A State and Corporate Undertaking in Water Supply and Management in Botswana, 1966-2014

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Abstract

Many works on the history of water in Botswana emphasize the already affirmed arid status of the country, but not how the country's government with the cooperation of corporate partners has, over the years, confounded the challenge of water paucity to achieve growth and development. This article, based on triangulation methods which take into account both qualitative and quantitative approaches, evaluates hydrological management and water supply in the predominantly water-scarce nation from independence in 1966 to 2014. It contends that post-independence just as pre-independence Botswana faced challenges in water management and supply wrought by desert conditions. However, by 2014 the state was able to turn the challenges into opportunities despite escalating climate change-induced dryness, its own capacity weaknesses and implementation inefficiencies, thus emphasising the point that water insecurity wrought by desert conditions did not always mean lack of development. Why and how post-colonial state officials played a vital role to secure equitable distribution of water for development against the backdrop of water shortages and funding challenges is a critical aspect of this discussion.

Introduction

Since Botswana's independence in 1966, rising local demand for water in the growing towns (especially the capital city, Gaborone) and surrounding and distant villages strengthened government's resolve to develop national supplies to meet demand. The paucity of water supply in Botswana had been inherited from the colonial power, Britain, whose neglect of water development meant that the post-colonial government was constantly and persistently faced by insurmountable water challenges (Tlou and Campbell 1997). However, Tlou and Campbell's argument about the colonial neglect of water resource development has been refuted and considered a matter of perception by Steenkamp (1991). Focusing on colonial Botswana's development policy, Steenkamp rejects the conventional characterisation especially of the 1930s as either one of unremitting neglect or deliberate underdevelopment by providing a totally different perspective regarding the cattle industry.

He, for instance, categorically pays tribute to Charles Rey, the Resident Commissioner at the time, for responding to the needs of the country's economy with a comprehensive development strategy focusing on water resources and the revival of the cattle industry (Steenkamp 1991). Steenkamp's (1991) argument that cattle and water were inextricably linked in colonial Botswana, nevertheless, cannot be interpreted to mean that there were totally no challenges or impediments. The challenges that afflicted the economy were a result of undeveloped water resources and that water security in the early colonial times was restricted mainly to a reliance on oases, (in particular the world's largest inland delta, the Okavango Delta (Map 1) in the middle of the Kalahari Desert, which is Botswana's major freshwater oasis for people and wildlife), boreholes and wells for potable water and agricultural water including water for watering livestock (Peters 1984 and Peters 1994). This reliance on oases as well as colonially-implemented sources of water like boreholes (Peters 1984 and Peters 1994) influenced the government of Botswana, which was committed to rectifying water provision and management problems of the past, to facilitate modern water resource development projects. The projects included the establishment of dams and a public water enterprise, the Water Utilities Corporation (WUC) established in 1970, to boost water

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supply because of water's political, socio-economic and strategic significance for growth.

Map 1: Geographic location of major rivers, Okavango Delta, Botswana

Source: https://www.worldatlas.com/webimage/countrys/africa/botswana/bwland.htm accessed 29 May 2018

This article was a response to the *Botswana Notes and Records*' call for articles to commemorate the journal's golden jubilee volume and also in honour of the late Sir Ketumile Masire who was Botswana's second President from 1980 to 1998. Therefore, in part the article incorporates the role played by Masire, who was Botswana's Vice President from 1966 to 1980, and also other presidents on water development during their tenure of office. It evaluates the opportunities and challenges in Botswana's water supply and management sectors and the measures that were implemented following the advent of independence to augment supply in a country which receives low to no rainfall annually and is beset by climate-induced droughts. In the colonial period when the country was under British rule from 1885 to 1966, there was acutely inadequate development in Botswana's crucial water sector, but the post-colonial era significantly changed this. The paper submits that historically there was development in Botswana's water sector (Peters 1984; Peters 1994; and Makgala 2012). However, it was merely modicum development. Such development exacerbated water shortages and it meant future water insecurity for the country. Thus, water scarcity due

to aridity (illustrated in Figure 1) and excessive dryness demanded a combined state and corporate water management strategy to correct past and present errors to ensure water security and achieve sustainable development for a country with no perennially flowing national rivers (Nyandoro 2013a and Nyandoro 2013b). The construction of dams or major water reservoirs such as the Gaborone and Dikgatlhong dams was one way of boosting water supplies in the post-independence era (Kedikilwe 2008).

Figure 1: Extent of aridity, poor vegetation cover, Kgalagadi south, Botswana

Source: Republic of Botswana (2008).

The main hypothesis of the paper is that many works on the history of water in Botswana (for example, Swatuk and Rahm 2004); Stephenson 2007; and Fontein 2008), emphasize the already affirmed arid status of the country, but not how the government of Botswana with the cooperation of corporate partners has, over the years, confounded the challenge of water paucity to achieve growth and development. This article, based on triangulation methods which take into account both qualitative and quantitative approaches, evaluates hydrological management and water supply in a predominantly water-scarce nation from independence in 1966 to one of the highest points of drought in 2014. It contends that post-independence just as pre-independence Botswana faced challenges in water management and supply wrought by desert conditions. However, by 2014 the state was able to turn the challenges into opportunities despite escalating climate change-induced dryness, thus emphasising the point that water insecurity wrought by desert conditions did not always mean lack of development. Why and how post-colonial state officials played a vital role to secure equitable distribution of water for development against the backdrop of water shortages is a critical aspect of this article.

Studies on Botswana have demonstrated that development in the country is inhibited by water scarcity. Water shortage in this largely desert area pre-dated political independence and is a matter of world security. According to Nyandoro (2013a) since the 1880s some effort was invested in water development

and research, but more plausible work in this field is associated more with the post-independence than with the colonial era. Much research, for instance by Roe (1980); Cleophas (1997); Carlsson and Ntsatsi (2000); Swatuk and Rahm (2004); Makgala (2012); Nyandoro (2013b); and Senai (2014), has been conducted on water in Botswana emphasizing mainly supply and demand issues and the role of the post-independence state in facilitating infrastructural development in light of scarcity. Experts, water governance institutions, planners and the United Nations (UN) have consistently, in recent times predicted a critical water shortage if concerted efforts were not made to forestall the problem (UN 2006; Marone 2009; WWAP 2012; Nyandoro 2013b; WAVES 2013; WAVES 2014). In its 2012 report, the World Economic Forum identifies water-food-energy security as one of the world's greatest threats. In the report, a global water shortage in the near future is portrayed as a likely prospect. In Sub-Saharan Africa, Botswana is one of the nations that is likely to feel the water crunch (Nyandoro 2013b). With no perennial rivers under its full control (apart from the tail-end of the Okavango River –Map 1), a drought-prone environment and dam evaporation rates accelerating with global warming, Botswana has few water resources to meet ordinary demand and support economic growth (Nyandoro 2013a and b). Water scarcity is arguably the biggest limiting factor to development in Botswana.

Water development, supply and management in post-independence Botswana and the Southern African region have been studied by several scholars, notably Cleophas (1997), Canesah (2001), Toteng (2002), Swatuk and Rahm (2004), Stephenson (2007) and Fontein (2008). They argue in favour of improving water supply, management and the development of sustainable hydrological systems mainly due to the incessancy of droughts. Further, the impact of droughts on farming in Botswana has been examined by Jerven (2010:73-94) in his article, 'Accounting for the African Growth Miracle'. For Jerven (2010), the agricultural sector stagnated or actually shrank in the period 1965-1995 due to drought conditions the worst of which occurred in the 1978/1979 season. This drought had serious consequences on the nation's agriculture because it caused 'an absolute failure of crop output, while cattle owners wanted to slaughter their animals because of the lack of water' (Jerven 2010:82). This catastrophe, though, had a silver lining for the Botswana Meat Commission (BMC). As the dominant beef processing sector located in the town of Lobatse, the BMC realised a record output that year. There are also BMC abattoirs in the towns of Maun and Francistown, even though these two operate intermittently.

Invariably, the lack of a focused water policy by the Bechuanaland Protectorate (colonial Botswana) administration had previously constrained the economy of the country as argued by Roe (1980), Peters (1984) and Makgala (2012) whose works reveal the inadequacies of the colonial water infrastructure and management system which was mainly confined to the borehole programme (see also Parsons and Crowder 1988; and Peters 1994). The Tswana rulers (especially Isang Pilane, Regent of Bakgatla-ba-Kgafela) and other *Dikgosi* (Chiefs) had lobbied hard and successfully for the borehole programme to be developed culminating in an over-reliance on underground water resources as evidenced by the significant increase in borehole and water development projects throughout the territory between the early 1930s and the late 1970s (Sillery 1974; Tlou and Campbell 1997). Colonial annual reports suggest that the demand for water in pre-colonial and colonial Botswana was perceived to be minimal, based on population size (about 84,210 in the 1880s) and the absence of major industries (Bechuanaland Protectorate 1927 and 1936). However, such a view is erroneous, because water development projects were constrained by limited funds and a political landscape dominated by white interests.

Peters (1994:223) shows awareness of the 'limited funds', which was the complaint of Resident Commissioner Charles Rey, despite his efforts to interest London in spending money on water infrastructure (Parsons and Crowder 1988). Water development on a national scale failed because available funds were often deployed for the advancement and supply of water to the few white-owned mines and ranches

(Morapedi 2014). The emphasis on water development in the post-colonial era bears testimony to this. A study of colonial government annual reports, the works of Roe (1980), Swatuk and Rahm (2004), including the Department of Water Affairs (DWA) established in 1968 and the Water Utilities Corporation (WUC) annual reports reveal an ever-present demand for water provision by various categories of urban and rural dwellers for agriculture, livestock watering and other industrial activities after independence (Roe 1980; Peters 1984 and Nyandoro 2013a).

In light of the pre-independence government's failure to improve water provision/delivery and management, the state and non-state actors after independence made progress in water resource policy formulation and practice. Both the state and non-state actors saw how the inherited colonial water infrastructure was grossly inadequate to addressing the developmental demands of both the twentieth and twenty-first centuries hence they developed strategic synergies to address the challenge. Their interventions on Batswana society's water governance structures had a positive impact on the society as state action coupled with non-state partners went a long way in ameliorating water shortages.

Shortage of Water: The Drive to Develop and Augment Supplies

In the colonial period Botswana had no clear water policy and it used to view water merely as a social responsibility. Water shortages especially for the African populace were endemic. As already stated, the role of the state in developing and augmenting water supply was minimal. It was not until the 1990s that the National Water Master Plan (NWMP) was implemented, and the Plan marked the start of serious efforts to change/transform water sector legislation. The current water policy initiated in May 2009 under the new water sector reforms following the adoption of the NWMP is the only meaningful post-colonial attempt to introduce a clear water policy for the country and allay water shortages in an arid terrain (Republic of Botswana 1991).

The colonial administration either deliberately ignored or was reluctant due to the costs involved to significantly develop the water sector beyond the precincts of the isolated white enclaves dotted in some parts of the country. At any rate, the colonial enterprise was never meant to benefit the colonized but to exploit them for the benefit of a small white settler community or European metropole. In colonial Botswana the management of bulk water and its supply to the largely sparsely populated African areas was then provided by tribal administrations (Makgala 2012), the borehole syndicates and to some extent by the Protectorate administration itself. Makgala (2012:801) contends that water development was one of the key responsibilities of the tribal administration, usually with the help of the government. This structure, however, had to change to counteract episodes of shortage as water scarcity is arguably the biggest limiting factor to national development in Botswana where vast amounts (volumes) of water are required especially for the diamond mining and livestock industries (Swatuk and Rahm 2004; and Nyandoro 2013a).

Mining is the largest consumer of groundwater in Botswana as the Water Act of 1967 afforded mining companies virtually unlimited abstraction rights over water in their respective mining areas. Assuming transportation infrastructure was amply developed, Botswana was set to emerge as a major mining country in the coming years with estimated water consumption by mining companies expected to rise to 107Mm^3 per annum over a decade if all the currently propitious coal, uranium and base metal resources were developed to the same level as diamonds (Swatuk and Rahm 2004). Nonetheless, this has not materialized as diamonds are said to be depleted in 20 years time or so and this is the major contributor of revenue to government. State-owned BCL and Tati nickel mines were closed in 2016 owing to their unprofitability. Coal has long been talked about as the next major minerals revolution but in Botswana this is just mere talk and no action has been taken which underscores the precariousness of the situation besetting the local mining industry. It is also doubtful if coal revenue can rival that from diamonds. Notwithstanding the problems confronting the mining industry, there is no denying that when the mines are fully operational

they will consume a relatively bigger volume of water. However, as long as the price of groundwater is virtually free, as is presently the case, it provides no commercial incentive for mining companies to employ best–practice water saving technologies in the mining, washing and dewatering of mines.

The other big consumer of water is the cattle sector. It is estimated that a single beast drinks 50 litres of water or more per day or 30,000 litres until slaughter, which translates to 80 litres for a single kilogramme of beef bought at the local supermarket (Morton 2014). This seems to point to the need to commodify or price water appropriately as a cost-saving or conservation mechanism as South Africa has done because water is a scarce commodity in Botswana (Toteng 2002; Morton 2014). Indeed, commodification of water was subsequently achieved under the auspices of the WUC and other state institutions, but water in Botswana is still very cheap compared to its price in the region (Morton 2014). Since the adoption of the Water Act of 1967, concerted effort was made to address imminent water shortages in the country through the work of state agencies. Whilst all water resources including their control were vested in the state, legislation in 1967 and subsequent legislative amendments allowed the state to delegate power over the issuance of water rights to the DWA and the Water Apportionment Board. DWA fell under the ambit of the Ministry of Minerals, Energy and Water Resources (MMEWR) which has the mandate to formulate post-colonial water policy. The MMEWR is assisted in the implementation of policy by the DWA, the then Department of Geological Surveys (DGS) –now known as the Department of Geosciences, and the WUC.

For Botswana, as in many Southern African economies, the importance of water not only as a distinctive life saver but also the significance of management of finite freshwater, including groundwater cannot be overlooked. Because in the country as in Namibia water shortages caused by the vagaries of the climate were endemic in the region, the resort to sinking wells and drilling boreholes to tap groundwater was, therefore, not only frequent but a priority in some of Botswana's villages even after independence. Several stakeholders and researchers have argued in favour of improving and enhancing water supply, management and the development of sustainable hydrological systems to alleviate shortages (Cleophas 1997; Canesah 2001; Toteng 2002; Stephenson 2007; and Fontein 2008). In addition to efforts at augmenting supplies, the state also strove to achieve high levels of water management as a security and conservation measure, a theme I now turn to.

The Importance of Water Management to Development

Water is a key element to socio-economic growth not only in Botswana but globally. International development agencies like the United Nations Development Programme (UNDP) concur with this view (UNDP 2007; see also Marone 2009). Water is life or is a vital commodity for sustaining community livelihoods. It satiates people's potable (drinking) and agricultural (including livestock) requirements, but its scarcity due to a cumbersome geophysical and aquatic environment is on the one hand the biggest limiting factor to sustainable national development. On the other hand, since 1990 experts were worried by Batswana's indifference to water conservation (Toteng 2002). Between the 1990s and the early 2000s attempts to satisfy humans' drinking water requirements and conservation were frustrated by a combination of funding problems and management inefficiencies. Efforts to meet agricultural needs and competing water requirements claims notably from modicum irrigation activities, wildlife, industry, mining and energy generation were made but decentralisation of management still had to be pursued with greater vigor. It can be noted that at the end of the colonial period, to augment supply to meet escalating demand for water, Botswana relied primarily on state centralised control and management of the water sector. The country seemed to overlook the value of decentralisation in hydrological management. Decentralisation, however, is not an advocacy for removal of the state. Whilst the state had a role to play in water delivery and management, efficient management and governance could be achieved through decentralising the functions of state agencies and giving autonomous power to non-governmental organisations (NGOs), water user

associations and private institutions. Such an approach strengthened the government of Botswana's central theme of good governance for water preservation and utilisation. One of the merits of the approach was that it enhanced policy formulation, legislation and the creation of democratic space which the country continued to enjoy.

Additional options for the improvement of Botswana's water situation include advancing and consolidating current efforts on integrated water resources management (IWRM) and water demand management (WDM) initiatives such as rainwater harvesting, storm water capture and diversion, progressive pricing policy, eco-sanitation and consumer education (Arntzen *et al.* 1999; and Toteng 2002). The use of water tanks is important especially in areas where dams and other water storage reservoirs were still absent. Given Botswana's arid conditions government had to more aggressively pursue these multiple alternative and innovative technologies to improve water use efficiency. As a water-stressed country, the post-colonial government made determined efforts to harness these astute management approaches which strengthened the institutional capacity and institutions responsible for efficient water development and supply (Holm and Cohen 1988). In doing so, matters of equity (equitable distribution) were emphasized by the state.

The State and Equitable Distribution of Water

Because of the importance of water in development, the Botswana state embarked on efforts hitherto not prioritized in colonial times to improve supply and achieve equitable distribution of a major but finite resource. Botswana faced the problem of how to equitably distribute water among its rapidly growing population (estimated at 500 000 in 1966, over two million in 2010 and 2.169 million by 2014) (Charumbira *et al*. 2011). Before independence water demand was not high given the small population size but the response to population growth in water development in subsequent years is quite clear. Demand for water for mining and industrial development also rose markedly in the post colony.

For instance, among the country's growing population of approximately two million in 2010, there are many potable water consumers; large-scale, small-scale livestock farmers; old and emerging mining and industrial enterprises - all requiring water. The demand for water was dictated by the insatiable needs of these various sectors, including tourism and wildlife water requirements (UNFCCC 2001). Consumptive use of water by people includes water for drinking, sanitation and hygiene.

Consumption of surface and groundwater for 1990 was 41,9 Mm^3 per annum and 75,7Mm^3 per annum respectively. Water consumption is projected to reach 186,2 Mm^3 per annum and 140,3 Mm^3 per annum for the same categories of water by 2020 (Republic of Botswana 1991). The rate of urban water consumption in comparison was higher than the rate in the rural areas of the country, but for both areas water is fundamental to sustainable development (Republic of Botswana 1992). An increase in population also directly entailed a proportionate if not an incomparable escalation in the demand for water which invited two specific government water-sector responses. Firstly, in the five-year development planning period from 1992 to 1997 during the presidency of Sir Ketumile Masire, population growth trends compelled the government of Botswana, as required by the UN, to primarily focus on meeting the basic needs of the people through the provision of safe, reliable and affordable water supplies (Botswana Human Development Report 1997; see also UNFCCC 2001). Secondly, the state aimed to meet the water requirements of industrial, mining, agricultural (irrigation), commercial and institutional users in order to achieve the stated objectives of rapid economic growth and sustainable development (Swatuk and Rahm 2004). For Botswana, it is also government or official policy to achieve sustainable and equitable water distribution (Republic of Botswana National Development Plan 8 1992:281; see also, Swatuk and Rahm 2004).

Notwithstanding the scarcity factor, in line with the UN's water governance principles, Botswana is

making enormous efforts to cater for all actual and latent water users in both the urban and rural settlements. To keep pace with aggregate demand in the latter, more than 60 supplementary boreholes were drilled every year (Carlsson and Ntsatsi 2000). In order to meet major urban, village and subsidiary water supplies government was complemented by the local district councils. According to the National Development Plan 8, in 1998 (the year Festus Mogae assumed the presidency) there were 460 rural village water supply schemes operated and maintained by the various district councils situated throughout the country (Republic of Botswana National Development Plan 8 1992:280). Mogae whose reign ended in 2008, like his predecessor (Masire) realized that institutional stability depended on the strength and inclusiveness of village institutions (Baturo 2014) in maintaining water supply.

Thus, water, its supply, management and conservation as a key natural resource has implications for current and future water availability, accessibility, agricultural production, food security, and poverty reduction as stipulated under the (no longer popular) United Nations Millennium Development Goals (MDGs). MDGs were designed by the UN as an instrument for poverty eradication (Ravallion 2002). The UN has stated that MDGs are no longer popular due to their lack of progress towards achieving the eradication of poverty in the developing world, hence MDGs have now been replaced by the post-2015 sustainable development agenda. Above all, water supply, management and conservation also have implications on democratic governance. Both surface water resources and underground aquifers, which represent the majority of the world's accessible freshwater, were protected for long-term sustainability (UNFCCC 2001). Trans-boundary or international water agreements targeting the use of the Zambezi, Limpopo and Shashe were signed by the post-colonial administration as in there lies the hope for Botswana for uninterrupted and abundant water supply given the absence of perennially flowing internal rivers. A management transformation focus by the state was thus paramount.

The need to change the management system of the colonial period was given priority, but this does not mean that Botswana should ignore the important lessons of the past for modern economic transformation to be realized in the water sector. Water shortages were compounded by rainfall deficiencies. Rainfall insufficiency ranging from 250 mm to 600 mm per annum and the very high rates of evaporation of approximately 2000 mm per annum (Kenabatho and Montshiwa 2006) from dams alone exacerbate Botswana's water situation. Climatic change is expected to increase rainfall variability and the stress on agro-based livelihood activities such as crop cultivation and livestock rearing (Draft Policy Note 2010; Nyandoro 2013b).

In the circumstances, the imperativeness to ensure water security has, therefore, always been very high since independence. Nevertheless, vital economic sectors like industry including cattle and meat abattoirs in Lobatse and mining require regulation of their daily, weekly, monthly and annual consumption in the face of water scarcity. The pollution that they cause and its allied effects pose daunting environmental and developmental challenges that threaten sustainability (Toteng 2002 and Nyandoro 2013b). Water pollution, wastewater or effluent discharge which is contaminating valuable surface to underground water resources had to be curbed and this is partially being done by implementing cost-effective and efficient consumption water patterns. In fact, pollution and lack of effective policy implementation exacerbate water shortages hence the adoption of the water act a year after the attainment of independence by Botswana.

Post-independence Water Management Achievements and Opportunities

The adoption of a statutory instrument in the name of the Water Act of 1967 after independence reveals government's commitment to address imminent water shortages. The Act presented opportunities to transform not only water legislation, but also the water supply and management landscape in Botswana. Since the 1960s and 1970s the state bestowed the mandate to formulate water policy on the Ministry of Mineral Resources and Water Affairs (MMRWA), renamed the Ministry of Minerals, Energy and Water

Resources (MMEWR). MMEWR was assisted in policy implementation by the DWA, the DGS and WUC (Republic of Botswana 1991). These state institutions performed a mixture of sometimes different, but at times related functions. Among the core functions/business of WUC, for example, were planning, constructing, operating, treating, maintaining and distributing water resources in the areas mandated by government countrywide.

From this, it can be noted that Botswana was committed to rectifying water deficiencies in the post-independence era. At the highest state level, President Ian Khama (2011) acknowledged the legacy of an inadequate water infrastructure inherited from the colonial government and the importance of water to twenty first-century Botswana when he stated that there are state-initiated projects such as water and electricity that are running that will not be allowed to suffer as they are central to the development of the country (Khama 2011). As drought conditions intensify in the face of increased global warming, the MMEWR, DWA, WUC, the National Water Master Plan (NWMP) admit that water demand which was low in 1990 will increase considerably by 2020. For the NWMP, in the urban and rural areas, consumption of surface and groundwater for 1990 was 41.9 Mm^3 per annum and 75.7Mm^3 per annum respectively (Figure 2). Water consumption is projected to reach 186.2 Mm^3 per annum and 140.3 Mm^3 per annum for the same categories of water by 2020 (Figure 3).

Figure 2: Water consumption 1990

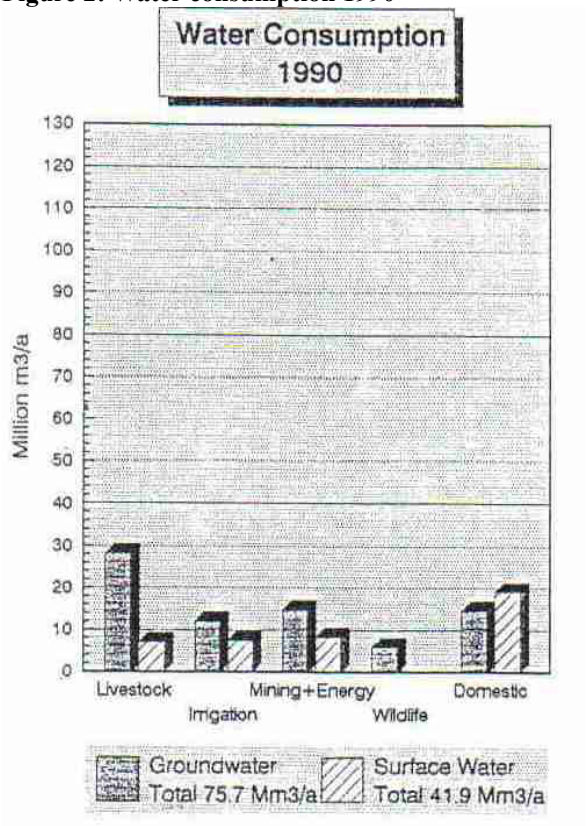
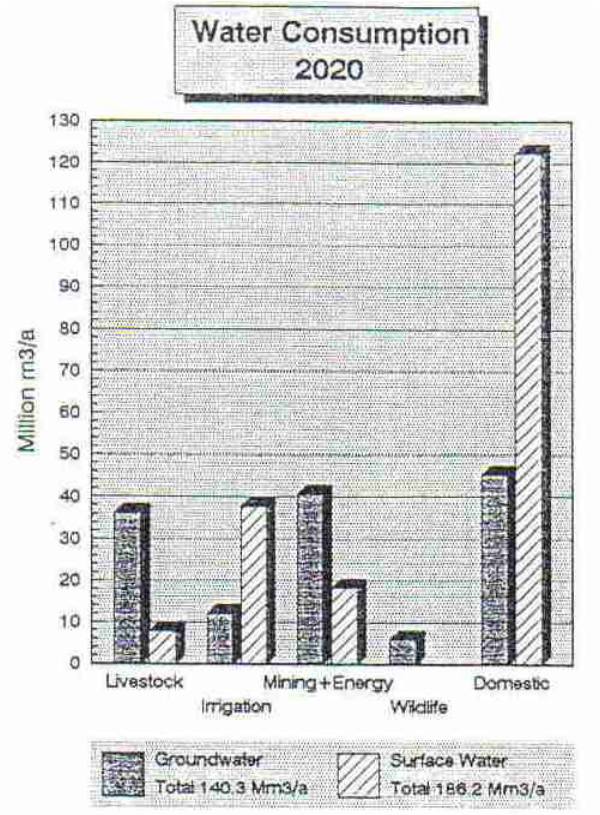


Figure 3: Water consumption 2020



Source: Swatuk and Rahm (2004).

A key feature of these statistics is to show supply and demand. Controlling demand, for policy makers, is an important way of increasing supply and water use efficiency. However, these figures and their architects, on one side, fail to capture an accurate measure of demand and this is hindering the implementation of demand-side policy measures. On the other side, supply is complicated by system water

losses through damaged old pipes that need replacement. The average total water loss through leakage per year for 450 villages is estimated to be 3.5 M m^3 of water which is equivalent to P10.5 million (Swatuk and Rahm 2004). Clearly, the country cannot afford these inefficiencies in the distribution of a scarce commodity envisaged by the UN to be under threat of depletion. WDM – defined at the 1992 Dublin Conference (Solanes and Villarreal 1999) as 'actions which promote more desirable levels and patterns of water use' - should be an integral part of hydrological planning in Botswana. This International Conference on Water and the Environment held in Dublin put water, the right to fresh/safe water as well as water and sustainable development on the global development agenda. The meeting paved the way for better water management based on participation and recognition of the holistic nature of water resources, and this included the establishment of simple participatory or community development technologies such as rainwater harvesting structures (Solanes and Villarreal 1999). Instead of pursuing WDM initiatives or strategies only, it is also important to consider other alternative measures and explore internal (currently not so significant) and external funding opportunities.

Post-independence Water Management Challenges

Botswana's precarious and ubiquitous water situation was confirmed in observations made at one of the public forums on water organized by the Botswana Society in Gaborone in May 2014. The forum's theme was 'What Does the Future Hold for Botswana's Water Supply'? In underlining the point that water was a privilege, not a right, it was noted that when it comes to water resources versus consumption rates Botswana is living on borrowed time (Morton 2014). Presenter Gaselemogwe Senai, Infrastructure Director at the WUC, candidly surveyed the nation's existing water resources insofar as rainfall patterns, water capture systems, and groundwater resources were concerned and described the long-term plans in place to attempt to secure Botswana's future water supply. The talk revealed that a) water is in critical short supply where the demand is greatest –especially in Greater Gaborone; and that b) long-term remedies being put into place are likely to cope with the situation for another decade or, at best, two (Senai 2014).

Clearly, the most troubling fact staring Botswana in the face is the pattern of intensifying drought. Of the last 33 years (that is, between 1980 and 2013/14), more than half (18 years) have been drought years, and on three occasions (1981-1984, 1991-1992/1993-1994, and 2002-2006) drought has been 'episodic' (Holm and Cohen 1988; Fako and Molamu 1995; Morapedi 2006; Jerven 2010; and Mogotsi *et al.* 2011). It extended over four or five successive years of varying intensity. This means that subsequent rainy years were unlikely to recharge the water supply. For example, the most recent episodic drought dropped the capacity of Gaborone Dam to 16% unleashing another episodic stretch, which began in 2011 and for which no clear end was in sight by 2014. In the 2013/14 season the Gaborone Dam was at 11% capacity, or effectively dry, and where rainfall is scarce, as in the Kanye area, boreholes were being tapped at varying levels – some well above what was required for sustainability (Senai 2014). However, by early 2017 the Gaborone Dam overflowed because of the Dineo cyclone floods, but drought is more endemic in the country than episodes of flooding. In the past, extended droughts were often followed by uninterrupted years of good rain, but this was no longer the case (with occasional exceptions like the 2017 floods) as the negative effects of climate change were being felt more and more.

In the 2000s rainfall, when it comes, it poses another problem that offers no simple solutions. Rainfall patterns vary widely in the country, with most rainfall (as much as 650 mm) falling on average in the north, and as little as 150 mm in the south (Department of Metrological Services Botswana 2003; 2008). Even in areas of higher average rainfall, it cannot be counted on to occur at particular times or even regularly in given areas due to climate change (UNFCCC 2001; Department of Meteorological Services Botswana 2003). As high as 90% of an area's rainfall has been known to fall in a single month, and of course almost all rain, wherever the location, comes during the hottest months of the year, when evaporation rates

are at their highest level. In other words, Botswana's conditions favour neither fresh water predictability nor availability (Senai 2014).

In the circumstances, problems exist but the state can be commended for coming up with structures to address water supply and management challenges in the post-independence period. However, instead of the state bestowing the mandate to formulate water policy on the Ministry of Minerals, Energy and Water Resources, assisted in policy implementation by the DWA, the DGS and the WUC, it may need to embrace consultative dialogue with all major stakeholders in policy formulation.

It must be pointed out that whilst this paper has commended Botswana government policy on water, there were some implementation inefficiencies and capacity problems. For example, even after heavy rains which occasionally fill up dams, water scarcity and shortage remain a serious problem in villages next to the Gaborone or the Bokaa dams and indeed other reservoirs or water impoundments all over the country.

Recommendations

Whilst the synergies between the state and corporate entities are plausible, a consolidation of the strong management strategies of the present as well as a rethink of water management based on historical experience is essential in order to implement newer and more sustainable water supply and management methods. Existing alternative technologies to improve water use efficiency should be more intensively pursued together with even newer technologies to unravel the untapped potential extant in Botswana's water sector and its neighbours who, even so, are also facing serious water shortages. This is the case with South Africa where Botswana gets most of its manufactured imports from.

State water institutions like the DWA and the WUC whilst serving their purpose in a post-colonial context, should be fully capacitated as they move towards consolidating their national outlook. They need to be further capacitated from a financial and human capital (expertise) perspective. Apparently, they do not need to be replaced, but strengthened through merging them with the MMEWR under a strong water resources commission as in Ghana (West Africa). The government of Botswana should also design a national water policy to provide a framework for the sustainable development of the country's water resources. This would include:

1) strategically repositioning Botswana to harness newer, home-grown water purification and treatment technologies to alleviate water paucity, allay diseases attributable to lack of safe drinking water and basic sanitation in order to achieve optimum growth;
2) the establishment of a research institute/centre funded from local, bilateral and multilateral sources emphasizing long-term research partnerships with the government and academic institutions such as the University of Botswana (UB) to generate a water and other natural resources data bank as well as;
3) teaching citizens ways of harvesting rain water, as a strategy for generating and sustaining water for future or later use. (Admittedly, this is being done by WUC and agricultural colleges through television and radio awareness programmes, but more needs to be done).

The recommendation on establishing a research institute or think tank on natural resources is based on the following facts:

- A research institute on water and other natural resources is an essential ingredient to development and its consolidation. The MMEWR and other institutions dealing with natural resources might not have the time and money to cover data collection and analysis.
- The knowledge generation and skills capacity of institutions that deal with water should be

developed with a long-term focus. This could be enhanced through the staging of annual symposiums or conventions on water to learn new practices, analyzing and reviewing alternative policy responses in order to understand how other countries faced with similar challenges to Botswana's overcame their problems. Working with others yields more positive outcomes as the former American Secretary of State, Hillary Clinton, said at a World Water Day in 2010: 'By focusing on our strengths and leveraging our efforts against the work of others, we can deliver results that are greater than the sum of their parts' (Clinton statement 2011).

- The history of water development and management should continue to be promoted because knowledge generation operates in a spiral if it is supported by historical and scientific investigation of trends over a long period. On the contrary, if societies do not go back to history they move in a circle.
- On the whole, water research in line with building capacity through new partnerships and sharing science and technology solutions should be given top priority because water is at the core of the global development debate.

Thus, these modest observations and recommendations may assist in taking existing supply and management development policies/efforts in the water sector of drought-prone Botswana to a different level.

Conclusion

This paper has argued that since independence in 1966 the state with the aid of corporate partners has created a number of modern hydrological management institutions and water projects against the backdrop of droughts to facilitate water supply. This was in order to meet the insatiable demand for water in Botswana. Respective Presidents, for instance, viewed hydrological projects as key or central to the development of the country. Numerous attempts have been under way. Clearly, these efforts have enabled the post-independence government of Botswana, more than its predecessor, to rectify the challenge of water paucity wrought by desert conditions in order to achieve sustainable growth and development. In an arid zone beset by relentless droughts, provision of water for potable purposes, agriculture (in particular ranching) and the mining industry were paramount in stimulating growth in a country with a few wealth-creating natural endowments apart from diamond, wildlife and the Okavango Delta for tourism.

Besides diamond, there is copper, nickel and other minerals which the government has failed to beneficiate for economic diversification and meaningful employment creation. Notwithstanding these challenges and droughts, the economy of Botswana is one of the most stable in the southern African region. Thus, water insecurity wrought by desert conditions did not always mean lack of development as attempts have been made to utilise the limited water resources for strategic development. Diversified efforts continue to be made to augment existing supplies.

In spite of the plausible efforts by government in rectifying water shortages and enhancing management systems, it is, however, important to offset the challenges facing the post-colonial state. For example, it is imperative to tighten some supply and managerial loopholes inherited from the colonial period. At the same time, it is clear that the government of Botswana has very good policies but implementation is a serious hindrance. Therefore, the time to adopt appropriate measures and policy changes in some areas is now.

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