DEMOCRACY REPORT
March 2017

Special Briefing Report No.18

By Dietrich Remmert

MANAGING WINDHOEK'S WATER CRISIS:
SHORT-TERM SUCCESS VS LONG-TERM UNCERTAINTY

Dietrich Remmert

Clockwise from left top image: Borehole in city area; Leaking pipe near the National Museum; Ignoring water restrictions at a construction site; Von Bach dam February 2016 & City of Windhoek's info poster.

Introduction

Over the past couple of years the water supply situation to the Windhoek city and surrounding settlements has become increasingly strained. Demand for fresh water or potable water in the urban centre of Namibia has grown apace over the past decades with the increase in the city's population. Aside from natural population growth, rising resident numbers' are attributed to increasing rural-urban migration, a trend that is evident across Africa.[1] Steady economic growth in Namibia since independence has also added significantly to the water demand in the central area.

Disconcertingly, the current crisis was not an unforeseeable phenomenon and neither can it be dismissed as a short-term event that can be solved by technical expertise and infrastructure investment alone. Crucially, the water crisis experienced by Windhoek not only raises questions about the nation's water resources and management thereof; but points towards much wider and serious considerations for Namibia's development trajectory.

This paper will attempt to map out a brief chronology of the water crisis. The description will focus on natural events, policy and technical responses, as well as obstacles. The paper will also consider the water supply and demand situation prior to the crisis. Finally, the author will critically analyse the status and effectiveness to date of the overall water crisis response by the relevant authorities and the public. The paper will focus primarily on Windhoek and the discussion will be limited to the timeframe of 2013 to the start of 2017.

1 UN Habitat, "The State of African Cities 2014," 2014, 17.

Democracy Report is a regular publication featuring analysis and commentary relating to the legislative agenda of the Parliament of the Republic of Namibia. It is produced by the Institute for Public Policy Research (IPPR), PO Box 6566, Windhoek, Namibia. Tel: +264 61 240514, Fax: +264 61 240516,info@ippr.org.na. The publication is also available as a PDF download from http://www.ippr.org.na Democracy Report is funded by the Embassy of Finland

Future options for the augmentation of the country's central area water supply are not the focus of this paper. A detailed discussion of these is provided in IPPR's Special Briefing Report No. 13.[2]

Summary of Findings & Recommendations

At various times during 2015 and 2016 representatives from Namibia Water Corporation (NamWater), the City of Windhoek (CoW) and Ministry of Agriculture, Water and Forestry (MAWF) warned that the crucial three-dam system would 'run-dry' before the end of 2016,[3] leaving the capital and surrounding areas short of potable water supplies. The Windhoek water crisis has spawned a range of management responses and mitigation efforts from different institutions. In general it can be cautiously stated that these actions have, to date, succeeded in providing city residents, businesses and public entities with an uninterrupted bulk water supply. Windhoek and surrounding settlements have so far avoided wide-ranging water cut-offs and enforced rationing, a scenario that seemed likely from around March 2015 onwards.[4] At the start of 2017 and particularly in February, the Von Bach dam, and to a lesser extent the other two central dams, received a fair amount of inflow from generous seasonal rainfall somewhat alleviating, for now, the central area's fresh water shortages.[5]

It can be conclusively argued that the successful management and mitigation is due to a fairly small number of pro-active, individuals and departments at the relevant public authorities. The strategies and especially practical efforts emanating from these institutions were in turn crucially supported by large private sector companies and by a growing number of conscious and concerned city residents.

When appraising public pronouncements with regards to policy formulations by senior national officials and politicians, during the water crisis the observation can unfortunately be drawn that they contributed very little in terms of genuine leadership and support to the management of the crisis. The rhetoric by senior government officials repeatedly acknowledged the gravity of the situation and concerns about the estimated high costs of addressing infrastructure shortages of the overall water sector. However, concrete strategies and action plans were very seldom publicly formulated. This assessment is also widely reflected in media circles judging by the many critical reports and editorials published over the recent past.[6] Only over the past few months have senior central government leaders demonstrated some progressive leadership on the issue.

The analysis presented in this paper argues that a number of specific and concrete actions, particularly around limiting overall water demand and fast-tracking infrastructure development for the Windhoek aquifer, were crucial in averting critical water shortages in the central areas. These efforts can be summarised as follows:

1. Setting and increasing water-saving targets
2. Progressive increase of water tariffs charged to consumers
3. Targeted water saving initiatives with Industries
4. Identifying & targeting high water consumers
5. Rapidly financing and implementing emergency abstraction from the Windhoek Aquifer
6. Increasing water supply from other sources

The combined results of the activities listed above essentially saved residents, institutions and businesses from significant water shortages and severe water restrictions that would have had to be initiated as a result. The first four identified efforts listed above, constitute Water Demand Management (WDM) strategies – aiming in short to reduce consumers' water demand.[7] The WDM approach is not a new concept in Namibia yet it has received little acknowledgment prior to the recent crisis. Much of the success of the water crisis management has to be attributed to the efforts of the CoW and the support and cooperation of selected industries and many private households, even if city residents only seldom reached the water saving goals set by the CoW. It can be also stated that the country's media played a vital role in raising awareness about the water shortages in the absence of a dedicated public communications campaign.

Nevertheless, there were also a number of efforts, notably targeting wasteful public institutions to limit water use that failed to make much of an impact. The city's overall water supply situation remains precarious. Increases in water consumption in the central area have essentially exceeded available supply already in 2013, according to CoW. This trend is unsustainable.[8] Detailed water consumption figures collected by NamWater and CoW show that the capital and its surrounding areas are living on borrowed time. Genuine and concerted action, including the provision of significant financial resources by central government, will be essential in averting a major water crisis in the not-so-distant future. It has to be observed that Namibia needs to enter into a critical public dialogue with regards to the development and administration of urban areas given critical water supply constraints and the exorbitant cost of new infrastructure. Serious questions need to be raised about the long-term viability of Windhoek's continued dominance in Namibia's economic growth. The current state of affairs in urban and economic planning which continues to be dominated by often out-dated regulations, bureaucratic inefficiencies and reactive decision making should be addressed. In the short-term it is recommended that:

2 Dietrich Remmert, "Water Governance in Namibia: A Tale of Delayed Implementation, Policy Shortfalls, and Miscommunication", Democracy Report, Special Briefing Report No.13. Institute for Public Policy Research, September 2016.

3 Dirk Heinrich, "Von-Bach vor Regensaison trocken", Allgemeine Zeitung, Mai 17, 2016. http://www.az.com.na/lokales/von-bach-vor-regensaison-trocken.431149. Office of the Chief Executive, "Media Briefing", City of Windhoek, March 4, 2015.

4 Tuyeimo Haidula, "City to fine residents for not saving water", The Namibian, June 10, 2015. http://www.namibian.com.na/index.php?id=137916&page=archive-read

5 Werner Menges, "Water crisis continues while dam levels rise," The Namibian, February 15, 2017. http://www.namibian.com.na/51190/read/Water-crisis-continues-while-dam-levels-rise

6 For recent examples see: Windhoek Observer, "Water, water everywhere, but not a drop to drink," June 9, 2016. http://www.observer.com.na/index.php/editorial/6346-water-water-everywhere-but-not-a-drop-to-drink, Pendapala Hangala, Comment: "Windhoek faces chaos in future," New Era, January 27, 2017. & Steffen, Frank, "Wasser – Jedem sein Süppchen," Allgemeine Zeitung, January 31, 2017. https://www.az.com.na/nachrichten/wasser-jedem-sein-sppchen/

7 The Government of Namibia, "Integrated Water Resource Management Plan for Namibia," August 2010, 27.

8 Interview with Mr Pierre van Rensburg, Windhoek, January 30, 2017.

- Appropriate WDM strategies including public and private water-saving measures should continue to be promoted and enforced within the central areas, regardless of the supply situation
- Authorities, including the central government, should ensure that adequate funds are set aside to complete water infrastructure construction for the Windhoek aquifer recharge and abstraction project to ensure sustainable emergency water supply
- Coordination and cooperation with regards to water resources, demand and supply management between the CoW, NamWater and the MAWF, as well as other local authorities and the private sector should be strengthened
- Severely degraded water infrastructure at public entities should to be addressed forthwith
- Communication with the public by relevant authorities regarding water issues should be underpinned by a joint, well-resourced campaign
- A wider, more holistic public discussion on water resource management – which goes beyond technical supply options – to include issues of urban/rural planning, environmental sustainability and economic development should take place

Water Supply Central Area

The bulk water supply system in which Windhoek falls is referred to as the Central Area of Namibia (CAN). CAN roughly encompasses an area stretching from the town of Grootfontein to Windhoek, bulging out to the east to include Okakarara, and towards Karibib in the west. For its main source of fresh water supply the CAN relies on the Grootfontein–Omatako Eastern National Water Carrier (ENWC) and three large, interlinked water reservoirs – the Omatako, Von Bach and Swakoppoort Dams, also called the three-dam system.[9] Potable water that feeds into the CAN water infrastructure comes from a variety of sources which are run-off from rivers, groundwater drawn primarily from the Karst aquifer and reclaimed domestic wastewater. This latter process takes places only in Windhoek. The 260km long canal transferring groundwater from the Karst and Grootfontein areas, the three-dams system and various pump stations and pipelines linking the infrastructure together are all technically part of the ENWC. The transfer of significant fresh water supplies from the Grootfontein area to Windhoek (already happening prior to independence) was necessitated due to the steady growth of the city.[10] Hence it is important to note that for the CAN area:

> "…extensive infrastructure is required to transfer water over great distances from where it is available to where it is needed. This presents difficulties in the operation and management of these schemes and particularly in the cost-effective supply of water, given the high cost of such extensive infrastructure and operation."[11]

The fact that Windhoek and the surrounding settlements were already partially dependent on water supply transfers in the late 80s puts into stark contrast the recent public discourse on possible new and costly augmentation schemes under consideration by government.

Socio-Economic Background of Windhoek

Namibia is the most arid country south of the Sahara desert. This is the result of two natural weather factors: firstly annual rainfall patterns for the country are low and highly variable, secondly much of Namibia is exposed to extremely high evaporation rates. It is estimated that roughly 97 percent of rainfall is lost through evaporation while only 2 percent and 1 percent end up as run-off surface water and recharge groundwater respectively. Therefore the arid nature of the country alone means Namibia's fresh or potable water is an extremely precious and scarce resource.[12]

According to the pre-feasibility study on augmentation the water supply of the CAN and Cuvelai areas commissioned by the MAWF, the median rainfall range for Windhoek is 300 to 350 millimetres (mm) per annum.[13] As has been the case for decades the annual rainfall in the Windhoek area is too low to meet the demand for potable water.

Roughly 91 percent of the fresh water resources available in the country are utilised to satisfy demand from urban areas and agricultural purposes. As the population and economic activity has grown apace in the country – particularly since independence, water resources and adjacent water supply infrastructure are increasingly reaching their limitations. Due to the erratic rainfall patterns and high evaporation rates the surface water runoff, which fills dams and recharges groundwater, is often sparse and unpredictable.[14] However, the demand for fresh water overall has grown at a fairly consistent rate.

To illustrate the predicament: in the past decades the three-dam system supplying the Windhoek area was able to accumulate adequate water reserves during average and above average rainfall seasons to ensure that over the course of poor rainfall years and droughts the water demand could still be meet. But even with groundwater transfer from the Karst aquifer, the demand for water over recent years in the CAN is outstripping what the ENWC is able to supply. It has been estimated that by 2012 all existing water resources in the CAN were developed to their full potential – excluding the Windhoek aquifer.[15] There is a host of data from various sources regarding water demand and supply in Namibia. These numbers are not always consistent or comprehensive. However, figures provided by NamWater and CoW officials to the author indicate that Windhoek's water demand has grown from around 21 million cubic meters per annum (Mm^3/a) to around 27 Mm^3/a over a ten-year period from 2005-2014. Particularly the growth of water connections to businesses in the city area has markedly increased fresh water consumption. CoW records show that business water connections grew from 4,832 in 2012 to 8,495 in 2015 and that this sector's water consumption more than doubled over the same period.[16]

9 The Government of Namibia, "The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 25 July 2014, xxix & 1-4..
10 Ibid., 1-6 & 2-32 – 2-33.
11 Ibid., 2-34
12 "Integrated Water Resource Management Plan for Namibia," 2-3.
13 "The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 2-5.
14 Ibid, 2-33.
15 "The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 2-39.
16 Figures cited where kindly provided by NamWater and CoW officials, with the assistance of Mr Pierre van Rensburg, CoW.

It can be stated without a doubt that Windhoek constitutes Namibia's economic centre. Discussing possible economic effects of water shortages in the capital, a brief analysis from September 2015 notes that:

> "Windhoek is the central and most significant business hub in Namibia, from which most of the business activity and income is originated from. A water shortage in this area is likely to have a significant impact on all businesses, not only water dependent and intensive industries."[17]

The analysis published by Simonis Storm Securities (SSS) states that GDP figures per region are unfortunately not available. Specific figures detailing only Windhoek's economic makeup are difficult to ascertain. Primarily national economic data in surveys is disaggregated by sector not by region. Nevertheless, an indication of the economic importance of the Khomas Region, and therefore Windhoek, can be found in the government's latest Namibian *National Household Income and Expenditure Survey* from 2009/10. Around 19 percent of all national household income is generated in Khomas with the next highest region per household income lagging far behind with 10 percent each respectively for Omusati and Kavango.[18] According to the latest official, countrywide labour force survey from 2014, Khomas is the location with the largest proportion of employees, among all regions. Some 144,780 employees alone work in Khomas, which is more than double the number then the next largest region Erongo with 65,869 employees.[19]As would be expected, the capital hosts most if not all of the head offices of larger local companies and regional multinationals such as South African supermarket chains and subsidiaries of international corporations. Furthermore, most of Namibia's manufacturing industries are located in the Khomas region. According to the Namibia Manufacturing Association's (NMA) 2015/16 *Manufacturing and Processing Directory*, over 300 of a total of 500 manufacturing firms are located in Windhoek.[20]

Overall the country has seen significant and steadily rising expenditure on construction over the past ten years. Government and parastatals in particular have initiated a number of considerable capital projects including the construction of numerous office buildings and monuments in Windhoek. However, contrary to public perceptions, the construction sector in the capital has over the past years not grown markedly. The actual level of completed as compared to approved building plans by the CoW is low.[21] Hence, while the construction industries' demand for water in Windhoek is probably not insignificant it is difficult to quantify. According to IJG Securities, the primary reason for decreasing construction activity in the capital is due to the increasing lack of serviced land and not water shortages.[22] The Khomas region also features a number of important industrial plants that are deemed 'water-intensive industries'. Such plants require considerable amounts of fresh water in their production process. In addition water is also often used indirectly in the plant's supply chain. While such plants can limit their water use they cannot operate without it. Water-intensive industries include among others meat and beverages production and power generation.[23] Water-intensive industries in the Khomas region include Namibia Breweries Limited (NBL) and a competitor plant from South African Breweries (SAB) located at Okahandja, the Coca-Cola bottling plant, Namibia Dairies, the chicken farm and abattoir of Namibia Poultry Industries (NPI), and Meatco's cattle abattoir and Okapuka feedlot. The 2015 analysis by SSS notes that the operations of Meatco and NBL in particular would be negatively affected by water shortages. Industries could cushion the effect of water shortages by using water more efficiently and thus saving water and scaling back production. However, this course would also lead to a loss of revenue, the likelihood of staff layoffs and curtail future investments.[24]

Windhoek's Water Crisis Timeline in Perspective

It is hard to designate a specific date which can be seen as a starting point of Windhoek's current water crisis. As a result of Windhoek's location, economic status and continued growth it can be argued that the capital's bulk water supply has been in a precarious if manageable situation over the past two decades or so. Water experts compare the current crisis with a similar situation in 1996-97, which was eased when a good rainy season replenished the three-dam system.[25]

As mentioned this paper will limit the discussion timeframe from 2013 to the start of 2017. Following from a mediocre 2012 in terms of overall precipitation, the capital experienced very poor rainfall - receiving only 245mm in 2013.[26] According to the media this drought period, having already affected parts of the country in 2012 was perceived by many citizens as one of the harshest in a generation. Harvests failed and many farmers suffered significant livestock losses. In May 2013 President Pohamba declared a state of emergency as a result to widespread food insecurity and launched an international appeal for aid.[27] Media reports noted that around 700,000 drought-affected Namibians required drought relief aid.[28] The Von Bach dam received no inflow of water in the 2012/13 rainy season - a first in the reservoir's history.[29]

17 James Cumming, Andre Kuschke and Indileni Nanghonga, "The economic effects of a water shortage in Central Namibia", September 15, 2015, 5.
18 Ibid., 5.
19 Namibia Statistics Agency, "The Namibia Labour Force Survey 2014 Report," March 2015, 8.
20 Insight Namibia, SONA: Manufacturing, "Waiting to Launch", April 2016, 27.
21 Robin Sherbourne, "Guide to the Namibian Economy 2017", October 2016, 299 & 302.
22 Allgemeine Zeitung, "Anbauten halten Baugewerbe auf Trab", Oktober 27, 2016. https://www.az.com.na/nachrichten/anbauten-halten-baugewerbe-auf-trab/
23 Tracey Schelmetic, "Down the Drain: Industry Water Use", April 10, 2012. http://news.thomasnet.com/imt/2012/04/10/down-the-drain-industry-water-use
24 Cumming, Kuschke and Nanghonga, 6-7.
25 Interview with Pierre van Rensburg, Windhoek, January 30, 2017.
26 Cumming, Kuschke and Nanghonga, 3.
27 Azad Essa, "Namibia battles worst drought in decades", Al-jazeera Online, October 9, 2013. http://www.aljazeera.com/indepth/features/2013/10/namibia-battles-worst-drought-decades-201310851010116562.html .
28 Timoteus Shihepo, "Sanlam donates to Drought Relief Assistance Fund", The Villager, October 14, 2013. http://www.thevillager.com.na/articles/5184/Sanlam-donates-to-Drought-Relief-Assistance-Fund/
29 "The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 4-8.

In an official press statement at the end of 2014, the CoW called on residents to reduce their water consumption by at least 10 percent. The authority noted that in this rainy season to date, only limited runoff surface water had reached the reservoirs supplying the city's potable water.[30] Nevertheless, Windhoek received a recorded 475mm during the course of the 2014 rainfall season. Yet this above average annual figure failed to replenish the dams.[31] In this regard water experts and technicians have noted that, besides rainfall volumes, the actual inflow of runoff water into dams can be obstructed and limited by among others smaller farm dams that fill up first, high evaporation rates and limited rainfall in the actually catchment area of a respective reservoir. During the course of 2015 the capital only received a recorded 197mm of rain.[32] Again the government was forced to set aside significant funds for drought relief aid to over 400,000. Around N$300 million was set aside for interim drought relief measures for the period of May to July mostly for the northern regions worst affected by the drought.[33]

In 2015 and 2016 the capital and its surrounding area were in dire straits in terms of adequate bulk water supply. This time period arguably represents the most crucial frame with regards to the management of the CAN water crisis. The next section therefore will describe and analyse the water crisis and the corresponding management efforts by various authorities in more detail.

Water Crisis Management Strategy

In its introduction the DRP developed by the CoW states:

> "The Drought Response Plan outlines guidelines the City of Windhoek will use to manage water supply and water use during drought situations. The guidelines are designed to maintain the health, safety and economic vitality of the community; to avoid adverse impacts to public activity and quality of life for the community; and to consider individual customer needs as much as possible."[34]

The plan further emphasises that individual droughts bring with them different conditions which necessitate a practical and flexible set of guidelines rather than a rigid system of rules. The document is fairly short and divided into three separate components: the water severity indicators, drought response actions and drought response programme elements. The latter section basically entails a comprehensive list of recommended actions for activities and operations that make use of water and staggered according to drought severity.

Probably the most crucial aspects of the plan are the drought severity indicators that "provide an indication of the period for which water is available to sustain the present demand given available resources." The primary measurement on which the indicators are based on is the combined volume of fresh water available at a given time in the three dam system. Ideally, there should be adequate resources available to sustain bulk water supply to the Windhoek area for two consecutive rainy seasons in which no inflow into the dams occur.[35] In other words, a guaranteed bulk supply of potable water for around 24 months should be held for the central area to cope with any drought situation. Unfortunately, in light of high and rising consumption rates over the past years, this ideal scenario has been very hard for authorities to achieve.

According to the DRP, the Central Areas Water Supply Committee should meet annually in May after the rainy season and determine the likely availability of water supply for the next two years and this measurement will determine the drought severity indicator. The level or stage at which the indicator is set, ranging from 'normal' to 'water crisis', also prescribes the responses and actions that authorities and consumers should take with regards to overall water consumption and savings.[36] There are five stages on the drought severity indicator scale of which the first: 'normal' does not require specific actions apart from the sensible use of water. Figure 1 taken from the DRP illustrates this drought severity scale. The remaining four stages are linked to recommended responses which escalate in scope and enforcement as the water supply situation dictates. The four 'drought severity' stages and responses are summarised in the plan as follows:

- A Water Scarcity Classification requires increased communication on dry conditions;
- A Drought Classification implements mandatory watering restrictions;
- A Severe Drought Classification prohibits lawn watering, and
- A Water Crisis Classification rations water supplies for essential uses.[37]

Figure 1: Drought Severity Index

<table>
<tr><th>Normal</th><th>Water scarcity</th><th>Drought</th><th>Severe Drought</th><th>Water Crises</th><th>Water availability</th></tr>
<tr><td>Do not Waste Water</td><td>Drought Watch</td><td>Water Savings Required</td><td>Compulsory Water Savings</td><td>Rationing</td><td>Months of available water supply</td></tr>
<tr><td rowspan="5">Baseline Consumption</td><td></td><td></td><td></td><td></td><td>30</td></tr>
<tr><td rowspan="4">Reduced Water Consumption</td><td></td><td></td><td></td><td>24</td></tr>
<tr><td rowspan="3">% Water Savings</td><td></td><td></td><td>18</td></tr>
<tr><td rowspan="2">Requires % Water Savings</td><td></td><td>12</td></tr>
<tr><td>Restrictions</td><td></td></tr>
</table>

Source: CoW, Drought Response Plan

30 Nampa, "City of Windhoek urges residents to save water", The Namibian, December 31, 2014. http://www.namibian.com.na/index.php?id=131992&page=archive-read
31 Cumming, Kuschke and Nanghonga, 7.
32 Windhoek Yearly Rainfall Summary, http://weather.namsearch.com/wdhrainsummary.php
33 Theresia Tjihenuna, "Government to offer drought relief to 400 000 people", The Namibian, April 27, 2015. http://www.namibian.com.na/index.php?id=136323&page=archive-read
34 City of Windhoek, "Drought Response Plan", Version 1, November 2015, 1.
35 Ibid., 3..
36 "Drought Response Plan", 5.
37 Ibid., 7.

Once a drought severity stage has been set by the committee, the CoW can officially make the stage public and apply and enforce the appropriate actions linked to each respective stage. Furthermore the DRP also highlights a number of other important aspects with regards to managing and reducing water usage. These include additional tariffs, water use education and enforcement, monitoring and evaluation (M&E) and restrictions.[38] Essentially these complementary components are policy tools providing guidance to specific actions. For example, extra drought tariffs on above normal and excessive water use by customers are seen as a financial incentive to limit consumption to a reasonable level. While restrictions on water use are guided by specific principals like limiting non-essential before essential use and seeking to limit, as far as possible, adverse financial impacts on water-based businesses.[39]

Overall the DRP can be judged to be a very sensible, practical and accessible document and it reflects positively on the CoW technical staff – who drafted it in a short period of time.

Nevertheless, there are some shortcomings in the DRP. It is, for example, not clear if the CoW management is obligated to accept the severity indicator determined by the Central Areas Water Supply Committee. Disregard of technical recommendations by decision makers within the City are hardly unknown. If a drought condition is declared the plan foresees the establishment of a "Drought Response Committee" which will "monitor drought conditions and evaluate the effectiveness of the drought response".[40] This entity is mentioned only once in the whole document and it is not clear what powers this committee has or who it reports to. Neither is it established if this is an internal CoW committee or if it includes other stakeholders. One would have thought that, given the general critical water supply concerns over the past decade or more, there should be a broad forum for mutual support, information exchange and coordination for all key CAN stakeholders. According to water experts, such a forum under the auspices of MAWF did exist but has been dormant for years. Perhaps the Upper Swakop Basin Management Committee (USBMC), established mid-2016 and encompassing a wide range of stakeholders, could fill this role.[41]

Implementation Successes & Challenges

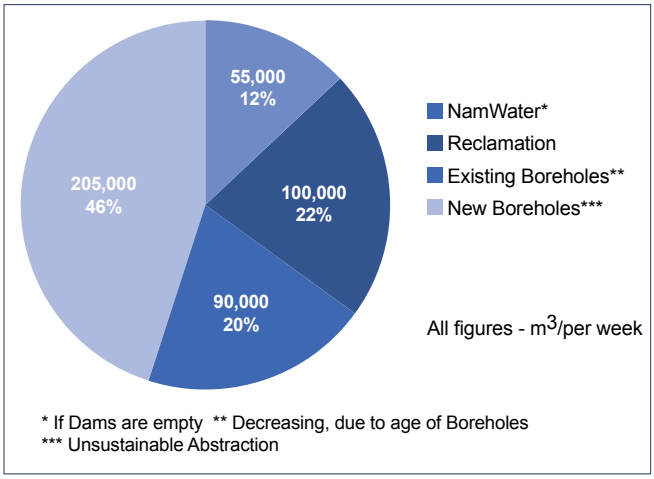
During the past two years authorities broadly focused their efforts and resources on three strategies namely: water saving measures, locating and utilising emergency water sources, and infrastructure maintenance. It can be argued that most attention was focused on the first two strategies while the latter was hampered by budget constraints and lengthy,bureaucratic procedures and therefore produced minimal results. Listed below and grouped under each of the three strategies, are all activities or specific efforts conducted to manage the water crisis. The activities are graded according to what worked (YES), what did not (NO), and what cannot be judged yet (STILL TO BE SEEN). Strategies, activities and grades are summarised in Table 1. The list focuses on specific efforts for which information was readily available; it does not claim to be exhaustive.

#	Table 1: Water Crisis Management Strategies & Activities	Success
1	Water Saving Measures	
1.1	Setting and increasing water-saving targets	YES
1.2	Progressive increase of water tariffs charged to consumers	YES
1.3	Targeted water saving initiatives with industries	YES
1.4	Identifying & targeting high consumers	YES
1.5	Communication & awareness raising	NO
1.6	Targeting public institutions	NO
1.7	Targeting 'car-wash' businesses	STILL TO BE SEEN
2	**Locating and Utilising Emergency Water Sources**	
2.1	Rapidly financing and implementing emergency abstraction from the Windhoek Aquifer	YES
2.2	Increasing supply from other sources	YES
3	**Infrastructure Maintenance**	
3.3	Marshals' Programme	STILL TO BE SEEN

1. Strategy: Water Saving Measures

1.1 YES – Setting and increasing Water saving targets: Throughout the course of the crisis the CoW set specific water saving targets for city residents. These saving targets escalated based on the severity of the water shortages over time. The water saving target gave citizens, businesses and public institutions a tangible goal to aim for. In turn the targets gave the City and other authorities a clear indicator by which they could track the capital's overall saving progress or lack thereof. This in turn could be utilised to judge the effectiveness and efficiency of their own water-saving strategy and efforts. Water use is also guided by the City's emergency water use scenario which outlines how much water should be used from which resource (see Graph 1).

Graph 1: CoW Emergency Water Use Scenario



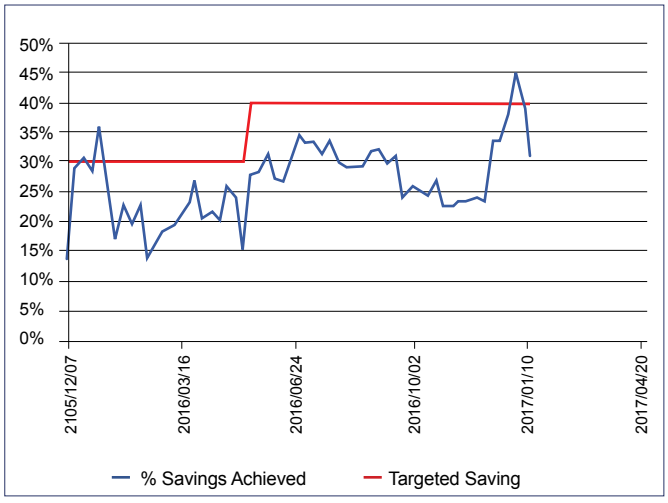
Source: CoW

38 Ibid., 8.
39 Ibid., 8, 10-11.
40 Ibid., 7.
41 Upper Swakop Basin Management Committee, Public discussion event, June 22, 2016.

Already, by December 2014, the city authorities urged residents to save 10 percent as compared to the overall consumption of the previous year.[42] In around April 2015 the water saving target was increased to 15 percent[43] and in January 2016 the savings bar was raised to 30 percent.[44] According to information provided by the CoW, a 40 percent water savings target was decided upon at a CAN workshop in mid-May between relevant authorities. To begin with targets where only mentioned in official press releases and at the occasional press conference. In can be argued uptake of the saving targets by residents was slow which likely can be attributed to overall poor communication on the part of the authorities and the lack of a coherent awareness campaign. However, as more attention was placed on the water crisis by the media and in combination with other efforts like the saving measures of large industries an upswing could be observed.

As can be seen from Graph 2, particularly between roughly May and September 2016 (see Graph 2) city residents achieved regular savings of between 30 and 35 percent. Water saving targets were also reinforced by the announcement of specific restrictions for example no private washing of cars and watering of lawns.[45] Furthermore, authorities began to regularly publicise saving targets and achievement which undoubtedly was also important information to the public and encouraged further savings. Reasonable water savings were achieved in a fairly short period of time. While water saving targets where seldom met throughout the crisis it nevertheless demonstrates the importance of setting tangible targets, tracking these targets and making them public. Finally, the savings also indicate that the overarching strategy and efforts of the CoW were sensible.

Graph 2: Water Crisis Savings Achieved



Source: CoW

1.2 YES – Progressive increase of water tariffs charged to consumers: Consumers, in this case private households that exceeded an amount deemed reasonable by the authorities, are charged an extra high tariff as a penalty. This aim of these tariffs was to discourage excessive and wasteful use of water. In Namibia there is evidence that increasing the cost of potable water can decrease water demand. It is estimated that a 10 percent tariff increase for bulk water can reduce demand by as much as 3-5 percent.[46] Already prior to the release of the DRP the Municipality introduced additional tariffs on high water consumption. In June 2015 the CoW announced a new "penalty tariff" for individual households that consumed more than 50 cubic meters (m^3) per month.[47] This limit was further lowered to 40m^3 and overall residents' basic water tariffs were also increased by 10 percent in July 2016.[48]

1.3 YES – Targeted water saving initiatives with industries: According to CoW around 10 percent of water provided by the city is consumed by water-intensive industries such as NBL and Coca-Cola. Since these industries are few and critically dependent on a regular water supply they were willing to quickly and actively engage with the municipality. The industries agreed to limit their consumption significantly often by optimising production processes for more water efficiency rather than limiting production. In turn, City authorities have agreed to try and accommodate limited, short-notice requests for increased production periods if these can be accommodated by current water saving rates.[49] The CoW has judged the cooperation with these industries as highly successful in terms of water savings and rightly so. It also reflects positively on the municipalities' stated goal in the DRP to reduce negative financial and economic impact of water saving measures as much as possible.[50]

1.4 YES – Identifying & targeting high consumers: Given the documented prevalence of water wastage in Windhoek due to leakages the CoW has drawn up lists since 2013, based on the Municipality's billing system, to identify customers which regularly exceed 50/40m^3 and requested them in writing to access and limit their water use.[51] According to the city's water engineers, much of this high use is the result of hidden leakages on private premises. However, officials note that for a variety of reasons most customers do not react to the notice or even query the high water bills. Consequently, the City drew up a list of around 1,500 high water consuming domestic households in September 2016. About half of these households were then classified as 'chronic high consumers' – regularly exceeding 40m^3 per month. Taking immediate action city officials started cutting-off water supply to these customers by default. Individual customers were thus forced to visit the City offices to enquire about their water connection and bills, giving officials the opportunity to engage directly with the customers and offer advice on locating and fixing possible leakages. Customers were not charged an extra penalty but only the standard disconnection and reconnection fee. In this way the city hopes to generate awareness among consumers regarding the importance of monitoring, managing and reducing individual house-

42 Nampa, "City of Windhoek urges residents to save water," The Namibian, December 31, 2014. http://www.namibian.com.na/index.php?id=131992&page=archive-read
43 Tuyeimo Haidula, "City to fine residents for not saving water"
44 Namibian Economist, "Saving Water the Windhoek way," January 18, 2016. https://economist.com.na/14841/extra/saving-water-the-windhoek-way/
45 New Era, "City of Windhoek water restrictions in place," May 19, 2016. https://www.newera.com.na/2016/05/19/city-windhoek-water-restrictions-place/
46 "The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 2-35.
47 Tuyeimo Haidula, "City to fine residents for not saving water"
48 Denver Isaacs, "Water, population weigh heavily on City", The Namibian Sun, July 4, 2016. https://www.namibiansun.com/news/water-population-weigh-heavily-on-city
49 Interview with Mr Pierre van Rensburg, Windhoek, January 30, 2017.
50 "Drought Response Plan", 5.
51 Tuyeimo Haidula, "City to fine residents for not saving water"

holds' water use.[52] While it is difficult to quantify the result of this activity it undoubtedly creates crucial awareness among consumers and is a positive if drastic measure.

1.5 NO – Communication & awareness raising: There is a strong argument to be made that key authorities in the water sector made insufficient efforts to raise public awareness prior and during the crisis. The press throughout 2015 and earlier had already reported on alarmingly low water levels in the three-dam system and government's perceived inaction while water experts have repeatedly over the past years highlighted major deficiencies and underinvestment in bulk water supply systems.[53] Key authorities tasked with managing the water crisis, including the CoW, NamWater and MAWF, made various attempts at communicating the status of water savings, water-saving measures, restrictions on water use and so forth mostly via press conferences and releases. Hence relying almost exclusively on the media alone to inform and advise city residents. No cohesive and comprehensive communication strategy was ever put in place. Neither did authorities focus on the critical importance of raising awareness among city residents regarding the urgent need to conserve water.

In August 2015 at an information-sharing session the deputy permanent secretary of MAWF, Abraham Nehemia, announced that the government would implement a large-scale awareness campaign to inform citizens about the water crisis and urge them to safe water.[54] This campaign was never realised. Instead individual public institutions, at different stages of the crisis, conducted small-scale, un-coordinated and often poorly conceptualised awareness-raising efforts. CoW produced stickers and posters with water saving tips but had no formal distribution channel for this material; while NamWater placed a few radio adverts urging citizens to conserve water. Eventually the authorities concerned established the National Water Savings Campaign (NWSC). However, nothing tangible has taken place under this campaign to date apart from the Water Marshals' programme.

Poor communication between authorities with regards to public announcements led to mixed and conflicting messages – sometimes with negative consequences for water saving efforts. At a press conference on the 16th September 2016, the CEO of NamWater, Vaino Shivute, stated publicly that the Windhoek aquifer had enough water to supply the city for 10 to 13 years.[55] On the 3rd October the CoW issued a press statement which clearly rejected the assertion by NamWater's CEO noting that:

> "… the Windhoek aquifer only holds sufficient water to sustain the city for between 2 to 3 years in the absence of the NamWater supply system and not 13 years as reported."

The statement further observed that water saving over the past weeks had fallen from 32 to 24 percent and attributed this to the CEO's statement reported in the media.[56]
The lack of a coherent, large-scale, well-resourced and professional water saving campaign will continue to hamper authorities' ability to communicate effectively with citizens and bring about crucial attitude change to manage the country's water resources responsible.

1.6 NO – Targeting public institutions: Authorities in the water sector are acutely aware that wastage of potable water is a real an ongoing concern in the country. This is mostly due to the age of much of the water infrastructure as well as inadequate maintenance over the years. Reports under the Augmentation of Water Supply to the Central Area of Namibia & Cuvelai project refer to studies that among other note: "… constant physical leakages occurred in approximately 20 percent of the logged residential households in Windhoek."[57] In addition, water leaks on Government properties have been identified as a major problem. A 2003 estimate concludes that leakage reductions in low-income households and at government institutions could reduce the annual water consumption of the city by over 800,000m3! Given the outdated nature of this data it is highly likely that wastage through leakages has worsened even further.

CoW official Pierre van Rensburg noted with regret, that getting public institutions to comply with water saving measures has been an uphill-battle and the most difficult sector to engage and cooperate with.[58] This assessment is also broadly echoed in the media and by private water experts and engineers. For a considerable time now many government departments simply lack the capacity, budget and motivation to address critical maintenance and infrastructure shortfalls on government property around the city.[59] The city authority's starting from around mid-2016, also tried to address massive recorded water losses at a number of public schools and hostels in Windhoek.[60] At one stage the authorities disconnected water supply to around 27 schools, primarily however due to unpaid bills for municipal services. Van Rensburg noted that for social and political reasons it is difficult to cut-off water to schools, hospitals and prisons, but stated that the city would continue to seek cooperation and solutions with public entities to limit water use and wastage.[61]

In January 2017 press reports noted that the French government, through an agreement with Namibia, would finance a detailed study of a major water pipeline to identify leakages. It was further stated that the French development company G2C Ingénierie would conduct the pipeline assessment. Reportedly,

52 Interview with Mr Dieter Tolke, Windhoek, February 2, 2017.
53 For example see: Neil Weatherman, "Water crisis, We should be concerned", Windhoek Observer, May 26, 2016. http://www.observer.com.na/opinions/6249-water-crisis-we-should-be-concerned, New Era, "Water crisis: How did we get here?", June 10, 2016. https://www.newera.com.na/2016/06/10/water-crisis-here/ & Dietrich Remmert, "Head in the Sand", Insight Namibia, October 2015.
54 Nampa, "Awareness campaign to help save water on the cards", The Namibian, August 13, 2015.
55 Namibian Sun, "Water: Windhoek is okay", September 20, 2016. https://www.namibiansun.com/news/water-windhoek-is-okay
56 Office of the Chief Executive, "Media Briefing", October 3, 2016.
57 The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 7-14.
58 Interview with Mr Pierre van Rensburg, Windhoek, January 30, 2017.
59 For an in-depth discussion of financial and institutional shortfalls, skill and staff deficits in Namibia's water sector see: Dietrich Remmert, "Water Governance in Namibia: A Tale of Delayed Implementation, Policy Shortfalls, and Miscommunication", Democracy Report, Institute for Public Policy Research, September 2016.
60 Augetto Graig, "Waterkrisis by HTS afgeweer", Republikein, August 22, 2016. https://www.republikein.com.na/nuus/waterkrisis-by-hts-afgeweer/
61 Interview with Mr Pierre van Rensburg, Windhoek, January 30, 2017.

pipelines under the CAN system where also under consideration but NamWater chose the Naute-Keetmanshoop pipeline for the study due to frequent pipe bursts.[62]

1.7 STILL TO BE SEEN – Targeting 'car-wash' Businesses: Having in the past repeatedly referred to the water wastage by 'car-wash' businesses, the authorities finally started to address this issue at the start of 2017. At the end of January the Windhoek City Police started inspecting car-wash businesses with the stated aim of fining and shutting down those businesses that were not complying with municipal by-laws including those with regards to water connections and usage for businesses. It has been estimated that over 300 car-wash businesses, many of them illegal, operate in the city. Business owners and employees raised concerns that they would be facing economic hardship and complained about the strictness of the compliance requirements.[63] In February the CoW announced a '28-day grace period' from the enforcement measures; urging car-wash businesses to use the time and ensure their compliance with city by-laws.[64] The issue of car-wash businesses brings into sharp focus the immediate economic necessity of citizens to make a living versus the long-term aim of achieving and maintaining a sustainable water supply.

2. Strategy: Locating and Utilising Emergency Water Sources

2.1 YES – Rapidly financing and implementing emergency abstraction from the Windhoek Aquifer: As has been known for many decades, underneath Windhoek and its surroundings is located a sizable aquifer that holds considerable groundwater reserves. Aquifers can be considered as a boon to water resources as they can serve essential as a natural 'water bank'. Hence with appropriate infrastructure groundwater can be abstracted from the aquifer when needed. However, the aquifer can also serve as a natural reserve by pumping surplus water back into the aquifer a process termed 're-charging'. Aquifers don't need to be constructed at high-cost and the groundwater is not exposed to evaporation.[65] The use of the Windhoek aquifer as a water bank to augment Windhoek's water supply was assessed and proven to be viable by a feasibility study and water quality assessment accepted in 2004 and 2005 respectively. The city then initiated the construction of infrastructure, including boreholes, pipelines and pumps to realise the Windhoek Managed Aquifer Recharge Scheme (WMARS). However, the finalisation of the scheme prior to the water crisis had been plagued by financial shortfalls even with funding support from MAWF and NamWater.[66]

According to van Rensburg, the CoW utilised the technical committee established as part of the Cabinet Committee on Water Supply Security to rapidly secure additional funds from the government for the WMARS. The total cost of the project has been estimated at around N$ 700 million and around 40 percent of the scheme has been completed.[67] The aquifer is currently providing crucial emergency water supplies to the city. The rapid financing and completion of the abstraction component of the WMARS after years of slow progress is undoubtedly a success. Nevertheless, the finalisation of the recharge component and the sensible and sustainable management of this resource will prove crucial in the long run. The sustainable yield of the aquifer has been estimated at around 1.73 Mm^3/a.[68] Given the emergency water supply scenario of the CoW which utilises 205,000 m^3 from the WMARS on a weekly basis – the annual sustainable yield will be used up in just over eight weeks. It is of note that water experts, environmentalists as well as public officials have repeatedly pointed out in the past that the aquifer does not constitute a long-term solution to the city's water woes, but should be utilised strictly as a source to supplement the water supply. Furthermore, funding to date has focused on abstraction infrastructure, for the proper operation of the scheme the recharge component needs to be priorities in the near future.

2.2 YES – Increasing supply from other sources: Provisions exist in the CAN system to abstract additional water from existing groundwater schemes if need arises. Permit-approved, emergency abstraction periods can be initiated from Kombat area boreholes and from the Berg Aukas mine.[69] Additional water is pumped from these sources to supplement the resources in the 3-dam system. It is not clear at what exact point NamWater started to abstract emergency water supplies from these sources. Use of emergency supplies from the Kombat and Berg Aukas locations are mentioned in a media report from August 2015. While these sources undoubtedly helped to mitigate water shortages in the central area it should be noted that the emergency supply is very limited compared to the amount required.[70] Like the WMARS pumping additional potable water from areas within the CAN system is not a long-term solution.

3. Strategy: Infrastructure Maintenance

3.1 STILL TO BE SEEN – Marshals' Programme: In August 2016 the cabinet instructed all public institutions to urgently address water wastage at public institutions. The New Era newspaper quoted the Minister of Information and Communication Technology Tjekero Tweya as follows:

> "All offices, ministries and agencies are instructed to use their maintenance budget to repair leaks and fix faulty plumbing contributing to water losses – with the assistance of the City of Windhoek technical team."[71]

The Minister noted further that all government offices should appoint two 'water marshals' from their staff who would be tasked with identifying and reporting leakages as well as to carry out

62 Ngatjiheue, Charmaine, "Pipeline project to cost N$7,2m," The Namibian, February 6, 2017. http://www.namibian.com.na/50800/read/Pipeline-project-to-cost-N$72m

63 Tuyeimo Haidula, "Clampdown on illegal car washes", The Namibian, January 24, 2017. http://www.namibian.com.na/50279/read/Clampdown-on-illegal-car-washes & "Illegal car washes shut down", The Namibian, January 26, 2017. http://www.namibian.com.na/50395/read/Illegal-car-washes-shut-down

64 Selma Ikela, "28-day reprieve for car washes", New Era, February 7, 2017. https://www.newera.com.na/2017/02/07/28-day-reprieve-for-car-washes/

65 The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 4-89 & 4-91.

66 Ibid., 4-91 & 4-104 - 107

67 Interview with Mr Pierre van Rensburg, Windhoek, January 30, 2017.

68 The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 4-91.

69 The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1," 4-121.

70 New Era, "Windhoek heads for crippling water crisis," August 12, 2015. https://www.newera.com.na/2015/08/12/windhoek-heads-crippling-water-crisis/

71 New Era, "Cabinet takes bold action on water wastage," August 19, 2016. https://www.newera.com.na/2016/08/19/cabinet-takes-bold-action-water-wastage/

regular water-meter readings and basic maintenance.[72] According to the CoW, at the end of the year 55 identified 'water marshals' received basic water management training including the importance of tracking water use, identifying leaks and so forth.[73] This is a commendable initiative, however it will depend on individual dedication and motivation as well as resources and management support factors that often are in short supply at public entities. With the easing of the water crisis in the central areas and the expected government budget cuts for the new financial year the initiative could likely subside.

APPENDIX A

Interview with Pierre van Rensburg, Strategic Executive: Department of Infrastructure, Water and Technical Services, City of Windhoek (The interview text has been edited for clarity purposes.)

The long-awaited official strategy to manage the water crisis facing Windhoek, named the Drought Response Plan (DRP) was made public at the end of 2015. Why did the formulation and approval of this plan take so long given the urgency of the situation?

The reality is that we (CoW officials) operate in a political environment so it is not always easy to get these things approved, everybody to understand the benefits – that sort of thing. It might be very simple on a technical level to say: if this happens then we do that and so forth. But factoring in political consideration – the picture always or sometimes will look a lot different. NamWater, whenever they cannot bridge two rainy seasons anymore according to their computer models (of supplying water), they request the city to reduce demand. When I talked to my guys at operations [regarding standard actions to request] they could not give me anything. I was very surprised because we know that drought is a frequent occurrence. I said then let's get an approach in place – we set about that task in June 2015 and completed it about in August. We looked at best practices around the world including from the USA and Europe. The draft DRP was completed and submitted but not approved. We got a principal approval at the end of 2015 from the Council because I told them if we cannot start implementing this now - starting December - the DRP document really means nothing, because we were really getting to the most critical stage [of the crisis]. But it was also a difficult political time as it was the end of the current term of the City Councillors. They were hesitant to approve anything and they had other things on their minds. It was a difficult time in any case to get anything approved. Full approved was only granted in February 2016 I believe.

From a public perspective it seemed that the implementation of water-saving measures outlined in the DRP proceeded very slowly. What is your take on this and what implementation challenges did the authorities encounter?

A typical household user will save water if there is a perception that there is a need to save. And that perception will only come about slowly. It is not like you go today and say: don't water your garden, don't fill your swimming pool etc. We know it will take time. You want the people not to turn against you but work with you. So you cannot simple say 'we allow you a certain amount per month and if you exceed that by one litre we will cut your water supply'. We shifted the block tariffs for water consumption. Now what we see as 'reasonable consumption' is charged at cost-recovery tariff, if you go above that – at around 30m^3 (per month), you pay double until we see a point when it becomes totally unreasonable which is at 40m^3 - we will cut you off. Over 40m3 is also charged at four times the basic tariff, a very high tariff introduced last year. If you look at how we applied this measure to private consumers, we started to monetarily penalise high consumers but many people don't' worry – they say they pay as much as they have to for water that they want. So they say: 'if I'm prepared to pay I should be allowed to water my garden and so forth' but this is not the case. If you don't have water you cannot allow people to water their gardens. So that's why we get to a point where we cut off water supply if you really become unreasonable in your consumption. We knew that 30 percent saving measures were hard to enforce. The only bottom-line enforcement is to cut off water supply. But this is difficult: if you cut a school's supply and they have a hostel, you cut off supply to the prison – it becomes a problem. Prisoners cannot simply be moved elsewhere. Yet these are the institutions that waste huge amounts of water. You can try and restrict supply – but they still need access to an amount. We knew that [meeting saving measures] for public institutions would be the hardest and longest part due to a lot of political interference and practical considerations.

Did the City follow a specific strategy when approaching consumers? For example do engagement efforts with respective consumers take into account levels of consumption, accessibility and likelihood to cooperate?

Around 60 percent of the City's total water consumption is on private households. In a typical household – if you have a yard connection & you can do gardening – almost 50 percent of your water goes into garden activities. So 50 percent of that private household consumption can be saved if we just cut those activities. That's why a large part of the DRP focuses on domestic activity and private households. So we start with them. Where can we save immediately? Those are the water-intensive industries, because water is a large part of their input costs, they manage their water consumption quite well. We went straight to Meatco, NBL, Namibian Dairies etc. In January 2016 CoW started negotiations with these companies and signed 'special water supply' agreements with them that make the 30 percent water savings mandatory and these are monitored on a monthly basis. That was a first easy gain on savings.

We are working with the people at central prisons – their consumption has gone down slightly, but the reality is that the plumbing for most of these places is basically non-existent anymore. Many of the public institutions have struggled from their side to get cooperation from the Ministry of Works and Transport because it is the Ministry's responsibility to maintain the pipes at these institutions. They get a budget for this to come and do the maintenance work and fix the pipes. But it seems that the coordination and communication sometimes between these institutions is very difficult.

72 Ibid.
73 Interview with Mr Dieter Tolke, Windhoek, February 2, 2017.

Looking at population growth projection for Windhoek and the overall water supply deficit that will be with us for some time to come, is the City currently considering specific medium- and long-term strategies to address recurring water shortages?

The biggest challenge, for me, is addressing the long-term water issue. We need to push for a long-term solution – this is the most important decision that needs to take place in this year 2017. We have already started and this is on the agenda for the committee. We sort of have dealt with the current crisis for now, but it is now really time to focus on the long-term. From my perspective the planning has been done the execution part is lacking.

We need to update studies where it is needed and then put a timeframe on reviewing plans and coming to a decision. We have already exceeded our maximum water supply cap in 2013 and we have a small deficit. With a drought that deficit is huge, but when the drought is over we will still sit with this deficit. Mitigating water shortages now is not the end of the situation. For me putting a plan in place that will increase supply and move the current supply cap up so we can sustain growth for the next 20-30 years that is where we need to move and to focus on. That period between now and when the new planned scheme comes on-line is critical because our water deficit is still growing. How long that period is will determine our intermediate plans. So we need to know how much we need to cater for and try to implement short-term solutions to bridge that deficit gap. Whichever scheme will eventually be decided on, pumping water from the Kavango or desalinated water from the coast it will take time. Likely more than five years – given the financial constraints that the public sector is facing it will be a big issue. It can be done but all responsible parties need to focus their attention on this. That is the number one priority: we need to decide on a long-term solution and by when it will be implemented.

Bibliography

Allgemeine Zeitung, “Anbauten halten Baugewerbe auf Trab”, Oktober 27, 2016. https://www.az.com.na/nachrichten/anbauten-halten-baugewerbe-auf-trab/

Augetto, Graig, “Waterkrisis by HTS afgeweer”, Republikein, August 22, 2016. https://www.republikein.com.na/nuus/waterkrisis-by-hts-afgeweer/

City of Windhoek, “Drought Response Plan”, Version 1, November 2015.

Cumming, James, Kuschke, Andre & Nanghonga, Indileni, “The economic effects of a water shortage in Central Namibia”, Simonis Storm Securities, September 18, 2015.

Economist Namibia, “Saving Water the Windhoek way,” January 18, 2016. https://economist.com.na/14841/extra/saving-water-the-windhoek-way/

Essa, Azad, “Namibia battles worst drought in decades”, Aljazeera Online, October 9, 2013. http://www.aljazeera.com/indepth/features/2013/10/namibia-battles-worst-drought-decades-201310851010116562.html

Haidula, Tuyeimo, “City to fine residents for not saving water”, The Namibian, June 10, 2015. http://www.namibian.com.na/index.php?id=137916&page=archive-read

Haidula, Tuyeimo, “Clampdown on illegal car washes”, The Namibian, January 24, 2017. http://www.namibian.com.na/50279/read/Clampdown-on-illegal-car-washes

Haidula, Tuyeimo, “Illegal car washes shut down”, The Namibian, January 26, 2017. http://www.namibian.com.na/50395/read/Illegal-car-washes-shut-down

Hangala, Pendapala, Comment: “Windhoek faces chaos in future,” New Era, January 27, 2017.

Heinrich, Dirk, “Von-Bach vor Regensaison trocken”, Allgemeine Zeitung, Mai 17, 2016. http://www.az.com.na/lokales/von-bach-vor-regensaison-trocken.431149.

Ikela, Selma, “28-day reprieve for car washes”, New Era, February 7, 2017. https://www.newera.com.na/2017/02/07/28-day-reprieve-for-car-washes/

Insight Namibia, SONA: Manufacturing, “Waiting to Launch”, April 2016.

Isaacs, Denver, “Water, population weigh heavily on City”, The Namibian Sun, July 4, 2016. https://www.namibiansun.com/news/water-population-weigh-heavily-on-city

Menges, Werner, “Water crisis continues while dam levels rise,” The Namibian, February 15, 2017. http://www.namibian.com.na/51190/read/Water-crisis-continues-while-dam-levels-rise

Namibian Sun, “Water: Windhoek is okay”, September 20, 2016. https://www.namibiansun.com/news/water-windhoek-is-okay

Nampa, “City of Windhoek urges residents to save water”, The Namibian, December 31, 2014. http://www.namibian.com.na/index.php?id=131992&page=archive-read

Nampa, “Awareness campaign to help save water on the cards”, The Namibian, August 13, 2015.

Namibia Statistics Agency, “The Namibia Labour Force Survey 2014 Report,” March 2015.

New Era, “City of Windhoek water restrictions in place,” May 19, 2016. https://www.newera.com.na/2016/05/19/city-windhoek-water-restrictions-place/

New Era, “Water crisis: How did we get here?”, June 10, 2016. https://www.newera.com.na/2016/06/10/water-crisis-here/

New Era, “Windhoek heads for crippling water crisis,” August 12, 2015. https://www.newera.com.na/2015/08/12/windhoek-heads-crippling-water-crisis/

New Era, “Cabinet takes bold action on water wastage,” August 19, 2016. https://www.newera.com.na/2016/08/19/cabinet-takes-bold-action-water-wastage/

Ngatjiheue, Charmaine, “Pipeline project to cost N$7,2m,” The Namibian, February 6, 2017. http://www.namibian.com.na/50800/read/Pipeline-project-to-cost-N$72m

Office of the Chief Executive, “Media Briefing”, City of Windhoek, March 4, 2015.

Office of the Chief Executive, “Media Briefing”, October 3, 2016.

Remmert, Dietrich “Head in the Sand”, Insight Namibia, October 2015.

Remmert, Dietrich “Water Governance in Namibia: A Tale of Delayed Implementation, Policy Shortfalls, and Miscommunication”, Democracy Report, Special Briefing Report No.13, Institute for Public Policy Research, September 2016.

Schelmetic, Tracey, “Down the Drain: Industry Water Use”, April 10, 2012. http://news.thomasnet.com/imt/2012/04/10/down-the-drain-industry-water-use

Sherbourne, Robin, “Guide to the Namibian Economy 2017”, October 2016.

Shihepo, Timoteus, “Sanlam donates to Drought Relief Assistance Fund”, The Villager, October 14, 2013. http://www.thevillager.com.na/articles/5184/Sanlam-donates-to-Drought-Relief-Assistance-Fund/

Steffen, Frank, “Wasser – Jedem sein Süppchen,” Allgemeine Zeitung, January 31, 2017. https://www.az.com.na/nachrichten/wasser-jedem-sein-sppchen/

The Government of Namibia, “Integrated Water Resource Management Plan for Namibia,” August 2010.

The Government of Namibia, “The Augmentation of Water Supply to the Central Area of Namibia and the Cuvelai, Interim Report No 1: Part 1,” 25 July 2014

Tjihenuna, Theresia, “Government to offer drought relief to 400 000 people”, The Namibian, April 27, 2015. http://www.namibian.com.na/index.php?id=136323&page=archive-read

UN Habitat, “The State of African Cities 2014,” 2014.

Weatherman, Neil, “Water crisis, We should be concerned”, Windhoek Observer, May 26, 2016. http://www.observer.com.na/opinions/6249-water-crisis-we-should-be-concerned

Windhoek Observer, “Water, water everywhere, but not a drop to drink,” June 9, 2016. http://www.observer.com.na/index.php/editorial/6346-water-water-everywhere-but-not-a-drop-to-drink

Notes

Notes

About the Author

Dietrich Remmert is an IPPR Research Associate and has worked intermittently for the Institute on a range of research projects since 2004. He holds a Master's degree in Peace Studies and International Politics from the Eberhard Karls University in Tubingen, Germany. He has over a decade of wide-ranging experience in the public sector predominantly in the field of health and communication as well as education and public policy analysis. He has worked for the Namibian government, donor and civil society organisations.

About Democracy Report

Democracy Report is a project of the IPPR which analyses and disseminates information relating to the legislative agenda of Namibia's Parliament. The project aims to promote public participation in debates concerning the work of Parliament by publishing regular analyses of legislation and other issues before the National Assembly and the National Council. The project is funded by the Embassy of Finland.

About IPPR

The Institute for Public Policy Research (IPPR) is a not-for-profit organisation with a mission to deliver independent, analytical, critical yet constructive research into social, political and economic issues that affect development in Namibia. The IPPR was established in the belief that free and critical debate informed by quality research promotes development.

Incorporated Association Not for Gain Registration Number 21/2000/468
Directors: M M C Koep, M Humavindu, D Motinga, N Nghipondoka-Robiati, J Ellis, G Hopwood (ex-officio)

70-72 Dr Frans Indongo Street, Windhoek · PO Box 6566, Windhoek, Namibia ·
Tel: +264 61 240514
info@ippr.org.na · www.ippr.org.na