developing a toolkit & ethical framework for practitioners by practitioners, this session will provide an opportunity to discuss the draft toolkit & ethical framework, collect comments and feedback before it is finalised.

Following a presentation of the draft toolkit and ethical framework, participants will break into small groups for an interactive discussion and reconvene to provide inputs into the design of the toolkit & ethical framework.

Morning tea will be provided before participants break into groups.

Speakers:

- **Filippo Cavassini**, Economic Adviser, Regulatory Policy Division, Public Governance Directorate, OECD
- **Pelle Hansen,** Director of The Initiative of Science, Society & Policy at Roskilde University and University of Southern Denmark, Chief Executive of iNudgeYou

12:15-14:00 **Lunch break**

14:00-15:00 **Panel discussion: Organisational behaviour change within governments (Plenary, 2nd Floor, Room 2.41-2.46)**

BI is becoming more widespread around the world as an effective means for improving the efficiency and effectiveness of policies. However, more can be done to apply behavioural insights to improve the decision making and processes of government, such as reducing red tape. This panel would bring together policymakers and practitioners who have experience in building capacity and applying BI in innovative ways inside government.

Moderator:

- **Lori Foster**, Professor of industrial-organizational psychology at North Carolina State University and the University of Cape Town

Panel:

- **Anjali Chainani,** Director of Policy, Office of the Mayor, City of Philadelphia, United States
- **Rupert Gill**, Head of Behavioural Insight, Behaviour, Insight and Research Team, Customer Directorate, HM Revenue & Customs United Kingdom
- **René van Bavel,** Scientific Officer, Foresight, Behavioural Insights and Design for Policy Unit, Joint Research Centre, European Commission
- **Nick Malyshev**, Head of the Regulatory Policy Division, Public Governance Directorate, OECD
- **Josh Martin**, Vice-President, ideas42

15:00-15:15 **Afternoon tea**

15:15-16:15 **Panel discussion: Supporting governments to mainstream behavioural insights (Plenary, 2nd Floor, Room 2.41-2.46)**

What does it take to mainstream the application of BI to policy design and delivery? This interactive panel discussion will bring the views from the participants and speakers on how lessons can be transferred to different contexts – such as regional or local governments and emerging economies – that face different constraints and challenges to the use of BI on a systematic basis. Topics to be discussed would include:

1) Leadership: who needs to be 'on board' for BI to take off, and how to gain buy-in for BI;
2) Institutional set up: what structures, if any, do governments need and how do they go about setting up, embedding, funding, and scaling BI work;
3) Frameworks for collaboration: how to break down silos and work collaboratively across government and with non-governmental partners; and,
4) Skills and capabilities: What skill sets do governments need to practice BI on a regular basis.

Moderator:

- **Anna Pietikainen**, Policy Adviser, Regulatory Policy Division, Public Governance Directorate, OECD

Speakers:

- **Tara Oliver,** Managing Director, Behavioural Economics Team of the Australian Government (BETA), Department of the Prime Minister and Cabinet, Australian Government, Australia
- **Javier Guillot,** Co-ordinator, Public Innovation Team, National Planning Department, Colombia
- **Ammaarah Martinus,** Director of Policy, Research and Analysis, Department of the Premier, Western Cape Government, South Africa
- **David Yokum,** Director, The Lab@DC, Executive Office of the Mayor, Government of the District of Columbia, United States

16:15-16:30 **Closing remarks and next steps (Plenary, 2nd Floor, Room 2.41-2.46)**

- **Marcia Korsten**, Deputy Director-General, Western Cape Government, South Africa
- **Nick Malyshev**, Head of the Regulatory Policy Division, Public Governance Directorate, OECD

This session would focus on tying together the key themes of the day and discussing next steps for the various communities in the room. This includes notifying participants of a BI masterclass, building connections between countries and regions at various stages in applying BI, policy and behavioural work being conducted, and other topics.

16:30 **Close**

WHO'S WHO

Marcos BONTURI, Director, Public Governance Directorate, OECD

Marcos Bonturi is the OECD Director for Public Governance. He leads a team of over 200 staff at the Public Governance Directorate (GOV). GOV helps governments design and implement strategic, evidence-based and innovative policies to strengthen public governance, respond effectively to economic, social and environmental challenges and deliver on government's commitments to citizens. It covers topics such as innovation, digital government, transparency, integrity, public procurement, public budgeting, gender-responsive policies, risk management and regulatory reform. Mr. Bonturi, who has both Italian and Brazilian citizenship, joined the OECD in 1990. Throughout his OECD career, Mr. Bonturi has held various senior positions, including Director for Global Relations and Deputy Chief of Staff in the Secretary-General's Cabinet, and has worked in several OECD Directorates. Mr. Bonturi studied Engineering at the Federal University of Rio de Janeiro, holds a Master's degree in Economics and has also undertaken Doctoral studies in Trade Policy and Development Economics at the University of Maryland.

Jacqui BOULLE, Chief Director, Department of Cultural Affairs and Sport, Western Cape Government

Jacqui Boulle is the Chief Director of the Western Cape After School Game Changer. She has over 30 years of development experience as a public servant, NGO leader and consultant. This includes running the SA NGO Coalition Poverty hearings in 1999, working on formalising the determination and training frameworks for expanded public works while the General Manager of Working for Water Programme and crafting the Provincial Youth Strategy as a consultant to Western Cape Government. Jacqui is particularly passionate about education and youth. In addition to her work building the After School Movement, she has worked extensively on youth development, pathways to employment and strategies to address poverty and inequality. Her particular skill is in bringing public, private and NGO partners together around a shared goal. Jacqui holds an economics degree and MBA.

Justine BURNS, Associate Professor, School of Economics, University of Cape Town

Justine Burns is a Professor in the School of Economics, Director of the Research Unit of Behavioural and Neuroeconomics, and a research associate of the Southern African Labour and Development Research Unit, all at UCT. Her research interests include behavioural and experimental economics, trust and social cohesion, discrimination, labour markets and social networks, and intergenerational mobility. Her experimental work has focused on the effects of racial identity and income inequality on individual decision-making, as well as group co-operation in the provision of public goods. She has also published work on educational mobility, social assistance, and the impact of social networks on employment outcomes. From 2012-2015, she was the co-PI on a project with WCG and ideas42 to use behavioural insights to improve implementation and service delivery in the areas of energy efficiency, after-school attendance, community safety, healthy lifestyle adoption, and the reduction of age-disparate relationships in the Western Cape.

John CARTWRIGHT, Research Associate, Centre for Criminology, University of Cape Town

After more that thirty years as an academic career as an academic specialising in English and medieval literature, John Cartwright has for the last twenty years been working in projects aimed at creating and sustaining community safety, most often through the Centre of Criminology at the University of Cape Town. The essential principles underlying this work have been (1) to identify all available resources in any given place that can contribute to community safety, from aunties sitting observing the street to police agencies, (2) to build institutional arrangements that promote and sustain the effective and sustainable mobilisation and – where appropriate – integration of such resources.

Filippo CAVASSINI, Economic Adviser, Regulatory Policy Division, Public Governance Directorate OECD

Filippo has 10 plus years of experience working inside government, with public administrations and in international organisations. At the OECD, Filippo is working on good regulatory practices in OECD members and partners with a special focus on the governance of regulators and their independence, the application of behavioural insights, and good regulatory practices in South-East Asia,. Prior to joining the OECD, Filippo was a results management specialist at the World Bank, advising governments in Central Asia, Europe and Latin America, and was an international affairs specialist in the French National Assembly. Filippo holds a Master in Public Policy from Harvard Kennedy School. You can follow Filippo's tweets at @FilippoCavass1

Cameron CYSTER, Policy and Strategy Researcher, Research and Analysis, Department of the Premier, Western Cape Government, South Africa

Cameron Cyster is currently a Policy and Strategy Researcher for the Western Cape Department of the Premier. His work has spanned across the policy research and implementation domains, including portfolios such as Youth Development and Behavioural Insights. Before entering the public service, he was employed by his alma mater, the University of Cape Town, where he taught Organisational Psychology at undergraduate-level and supervised postgraduate research projects. During his academic career, his research focus was on the behavioural determinants of sustained unemployment, specifically the structural barriers that resulted in discouragement amongst the unemployed. Cameron has a Master of Social Science specialising in Organisational Psychology, through which he has developed a strong interest in the behavioural sciences and its potential to tackle social ills.

Saugato DATTA, Managing Director, ideas42, United States

Saugato Datta is a Managing Director at ideas42, a behavioral science research and consulting firm, where oversees work in low- and middle-income countries in Asia and Africa. He works with partners in government, NGOs and firms focused on low-income populations to design, test and scale socially beneficial applications of behavioral science. His current work spans public health, violence reduction, financial inclusion, resource conservation, agriculture, the design of transfer programs, and helping cities use behavioral science to improve urban governance and sustainability. He has a PhD in economics from MIT, and undergraduate and master's degrees from the Universities of Cambridge and Delhi.

Josh MARTIN, Vice-President, ideas42

Josh Martin is a Vice President at ideas42 where he works primarily to facilitate the uptake of behavioral innovation in developing country governments, with a particular focus on social protection and government efficiency. Prior to joining ideas42, Josh was a policy advisor in Côte d'Ivoire's Ministry of Planning and Development, with various prior roles at Princeton University, the World Bank, the National Democratic Institute, and others. His primary domains of interest include cash transfer programs, governance, education, conflict dynamics, and religion. Josh has a masters from the Harvard Kennedy School of Government and speaks fluent Arabic and French.

Samantha DE MARTINO, Economist, World Bank

Samantha De Martino is an Economist in the World Bank's behavioral science unit - Mind, Behavior, and Development (eMBeD) which sits in the Poverty and Equity Global Practice. Her research is at the nexus of applied microeconomics and behavioral science, with a focus on developing and testing new measures for understanding behavior. She is currently leading projects addressing behavioral constraints in labor markets and local area development (South Africa and Cyprus), education (South Africa and Indonesia), energy and environment (Uganda, Madagascar, Rwanda, Senegal), and health (Turkey). She has extensive qualitative and quantitative experience in impact evaluation design and implementation of interventions for policy issues including land reform, renewable energy, environment, health, education, anti-poverty, youth

unemployment and social protection in Africa, Latin America, East Asia, Eastern Europe and Central Asia with the World Bank, Institute of Development Studies, Innovations for Poverty Action, and the City of Cape Town. She holds a master's degree from Johns Hopkins University and PhD in Economics from the University of Sussex.

Peter DE SMEDT, Senior Scientist, DKB Behavioural Insights Team, Flanders

Peter De Smedt has an academic background in System Analyses (KU Leuven, BE). He has been working with experts and stakeholders on a common understanding of unsustainable trends by offering scenarios, behavioural insights and integrated solutions to support policy makers at (inter)regional and European level. In his previous assignment he worked as senior scientist at the EU Policy Lab in the Joint Research Centre of the European Commission. Currently, Peter is involved in establishing a Behavioural Insight team within the Centre of Government of the Flemish administration (DKB).

James DRUMMOND, Junior Policy Analyst, Regulatory Policy Division, Public Governance Directorate, OECD

James Drummond is a Junior Policy Analyst in the Regulatory Policy Division, where he works on issues related to the Network of Economic Regulators, regulatory policy, and behavioural insights. Previously, he served as a consultant in the Reform of the Public Sector Division in the Public Governance Directorate working issues related to high-level risk governance, inclusive growth, policy advisory systems, and the Public Governance Committee. He started his career in finance, working in one of Canada's top brokerage firms specialising in Canadian Armed Forces, Royal Canadian Mounted Police and Government of Canada relocations. James holds a MPP from the University of Toronto, MA in Political Science from Carleton University, and a BSocSc in Political Science from the University of Ottawa.

Lori FOSTER, Professor of Psychology, North Carolina State University, Adviser to UN Secretary General on Behavioural Insights and former member of the White House Social and Behavioural Science Team, United States

Lori Foster is a Professor of Psychology at North Carolina State University and head of the IOTech4D lab, devoted to research at the intersection of work, psychology, technology, and global development. She recently completed a two-year assignment with the White House Social and Behavioural Sciences Team and now helps lead the Behavioural Insights initiative at the United Nations. She has more than fifteen years of experience as a consultant, applying the science of work to regional, state, national, and international organizations. Prior to her career in academia, she worked for Personnel Decisions Research Institutes. Lori Foster's areas of research and practice expertise include computer-mediated work behaviour, humanitarian work psychology, behavioural economics, and workforce development. Her current efforts focus on how these areas and other aspects of Industrial-Organizational psychology can be used to enrich and improve work carried out for the purpose of addressing the most pressing economic, social, and environmental challenges facing our world today. This includes combining I-O psychology and information technology to enhance the well-being and work of aid professionals and volunteers, and to stimulate workforce development in lower-income regions of the world.

Tougieda GALLOW, Personal Assistant: Policy, Research and Analysis, Department of the Premier, Western Cape Government, South Africa

Tougieda Gallow has worked in government for over ten years, and has garnered extensive experience in this sector. She has been actively involved in rolling out awareness campaigns to communities across the Western Cape. She has also worked as coordinator and implementing agent in programmes being piloted in schools in the Western Cape. Her work background includes experience in Events coordinating, Marketing, Public, Relations, and she is a novice in Graphic Design. She currently works within the Policy Research and Analysis unit at the Department of the Premier, where she provides support to the Director across multiple projects.

Rupert GILL, Head of Behavioural Insight, Behaviour, Insight and Research Team, Customer Directorate, HM Revenue & Customs, United Kingdom

Rupert is Head of Behavioural Insight and Trials at HMRC, the UK's Department for Tax Administration, where some of the UK's first Behavioural trials were run ('9 out of 10 people in your area have already paid their tax') in partnership with the Nudge Unit. The team specialise in influencing the behaviour of both tax payers and the Department's own staff. Rupert has worked across the UK Government, including in the Prime Minister's Office in 10 Downing Street and the Treasury, and has led major behaviour change projects in employment and tax. He has a PhD from Cambridge University (thesis 'My Personality, Whose Responsibility?'). He lives in Brixton, London with his wife, Lizzy and two (soon to be three!) young daughters.

Javier GUILLOT, Director, Public Innovation Team (EiP), National Planning Department, Colombia

Javier Guillot leads the Public Innovation Team (EiP) at the National Planning Department (DNP), a ministry-level agency that directs strategic policy making and serves as the government's think-tank in Colombia. Javier holds a BA (National University of Colombia) and an MA in Philosophy (University of Pennsylvania), as well as an MPP (Hertie School of Governance). He has experiences in social and public innovation, qualitative and quantitative research, workshop facilitation, and consultancy for organizations such as UNICEF, the World Bank, and NGOs in Colombia, Brazil and Uganda. He is also a member of the Penn Social Norms Training and Consulting Group, for which he has led workshops on social norms theory in countries such as Peru, Mexico and the US. He is also the co-founder of Onda, a team that creates immersive learning spaces to bridge creativity with the resolution of collective challenges.

Maha HAIDAR-MAKKI, Co-Founder and Board Member, Nudge Lebanon

Co-founder of Nudge Lebanon, Maha's interests focus on Education and Inclusion in the context of Lebanon and developing countries. She is currently the Director of the MasterCard Foundation Scholars Program at the American University of Beirut. Maha has extensive experience in several school and university settings in Lebanon and the Arab countries where she had teaching, managerial, as well as advisory roles. Her academic background spans health sciences, education, and management. She holds a BS in Environmental Health, a Teaching Diploma and an MA in Science Education from the American University of Beirut. She also holds an MBA from the Ecole Supérieure des Affaires. Maha serves on the board of The Assad Diab Cultural Foundation and is co-founder of Teach A Child, an NGO that strives to ensure that every child in Lebanon is given an education and the opportunity to prosper.

Bridget HANNAH, Deputy Director: After School Game Changer, Department of Cultural Affairs and Sport, Western Cape Government, South Africa

Bridget Hannah is the Programme Manager in the After School Game Changer, Western Cape Government. Coming from an international studies background and with a Masters in Health Policy, her passion is in development. Bridget is particularly interested in working to build strong, collaborative partnerships towards achieving collective impact.

Pelle HANSEN, Behavioural Scientist, Co-Founder of the European Nudge Network, Chairman of the Danish Nudge Network, and Founder of iNudgeyou, Roskilde University, Denmark

Pelle Guldborg Hansen is behavioural scientist, at Roskilde University. He is also the Director of ISSP – The Center for Science, Society & Policy at Roskilde University and University of Southern Denmark; Chairman of the Danish Nudging Network; Co-founder of TEN - The European Nudge Network, and CE of iNudgeYou - The Applied Behavioural Science Group. Hansen was awarded the PhD. degree from Roskilde University in game theoretical modelling of social conventions and norms in 2010. Since then he has worked with real world applications of behavioural economics, especially so-called 'nudge'-interventions, within a wide range of areas. He is the co-author the books The Blind Spots of Enlightenment and Infostorms (w.

Vincent F. Hendricks) and has published his research in a range of international peer reviewed journals, including The International Behavioural Public Policy, Review of Economics, American Journal of Bioethics, Annual Review of Public Health and European Journal of Risk Regulation. His research has often received widespread public interests and has been reported, in amongst the outlets, The Economist, Foreign Policy, CNN, New Scientist and Wall Street Journal. In 2010 he founded as well as became the Chairman of The Danish Nudging Network that comprises +100 governmental institutions, municipalities, universities, organisations and businesses. In 2014 he founded TEN - The European Nudge Network together with Alberto Alemanno, Jean Monet Professor in European Law and Risk Regulation.

Anthony HAZELL, Chief Director: Policy and Strategy, Department of the Premier, Western Cape Government, South Africa

Prior to starting this role in November, 2017, Anthony was a Programme Management Advisor at the Department of Human Settlement, where he was responsible for knowledge and information management and strategic coordination. He also served as Chief of Staff to the Western Cape Minister for Human Settlements from 2009 to 2011. With a Bachelor of Science (Honours) degree in Zoology from University of Cape Town and a background in Strategic Communication and Relationship Management, he has completed a variety of executive development courses, from nomadic marketing to public management to understanding poverty and inequality and evidence for policy making and implementation. He is passionate about problem solving and innovation in the public policy arena.

Bernice HLAGALA, Director: Youth Development, Department of Planning, Monitoring and Evaluation, South Africa

Dr R.Bernice Hlagala is the Director responsible for Youth Development in the Department of Planning, Monitoring and Evaluation since 2007. She oversaw formulation of the National Youth Policy and ensured its approval; the signing and ratification of the African Youth Charter; hosted the 1st and 2nd Commonwealth Conferences on Youth Work. In 2014, she was recognised as a recipient for the best Commonwealth Youth Worker Award in the Africa region and the overall winner for the Pan-Commonwealth Youth Worker Award. She was also instrumental in developing the Youth Development Business Plan and Strategy for the Southern Africa Development Community (SADC); African Union (AU) Decade Plan of Action for Youth; AU Common position on youth development; M&E framework for the youth policy; and is currently working on a framework legislation for youth development in the country. Dr Hlagala has PhD from the University of Pretoria; Masters from Howard University in USA; Bachelor Degree in Social Work from University of Venda; National Diploma in Public Relations from University of South Africa; and a certificate in Management from Technikon South Africa. She is a mother to three (3) daughters aged 27, 12 and 4.

Marcia KORSTEN, Deputy Director General, Western Cape Government, South Africa

Marcia is currently the Deputy Director-General: Strategic Programmes in the Department of the Premier in the Western Cape Government responsible for Provincial Strategic Management which include the areas of policy and strategy, strategic management information and international and priority programmes. Prior to joining her current department, Marcia held numerous positions in the Western Cape Provincial Treasury including heading up the Public Policy unit and the Provincial Government Budget Office responsible for the promotion of effective management and responsive allocation of fiscal resources. She commenced her career as a Lecturer and Researcher in the Department of Economics at the University of the Western Cape (UWC) where she also obtained her Masters Degree in Economics. Her experience is in the areas of public policy, fiscal and budget policy, strategic management and economic development.

Guy LAMB, Director, Safety and Violence Initiative, University of Cape Town

Dr Guy Lamb is the Director of Safety and Violence Initiative (SaVI) at the University of Cape Town (UCT) in South Africa. Guy is a Research Associate, Centre for International & Comparative Politics, Stellenbosch University, and a member of the Western Cape Provincial Government's Community Safety Improvement Partnership, and is also an advisor to the South African Cities Network's Urban Safety Reference Group. Prior to joining UCT he was a Senior Research Fellow and Programme Head at the Institute for Security Studies. He has undertaken research and published on arms control, violence reduction, urban safety, policing and peace-building issues in Africa for more than 20 years. He has served on the UN Security Council Panel of Experts on Liberia and was a member of the UN's small arms control standards expert reference group.

Pete LUNN, Senior Research Officer, Economic and Social Research Institute, Ireland

Professor Pete Lunn is a behavioural economist, author and broadcaster. He runs a consumer decision-making laboratory at the ESRI in Dublin. His research uses a combination of laboratory and field experiments to investigate how people make economic decisions and to pre-test policy interventions. Pete is also the author of "Regulatory Policy and Behavioural Economics", a review undertaken for the OECD in 2014 that documents the application of behavioural economics to regulatory policy in OECD countries.

Fadi MAKKI, Head of the Qatar Behavioural Insights Unit, Supreme Committee for Delivery and Legacy, Qatar

Dr Fadi Makki is a pioneer in the application of behavioural economics and nudging to public policy in the Middle East. He currently leads the first nudge unit in the Middle East, the Qatar Behavioural Insights Unit (QBIU) within the Supreme Committee for Delivery and Legacy in Qatar. He is founder and President of Nudge Lebanon and the Consumer-Citizen Lab. He is a Senior Fellow at Georgetown University in Qatar and AUB Issam Fares Institute of Public Policy. He served as Director General of the Lebanese Ministry of Economy and Trade and Advisor to the Prime Minister. He worked previously at Booz & Company, the Islamic Development Bank and the WTO. He was Visiting Lecturer at AUB & USJ. He obtained his PhD from Cambridge University, Master's degrees from the London School of Economics and the University of Hull, BA from the AUB and LLB from the Lebanese University.

Nick MALYSHEV, Head of Division, Regulatory Policy Division, Public Governance Directorate, OECD

Nick Malyshev is Head of the OECD Regulatory Policy Division where he directs thematic analysis and country reviews of regulatory reform in OECD and non-OECD countries. He was responsible for updating the OECD normative framework on regulatory policy, now the 2012 Recommendation on Regulatory Policy and Governance. He is co-author of a number of OECD publications, including the 2015 Regulatory Policy Outlook, the 2011 publication, Regulatory Policy and Governance, Supporting Economic Growth and Serving the Public Interest and the 2010 study Risk and Regulatory Policy, Improving the Governance of Risk. He has also worked with a number of national governments to support their efforts to realise regulatory reforms including, most recently, Korea, Peru, Chile and Mexico. While at the OECD he has also worked extensively on the economic transition in Russia and central and Eastern Europe, including analytical and advisory work on a range of topics including regulatory policy and institutional reforms. Prior to joining the OECD, Mr. Malyshev worked as a financial analyst at GlaxoSmithKline, a pharmaceuticals company, and as a securities trader at Wall Street West, an investment bank. Mr. Malyshev, a US national, holds degrees in economics from Duke University and Colorado College.

Ammaarah MARTINUS, Director of Policy, Research and Analysis, Department of the Premier, Western Cape Government, South Africa

Ammaarah Martinus was born in Cape Town, South Africa. Interested in issues of governance, politics and international relations, she pursued studies in Governance and Political Studies at the University of Cape Town, and completed a Master's Degree in International Relations from her Alma Mater. Passionate about positive change and governance in South Africa, she began her professional career as a researcher for the Western Cape Provincial Legislature. Since then she has worked for the British High Commission, Western Cape Provincial Treasury and the National Department of Cooperative Governance and Traditional Affairs (COGTA). Her main interests are focused on how behavioural insights can influence policy development and implementation. She is currently the Director of Policy, Research and Analysis at the Western Cape Government, Department of the Premier. In her current role, she focuses on innovative research, policy development and strategic implementation in the social sector.

Rebecca METZ ROSS, Deputy Director: Policy, Research and Analysis, Policy and Strategy, Chief Directorate, Department of the Premier, Western Cape Government, South Africa

Rebecca Metz Ross is a Deputy Director in the Policy and Strategy Chief Directorate of the Western Cape Government (WCG). Her current work has a particular focus on children's and youth issues in the policy space. She most recently project managed the running of a Behavioural Insights intervention called Growth Mindset which targeted the psycho-social wellbeing of learners in schools. Rebecca has worked on a range of policy issues in both government and academia – including infrastructure in the public works department of the WCG and on inequality as a policy manager at the Southern Africa Labour and Development Research Unit (SALDRU). Her experience at the Abdul Latif Jameel Poverty Action Lab for Africa (J-PAL) focused on designing and implementing Randomised Control Trials in the areas of education and health. She holds a Masters degree in Public Affairs from Princeton University and a B.Soc.Sci (Hons) in Economics from the University of Cape Town.

Faisal NARU, Head of Strategic Management and Coordination, Executive Directorate, OECD

Faisal Naru is the Head of Strategic Management and Coordination of the OECD's Executive Director. He spearheaded the OECD work on Behavioural Insights including OECD conferences and publications including "Behavioural Insights in Public Policy". He established the OECD Network of Economic Regulators which works with CEOs and Commissioners of agencies to define a "world class regulator", to be independent body and protect from undue influence and enhance organizational performance and culture. He also led multi-lateral work in Africa, Asia and MENA. Faisal is a former member of the UK Government's Cabinet Office. He then Headed the Governance Practice and was on the Leadership Board for a global development consultancy working in Asia, Middle East, Africa and Europe on public sector change and performance improvement. He then was Chief Advisor to the Government of Viet Nam on economic and regulatory reforms. He graduated from the University of Oxford. You can follow Faisal's tweets at @Faisal_Naru or connect with him on LinkedIn.

Tara OLIVER, Managing Director, Behavioural Economics Team of the Australian Government (BETA), Department of the Prime Minister and Cabinet, Australian Government, Australia

Tara Oliver is the Managing Director of the Behavioural Economics Team of the Australian Government (BETA) in the Australian Government Department of the Prime Minister and Cabinet where she leads a diverse team of behavioural scientists, economists and policy practitioners. Prior to taking on this role, Tara held senior leadership roles in the areas of water policy, regulatory reform and fiscal policy and has contributed to policy development and implementation across a range of other policy areas including retirement incomes and Commonwealth-State financial relations.

Nicolas OWSLEY, Research Associate, The Busara Centre for Behavioural Economics

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Peter PEACOCK, Chair, Customer Forum, Scotland, United Kingdom

Peter has had a career in the public, private and third sectors. He is a former politician, serving at the most senior levels in local government in the Highlands before entering the Scottish Parliament where he was a Minister and Cabinet Secretary holding responsibility for a number of portfolios. He is a former Vice President of CoSLA and served on the European Committee of Regions; and was a Board Member of SNH and the Scottish Post Office Board. He worked for 12 years for Citizens Advice in Scotland; Chaired the Scottish Library and Information Council; and ran his own public policy consultancy in a small partnership. As well as Chairing the Customer Forum Peter currently serves on the OFCOM Advisory Committee for Scotland, acts as the Policy Director for Community Land Scotland, and undertakes various policy consultancy assignments.

Priya REDDY, Director of Communication, City of Cape Town, South Africa

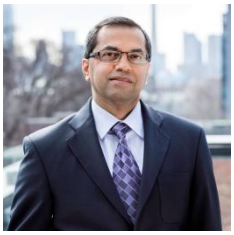
Priya has been Director for a year and a half. She has a great passion for the work she does in trying to make a complex organization with complex processes understandable for the people it serves. She is proud to be a part of an organization that is the best run municipality in the country and works with some remarkable people. The water crisis taught the City so much. It was hard on all Capetonians but we have so much to brag about now. She is so proud that she played a small part in changing the way we all think about water.

Anna PIETIKAINEN, Policy Advisor, Regulatory Policy Division, Public Governance Directorate, OECD

Anna currently works at the OECD on a number of regulatory policy issues, such as the governance of regulators, the use of good regulatory practices and of new tools like behavioural insights in OECD and partner countries. She has recently led performance assessment reviews of Mexico's and Ireland's economic and technical regulators and contributed to OECD work on the independence of regulators. At the OECD, she previously worked as advisor on co-operation with Latin America at the Development Centre, and as Counsellor to the Director at the Sahel and West Africa Club. Prior to joining the OECD, she provided guidance and support to governments in Latin America and the Caribbean on their national rural development programmes as Country Programme Manager with the United Nations - International Fund for Agricultural Development, IFAD. Anna is a political scientist with degrees in international relations and development studies from the London School of Economics and Sciences-Po Paris.

Karen SHIPPEY, Chief Director: Environmental Sustainability, Department of Environmental Affairs and Development Planning (DEA&DP), Western Cape Government, South Africa

Ms Karen Shippey has a Master's Degree in Environmental and Geographical Science from the University of Cape Town and over 20 years of work experience. Whilst her post-graduate studies focussed on Sustainable Development, her work experience took her into the world of infrastructure development, working as an Environmental Assessment Practitioner. She joined the Western Cape Government in 2011 and became Chief Director: Environmental Sustainability for the Western Cape in 2015. This role saw her providing oversight and leadership across the Provincial Climate Change, Green Economy Sustainability, Biodiversity and Coastal Management portfolios.



Dilip SOMAN, Professor and Director, Behavioural Economics in Action at Rotman (BEAR), University of Toronto, Canada

Dilip is the Canada Research Chair in Behavioural Science and Economics at the University of Toronto's Rotman School of Management, and also the Director of the University's Behavioural Economics in Action (BEAR) centre. He holds an undergraduate degree in Engineering (Bombay), an MBA (IIM) and a Ph.D in Behavioural Science (Chicago). His research is on behavioural science and its applications to welfare, policy and business. He has written published extensively in these fields, ncluding the 2015 book "The Last Mile". He also teaches a massive open online class (MOOC) on Behavioural Economics. You can follow Dilip on Twitter @Dilipsoman.

Zhi SOON, Director of Youth, Education and Skills, Behavioural Insights Team, United Kingdom

Zhi is Director of BIT's Youth, Education and Skills team, and was previously Director of the Behavioural Research Centre for Adult Skills and Knowledge, a joint initiative between BIT and the UK Government. BIT started life inside No.10 Downing Street as the world's first government institution dedicated to the application of behavioural science. It is now a social purpose company, jointly owned by the UK Government; Nesta (the innovation charity); and BIT employees. Before joining BIT, Zhi worked in the New South Wales (Australia) Department of Premier and Cabinet's Behavioural Insights Unit, where he led the team's work on education. Zhi has also served as a Board Member on the New South Wales Board of Studies, the authority responsible for developing and monitoring educational standards in Australia's largest education system. Outside of education policy, Zhi has worked in the Australian Prime Minister's Office and served as an Australian diplomat.

Alan SUTHERLAND, Chief Executive, Water Industry Commission for Scotland

Alan advised the Scottish Government on the creation of Scottish Water in 2002. In 2008, he opened the world's first retail water market. Alan's approach is guided by the principle that a well-managed company will "go much further for their customers than they will for the regulator". He is constantly seeking to improve the regulatory framework and strengthen the relationship between the regulated company and its customers. In his role, Alan has worked with Defra in England, the EU in Greece and Romania, the IMF in Cyprus and the International Department of the Ministry of Water Resources in China. Alan is a member of the Bureau of the Network of Economic Regulators of the OECD.

Umar TAJ, Research and Teaching Fellow, Warwick Business School & London School of Economics and Political Science

Umar is a Research Fellow in Behavioural Science at Warwick Business School and a Teaching Fellow in Behavioural Decision Science at London School of Economics and Political Science. His interest lies in helping public and private institutions apply the latest insights from behavioural science to improve decision making. His current projects span the domains of tech, health, finance, energy, security, politics and education. Umar is the founder of Nudgeathon™ - a crowd-sourcing platform in which diverse teams of stakeholders come together to find behavioural solutions to social problems. He is also the founder of Behaviour Insight™ - a tech-based behaviour change solution that systematically identifies barriers to behaviour change and

guides the user to develop successful interventions. He delivers regular training and facilitation workshops and has provided his service to over 50 global institutions.

Shyamala THILAGARATNAM, Group Director, Health Promotion Board, Singapore

Shyamala is responsible for developing 'healthy ecosystems' in Singapore, bringing healthy lifestyle programmes to schools, workplaces and community touchpoints – with the aim of making the healthier choices, the easier choices. Behavioural insights and rapid prototyping form the basis of developing creative models of preventive care to improve population health – often in partnership with the public, private and people sectors. Prior to joining Singapore's Health Promotion Board, Shyamala was in clinical practice. Her medical degree, and her Masters in Public Health are both from the National University of Singapore (NUS); her M.Sc in Healthcare Management is from the University of Wales. She also holds an adjunct associate professorship at the Saw Swee Hock School of Public Health, National University of Singapore. When she's not working, Shyamala enjoys photography, which provides as much joy as the day job. She also loves travelling on roads less travelled, preferably where the wifi is weak.

René VAN BAVEL, Scientific Officer, Foresight, Behavioural Insights and Design for Policy Unit, Joint Research Centre, European Commission

René van Bavel completed his undergraduate degree in economics at Queen's University, Canada, and his MSc and PhD in social psychology at the London School of Economics. He is currently Scientific Officer at the European Commission's Joint Research Centre (JRC), working on the application of behavioural insights to EU policy-making. Over the past 12 years he has contributed as a researcher, policy analyst, and team leader to bringing scientific evidence to policy-making at the European Commission. Prior to that, he taught social psychology at the University of Cambridge. His research interests include the social psychology of economic thought, behavioural nutrition and physical activity, and online behaviour. He has published quantitative and qualitative studies in economic, psychology, and public health journals.

Taryn VAN DE RHEEDE, Deputy Director, Department of Provincial Treasury, Western Cape Government, South Africa

Taryn van de Rheede is a Deputy Director in the Western Cape Provincial Treasury, where she provides strategic guidance to inform economic policy and strategy for the Western Cape Government. She is an experienced public official with specialist knowledge in the areas of budget policy, public governance, socio-economic policy and strategy development, and monitoring and evaluation. This has spanned across different roles, including Economic Researcher at the Department of Economic Development and Tourism, Policy and Strategy Researcher in the Department of the Premier. Taryn graduated from the University of the Western Cape with a Masters in Economics.

Martine VISSER, Professor, University of Cape Town

Martine Visser is a Professor in the School of Economics, University of Cape Town and holds a Ph.D. from Gothenburg University in Sweden. Martine is The Director of the Environmental-Economics Policy Research Unit (EPRU; www.epru.uct.ac.za) and a Research Chair with the African Climate & Development Initiative (ACDI). She is also associated with various research units within the School of Economics, including the Research Unit of Behavioral and Neuro-economics Research (RUBEN) and the South African Labour Development Research Unit (SALDRU). Professor Visser specializes in behavioural economic applications to climate change, natural resource use, health and poverty alleviation. She is interested in how behavioural nudges can influence social change and also how social norms and preferences such as trust, cooperation and risk aversion impact on decision making. Martine mainly uses experimental methods (in the lab and in the field) combined with survey analysis and randomized control trials. She is also involved in several projects with the City of Cape Town and the Western Cape Government, investigating the role of behvioural nudges in water and energy savings.

Alan WINDE, Minister of Economic Opportunities, Western Cape Government, South Africa

Alan Winde is the Western Cape Minister of Economic Opportunities. On the 19th of September 2018, he was announced as the DA's candidate for Premiership in the province, following the 2019 elections. "For the past decade, our number one focus has been to create growth and jobs in the Western Cape, to make this a better place for all the people living here. We have worked hard to achieve this goal, adding the most jobs to the economy of any province in South Africa. It is now time to build on the successes of the past. My key priorities include accelerating job creation, driving better health and education outcomes, and pursuing innovative approaches to improve transport, safety and resilience." Short Biography: Alan Winde was born on 18 March 1965. Before he began his career in politics, he started and successfully operated 10 businesses in his home town of Knysna. In 1996, he ran as an independent candidate and was successfully elected to the South Cape District Council. Shortly afterwards, Alan was approached by the leadership of the Democratic Alliance to run for Provincial Parliament in the Western Cape, a responsibility and challenge he gladly accepted. Between 1999 and 2009, Alan served in various political roles, including as Chief Whip of the official opposition and Western Cape Provincial Finance Chairperson. In 2009, following the DA's victory in the provincial election, he became the Western Cape Minister of Finance, Economic Development and Tourism. In 2014, the Democratic Alliance once again won the Western Cape with an even greater majority. Alan took up the position of Minister of Economic Opportunities, in charge of the Department of Agriculture and the Department of Economic Development and Tourism. He enjoys spending time with his wife, Tracy, and children, Jason and Lauren. In his spare time, Alan is a keen cyclist and coffee drinker. He serves on the governing body of Rustenburg Girls' High School, as its Chair.

Kathryn WOOLDRIDGE, Policy Researcher, Policy, Research and Analysis, Department of the Premier, Western Cape Government, South Africa

Kathryn Wooldridge is a Policy Researcher at the Western Cape Department of the Premier, South Africa. Her work includes policy research, analysis and implementation in a range of areas including health and wellness, animal welfare, youth development and behavioural insights. As a former primary school teacher, she also has a background in the education space and is passionate about using her experience and knowledge as a policy researcher to help improve education and youth policies and outcomes. Her academic background includes Community Development and Industrial Sociology where she has focused specifically on issues that many communities in South Africa face such as poverty, inequality and poor education as well as issues relating to the South African labour market. Her Master's thesis is focused on examining some of the reasons behind the employment trends of domestic work in Cape Town and how some of these can be addressed in the policy space.

David YOKUM, Director, The Lab@DC, Executive Office of the Mayor, Government of the District of Columbia, United States

David Yokum is Director of The Lab @ DC, which conducts applied research projects to generate timely, relevant, and high-quality evidence that informs the District's most important decisions. He hosts The Podcast @ DC, conversations that attempt to bridge the gap between research and practice in government. David was previously a founding member of the White House's Social & Behavioral Sciences Team and Director of its scientific delivery unit housed at the U.S. General Services Administration. David earned a Ph.D. in psychology (with dual specialization in cognition & neural systems and psychology, policy, & law) at UA, a law degree from the UA James E. Rogers College of Law, a Masters degree in bioethics & medical humanities from the University of South Florida, and a B.S. in biology from Birmingham-Southern College. He lives in Ward 6 with his wife Sara, son Ethan, dog Tieto, cats Philo and Mouse, and bunny Mr. Bubbles.

Helen ZILLE, Premier of the Western Cape, South Africa

Helen Zille is the Premier of the Western Cape. She was elected to office by the Provincial Parliament on 6 May 2009, and re-elected after the May 2014 general elections. She was educated at Johannesburg's St Mary's School, Waverley and the University of the Witwatersrand, where she obtained a Bachelor of Arts degree. Before Helen Zille began her career in politics she worked as a political correspondent for the Rand Daily Mail, where she covered key political stories, such as the death, in police custody, of black consciousness activist Steve Biko. In 1977 she was able to prove that Biko had been tortured to death and that the official version of the story, which claimed he had died of natural causes, was false. From the 1980s onward she became involved in NGOs and activist organizations, including the Open Society Foundation, the Independent Media Diversity Trust, and the Black Sash. She also campaigned against vigilantism and repression in the Cape Town townships, and was part of the peace movement that worked to bring warring factions in Crossroads together. She joined the former Democratic Party in the mid-1990s, where she was asked to reformulate the party's education policy and stand as a candidate on its election list for the Western Cape legislature. She also acted as Technical Adviser to the party at CODESA in the early 1990s. Helen was elected to the provincial parliament in the 1999 general election under the banner of the Democratic Alliance. From 1999 to 2001 she served as Minister of Education in the Western Cape Province. When the ANC gained power in 2001 she became Leader of the Opposition in the Western Cape legislature, where she remained until she was elected as a member of the National Parliament in 2004. As a Democratic Alliance MP she served on the Portfolio Committee on Education, and acted as the DA's National Spokesperson. Her constituency included Langa, Gugulethu and Khayelitsha. On 15 March 2006 she was elected as Mayor of Cape Town, and resigned from parliament. Two years later, in 2008, she was voted World Mayor in a poll of over 800 cities around the world conducted by global think tank World Mayors. On 6 May 2007 she was elected as the Leader of the Democratic Alliance, and was re-elected in 2012. Her term as DA leader ended in May 2015. In 2016, Helen released her autobiography *Not Without A Fight*. The City Press described it as the 'Nonfiction book of the year'.