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South African Water History

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South African Water History

Erratum

Sponsored by Amanda Lewis-Nanglea

Foundation and Change of Water Inequality in South Africa

Elisabeth Bablin

sponsored by Amanda Lewis-Nang'ea

ABSTRACT

Water is a scarce resource in South Africa, a country dependent on water for agriculture, yet plagued by droughts. This is an examination of the developing understanding and control of water in South Africa, as well as the societal impacts that control had on a conflicted society. It examines the responses to water in the early twentieth century, being a foundation period that sets up later water concerns in the following decades, and the period from the 1990s to the present, as a time of change in water use.

Water in South Africa is central to the struggles of the country. Since the earliest days of human habitation in South Africa, water has defined where people live, how they survive, what they eat, and why they move. As water is crucial to all aspects of human existence, water history touches on all spheres of life from governmental to environmental to economic. The most recent drought, brought to a pinnacle in 2018 with Cape Town's Day Zero, has drawn interest to the long history of water scarcity in the country. This ongoing water crisis in South Africa was caused by environmental factors and worsened by human actions. Responding to this crisis has been of paramount concern for the country since the rise of colonialism, specifically since the time of British control, which problematically sought to establish the area as an agricultural colony despite water shortages. During this time, there was also a rise in racial prejudice implemented by the government. Therefore, the responses themselves take on racially divisive characteristics. The actions taken by South African governments at the turn of the twentieth century grew water inequality based on race and created deeply entrenched water problems for the post-apartheid South African government to solve.

The time periods examined are the early twentieth century, from approximately 1900 to 1920, and 1994 (the end of apartheid) to the present. I occasionally mention events outside these time frames to provide background information on a certain topic, or to illustrate an ongoing trend. The early period was chosen because it contains the early responses to and understandings of water and water shortages, in the geographical region that is now South Africa. It represents a foundational period for irrigation and water con-

trol. The principles it establishes, as well as the consequences of the events contained within the time frame, continue throughout the century. The later period coincides with the end of apartheid, and thus a dramatic shift in South African society, including its relationship with water.

A BRIEF HISTORY

South Africa is a diverse country inhabited by an array of indigenous cultural groups, many of which are still present today. These include the Zulu, Xhosa, Khoekhoe, and San speakers. The Khoekhoe and San in the Western Cape region were semi-nomadic herders and hunter gatherers, respectively. The Nguni groups (connected by a Bantu ancestry and related culture) practiced agriculture, but never to the extent seen after colonization. Their method of agriculture was small scale subsistence farming. European contact first arrived in 1652, when the Dutch East India Company sought a refreshment station near the cape to help its ships sailing to Indonesia. European arrival was not without violence. San peoples experienced a near genocide at the hands of Europeans from being shot by raiding parties and the encroachment of cattle herders on their land. The Khoekhoe integrated into the European economy set up in the Cape and many converted to Calvinist Christianity. Zulu peoples continued armed resistance against European control until as late as 1900, increasing tensions within the area. The early colonial period was a time of intermingling of races. As African women frequently bore children with European men, and slaves from other parts of Africa and Southeast Asia continued to enter the area, South Africa developed a complicated system of race classification that could be very arbitrary (Heribert & Moodley, 2005, p. 48-58). This haunted the prejudiced governments of the twentieth century as they struggled to find a way to classify people based on race.

Later, the British would take an interest in the colony and spend years fighting for it with the Dutch. Settlers from Europe continued to enter the area, including Germans, Dutch, and French Huguenots. Around the beginning of the nineteenth century, Great Britain sent skilled workers with their families to inhabit the colony. The influx of British settlers and abolition of slavery pushed the Afrikaners inhabitants inland. The result of this 'Great Trek' was two separate Afrikaner Boer Republics, the Transvaal, and the Orange Free State. With British control came waves of immigrants from the then British colony of India. Originally hired as indentured servants, many stayed after their contracts expired. The group faced discrimination from both white and black South Africans (black South Africans criticized them for taking jobs) (Heribert & Moodley, 2005).

Natural resource extraction began in the mid-nineteenth century. Quickly, money poured in from Europe to build an infrastructure in South Africa that revolved around the extraction of diamonds and gold. The industrialists, such as Cecil Rhodes, who pioneered such ventures, gain wealth and considerable influence throughout all Southern Africa. Populous, long-term settlements allowed money to stay in the region and promote economic growth, instead of being immediately taken back to Europe.

This allowed for the area to industrialize earlier than other colonized parts of Africa. Industrialization also brought about more interest in the country's interior, and the growing European presence there forced native South Africans into denser communities. The strain from colonization collapsed most of the pre-colonial economy, forcing native populations to mines and slums to look for work (Heribert & Moodley, 2005).

Increasing activity and desire for control over precious resources brought the British back into conflict with the inland Afrikaans. The Boer republics fought a guerrilla war against the British with international support but lost after suffering heavy casualties (Heribert & Moodley, 2005, p. 48-58). By 1902 the Transvaal and Orange Free State republics were forcibly joined with the British Cape and Natal areas. With imposing British rule came white authority over the colony, further disadvantaging the non-white inhabitants. This was most poignantly seen with the 1913 Native Lands Act, which established the homeland areas as "Native reserves" for native African inhabitants. The area allocated for them made up only 7 percent of the country's total area (Heribert & Moodley, 2005). British cruelty during the war, including the use of concentration camps and attacks on rural non-combatants, sparked a flourishing of Afrikaner nationalism. The sentiment grew after the fighting, when British continued to discriminate against all non-English populations. A high percentage of Afrikaans gained the reputation of being "poor whites" without land or jobs, as the English preferred African workers to Afrikaans because they thought Africans were more obedient and accepted lower wages (Heribert & Moodley, 2005, p. 48-58).

In 1948, the Afrikaner National Party gained control of the government because most of the (white) voting population was Afrikaans, not British. After the election, the Afrikaner National Party implemented the apartheid system with a focus on separate development. This system frowned upon assimilation into European culture and instead categorized black South Africans into a few different "tribal" groups that rested below a unified white population on the social ladder (Heribert & Moodley, 2005, p. 48-58). Originally eight of these groups existed, with two more created in later years. Reinforcement of this system came with the creation of Bantu Authorities in 1951, just a few years after apartheid began, and was furthered by nominally giving the homeland areas self-governance (Southall, 2015). Public encouragement of cooperation between Afrikaans and British helped form one white minority population that kept control over all non-white groups. "Coloreds" and Indians, populations originally left out of the system, later gained a place somewhere in the middle of white and black, as they possessed voting rights but did not have a power equivalent to whites (Heribert & Moodley, 2005, p. 48-58).

Apartheid included segregation of peoples based on race. It achieved this by implementing racial practices in different spheres of life. These included physical separation (including the formation of homelands or Bantustans and the separation of cities into white and non-white living areas) and differentiation of services and facilities (distinct hospitals, schools, universities, bathrooms, etc., for whites and non-whites). Those in power crafted an illusion of equality by establishing homelands as quasi-independent

states, justifying the exclusion of rights to black South Africans throughout the country. Policies intentionally heightened social divisions; for example, passing laws created barriers to entry into urban workplaces for rural blacks, and different ethnicities possessed unique education systems (Heribert & Moodley, 2005).

By the end of the 1980s, apartheid was becoming visibly unsustainable. The collapse of the Soviet Union left resistance fighters without an arms supply and therefore willing to negotiate. The compromise reached shifted political power to new demographics but kept the economic system intact. The democratic elections that followed in the year after 1994 showed promise for the country, though it may be too soon to tell how successful the new government will be over a longer time period (Heribert & Moodley, 2005).

HISTORIOGRAPHY

Texts revolving around water in the pre-apartheid era in South Africa often focus on a specific public works project, including dam building and other irrigation schemes. They designed these projects to ease water issues in a small area of the then British colony, such as the Kamanassie irrigation scheme in the Western Cape and the Buchuber irrigation scheme near the Orange River (Visser, 2018). Previous works highlight the proximate purpose of the water projects, to ease the suffering of the rural, poor, white South Africans. They accomplished this goal in two ways: by improving the water situation, and by providing construction jobs for unemployed persons. Few articles mention how the projects affected non-white citizens, probably because few projects concerned themselves specifically with people of color. The agricultural sector was almost exclusively white (Visser, 2018). The sources that deal with the role of black and colored South Africans frequently discuss how governmental projects were hostile towards those people, or how they were under-prepared for the roles they sought to fill (Holbrook, 1998).

The creation of these projects were not only to improve drought, some projects, such as the Winterton Irrigation Settlement (1902-1904), served an additional purpose. They broke up sizable chunks of land for redistribution. With the Winterton Irrigation Settlement, this was not to assist the poor, but to increase the productivity of the land, as the large farms proved inefficient (Whelan, 2019). A similar concept, noted by Holbrook (1998) when explaining the 1976 Tyefu Irrigation Scheme, involved communal land being voluntarily surrendered, and irrigated land being redistributed. However, this redistribution seems to be primarily to aid the rural poor. If the other projects involved land distribution, it was not noted. Why some projects included land redistribution and not others is unclear. It might be because of the unique concerns of the region in which the project was being implemented. As it seemed foolish to underutilize land, even as a large landowner, it may have been a problem specific to the Winterton area. And the voluntary succession of communal land may not have been possible, or well received outside of Tyefu.

Visser (2018) notes the impact of climate change as a cause of drought and as a motivation for creating long lasting water projects. This is consistent with concerns expressed by government officials and other powerful figures in the primary literature. Interestingly, considering the prominence of the topic in primary sources, this is the only secondary source to mention climate change as a cause for water issues. The rest of the early twentieth century texts focus on cyclical droughts, common in South Africa, occurring every few years for interminable stretches of time. Climate change plays a greater role in post-apartheid water issue sources, probably because of increased scientific knowledge and the compilation of decades of climatological data.

Post-apartheid research on water in South Africa does not focus on specific projects, but on the influence of water through different lenses, be they social, scientific, or governmental. In their articles, Julia Brown and Philip Woodhouse both document the hopeful, yet plagued water reform initiatives throughout the country. Such reforms were needed because the distribution of and access to water was certainly tainted by the systematically racist apartheid government. Brown (2013) deals with the implications of entrenched white power and how it prevents change from occurring. Woodhouse discusses the necessity of water reform, as well as land reform. He also mentions hindrances to water reform, including multiple governing bodies attempting to control the same sources (Woodhouse, 2018). These two authors describe why and how water remains a racial issue, despite the formal end of apartheid.

This is another trend in the literature of water in post-apartheid South Africa: a greater emphasis on the social aspects of water shortage. Marcelle Dawson expands on the relationship between people and water with an article about water use in Soweto. It examines how, even after apartheid, water access and control remains an issue with serious social implications (Dawson, 2010). Karen Piper pursues a similar theme in her article about water during apartheid. This article examines the systematic water inequalities put in place to subdue non-white populations (Piper, 2014). In place of the discussion of specific irrigation schemes, authors on this topic cover why water is a social issue. Texts dealing with the early twentieth century hint at this, for example, by noting the beneficiaries of water projects or documentation of those hired to complete the projects, but never discussed as its own topic (Whelan, 2019). Once again, lack of sources for this topic may have caused this. The story of non-white South Africans and water was seldom told because the agricultural sector and water projects exhibited racial biases, that kept non-white groups away from water discussions (Whelan, 2019). Yet, their lack of presence in documents related to irrigation and dam building projects, may itself tell a story of exclusion. Here, recent literature has a distinct advantage. The people who have experienced apartheid and post-apartheid in South Africa can speak about their thoughts and experiences. There is no documentation of how South Africans felt about water issues before and after the shift in government, but there are firsthand accounts about the country's current water crisis and its impact on individuals. For example, Dawson's (2010) account of water use in Soweto includes the opinions of residents and officials who dealt with the change in government and post-apartheid water access issues.

The scientific sources about water in post-apartheid South Africa compared to pre-apartheid South Africa, vary in content and use of scientific data. As mentioned earlier, they recognized climate change in pre-apartheid South Africa, and Wessel Visser briefly touches on this subject. However, in pre-apartheid literature the topic is seldom mentioned, compared to the post-apartheid literature. The advancement of science and technology, and a compilation of South African weather and climate trends, allowed Piotr Wolski to scientifically study water in the country (2018). Wolski and others use these sources to offer explanations for droughts, model possible futures for a water scarce country, forecast the economic effects of water shortages, and offer potential solutions. They offer an analytical view of water in South Africa, which can create an accurate representation of the ongoing crisis facing the country.

Elizabeth Mettetal, Angea Mathee, and Tichantoga Gonah use scientific data to examine other water trends. Mathee (2011) examines the relationship between water and health in great detail. Mettetal (2019) focuses on infant mortality, and makes connections between infant mortality rates and clean water access. Gonah (2016) uses a different data set to examine acid mine drainage and its implication for water, health, and the environment. These authors benefited from emerging science to show various trends relating to the South African water supply. These trends are missing from earlier texts because writers and scientists lacked the data they needed to draw meaningful conclusions.

WATER INEQUALITY IN THE EARLY TWENTIETH CENTURY

At the core of all water issues in South Africa is rainfall. Drought has proven to be one of the country's central environmental issues. South Africa, which besides being largely arid, is prone to cyclical droughts. In 1901, *The Times* identified water as one of "South Africa's chief needs," necessary for expanding agriculture and attracting investment and immigrant laborers (South African Irrigation Colonies, 1901, p. 4). In 1902, William Willcocks, best known for his creation of the Aswan (Low) Dam, crafted a report on water in South Africa. In his report, he noted that one of the major issues facing South Africa was drought. The country could not continue to expand with an economy reliant upon agriculture, without a way to control and distribute water. In his words, "the long winter and spring drought and the uncertain summer rains absolutely prohibit agriculture of any advanced kind," meaning the country needed irrigation (Irrigation in South Africa, 1902, p. 11). He identified both winter and spring as being times of water shortage and summer as a time of water uncertainty.

South Africans knew of the seasonal water shortages facing South Africa, but multi-year droughts, like the one that plagued Cape Town around 2015-2017, posed another problem (Wolski, 2018, p. 26). In 1883, rainfall levels fell to 19 inches. The following two years saw "no rebound" in rainfall (*The Christian Express*, 1917, p. 5). Both 1899 and 1904 experienced droughts that continued throughout the entire year (*The*

Christan Express, 1917). In 1914 a drought began, continuing into 1916, at which time the rainfall was 18 inches below its former level (*The Christian Express*, 1916). 1916 appeared to be the worst year of this drought, though it continued into 1917 (*The Christan Express*, 1917). In *The Christian Express* review (1920) of *The Kalahari*, it writes about five “lesser droughts” and three “bad droughts” occurring in South Africa between 1875 and 1896 and ten “lesser droughts” and six “bad droughts” between 1897 and 1918 (p. 127). These numbers illustrate that South Africa had a water problem, and drought was at the center. This single precious resource in the arid country caused water inequality between people of distinct races (Review, 1920). It made people question why the rain was not falling and if there was anything they could do to stop the drought (Our Rainfall: Drying up of South Africa, 1909). It spurred different government initiatives and public works projects (South African Irrigation Colonies, 1900).

Soil played a role in water scarcity, both for its impact on farming and its ability to retain water. Inconsistent rainfall necessitated expansive irrigation projects throughout South Africa because nothing grew from under-watered soil. There would be no farms in the plains of South Africa, no people trying to extract wealth from it, no agriculture at all. “The soil comes next to the water in importance,” (Irrigation Problems, 1910, p. 3). When there was insufficient rain, the soil suffered. If soil was not treated properly, it contributed towards water scarcity. This idea was recognized by early twentieth-century South Africans who suggested soil remediation as a way to alleviate water shortages and reduce the water used for crops (Irrigation Problems, 1910). Water during drought years did not saturate the soil and grass, causing crops to shrivel and die (Irrigation Problems, 1910). Without enough rain, the vast swaths of land without irrigation in South Africa were worthless. To even think of farming land, a reliable water source had to be present such as the Orange and Vaal rivers. They believed these rivers to be key to expanding agriculture in the country as the basis of irrigation projects (South African Irrigation Colonies, 1901).

The final environmental factor that affected water levels was climate change. While climate change has received much attention in recent years, the idea has existed for decades. In 1916, *The Christian Express* reported, “South African climate is changing,” specifically regarding rainfall levels (*The Christian Express*, p. 34). Two years later, the newspaper described the possibility of long-term soil erosion detrimentally shifting the course of rivers and rain shortages, decreasing atmospheric water levels and increasing ground evaporation (Review, 1920). To find out with finality whether or not the country was drying up, and therefore experiencing climate change, South Africans called the government on to study climate in South Africa by recording weather trends such as rainfall. They also suggested for the government to compare the data collected with climatic trends from other countries, specifically those with a similar climate to South Africa. This would hopefully provide a definitive answer to if South Africa was drying up (*The Christian Express*, 1916). South Africans knew that climate change was a potential cause of their water problems. However, unlike how climate change is often conceptualized today, it was generally thought to be beyond human

control, with some exceptions. These included raising cattle and creating more run-off (*Our Rainfall: Drying up of South Africa*, 1909). They grasped that there were long-term climatic patterns that contributed to their lessening rainfall.

Even before apartheid officially began in 1948, segregation and inequality marked South African society. This extended to the placing and access to water, and the effects of drought on people. Drought in the early twentieth century created shortages of mealies, an important food source in native communities. Additional mealies could be bought but only at inflated prices, too high for struggling native communities suffering from a lack of water and poor harvest. Despite the drought, the surplus and import of food should have been enough to keep prices low. They attributed high prices to the greed of Europeans (*The Christian Express*, 1917). Those of European descent were better able to escape some of the worst effects of the drought. They had a buffer of wealth and privilege that native South Africans did not have.

Recurring drought left a void that needed to be filled. Water control needed to be implemented, either by the government or others. Interested parties suggested plans to expand irrigation and infrastructure in new areas of the country. South African land, if properly irrigated could support a thriving agricultural sector to the benefit of poor whites and “progressive natives,” (*Review*, 1920, p. 127). This plan, unlike many other irrigation schemes, mentioned indigenous South Africans. They were potential beneficiaries, but only those considered “progressive.” This presumably refers to the wealthiest, most agriculturally productive, and assimilated black South Africans. The plan illustrates no intention of helping natives. This view of native South Africans as lesser than their European counterparts is a theme in this newspaper. In the previous article mentioned, it asked of the inflation of prices, “Does it seem that Europeans wits and capital should be pitted against the Kafir’s improvidence and short-sightedness?” (*The Christian Express*, 1917, p. 5). Though *The Christian Express* argued on behalf of black South Africans, it viewed them as handicapped beings when compared to whites. The newspaper displayed paternalistic behavior towards black South Africans.

There was obviously a water problem. People both in South African and in England knew of it. So, what was being done about the water crisis? Quite a lot. By 1900 there were thirty-one private and public South African colonial irrigation projects known to the Public Works Department. By the early twentieth century the Cape Colony region had attracted several project ideas, but other areas of the country, such as in the Transvaal and the Orange River State (as it was known at the time) were largely forgotten. Yet, the implementation of a few minor projects showed that irrigation projects were both possible and profitable throughout the country. In 1879, an irrigation canal was dug at Upington off the Orange River, which successfully irrigated the land and increased its value to fifty pounds per acre. There was a similar project off the Vaal River at Warrenton, which allowed for earnings of up to £100 per acre from the produce it grew. These were not British government schemes, they were local projects, undertaken and maintained by those that enjoyed them. Private projects existed at a larger scale too. For example, the Smartt Syndicate created a dam near Britstown that

could irrigate 1,000 acres and a man named Weingarten constructed a complicated water pump system to irrigate 7,000 acres near Upington (*South African Irrigation Colonies*, 1900).

The government projects tended to be more expensive, and sometimes poorly done. In later years, they had a significant racial element. Their aim was two-fold: to increase the profitability of the country and to settle it with white Europeans (as a way of maintaining their control over their territory). By the turn of the century they had undertaken several throughout the colony. At Van Wyk's Vlei they built a dam to hold 35 million gallons of rain and river water, and off the Vaal River the Douglas Irrigation Canal was dug (*South African Irrigation Colonies*, 1900). These are both examples of early governmental irrigation projects that established a framework for all future projects. This framework included creating projects that assisted poor whites, with minor concern for the native South Africans whose lands they were inhabiting.

It is important to note that in 1900, when *The Times* published this article, South African society encouraged private irrigation projects. The success of previous irrigation projects, such as Upington and Britstown, proved their usefulness. They hoped these early small successes would spur on more companies to begin irrigation projects throughout the colony. Yet, these projects were not expected to stand on their own. Experts and writers recommended the government provide aid, specifically government subsidies and free use of land. This would ensure that work began and continued until complete, to the economic benefit of the colony (*South African Irrigation Colonies*, 1900, p. 3). However, the government's role in irrigation projects quickly changes, based on how desperate the water crisis seems.

In 1901, the British brought William Willcocks to South Africa to do a survey of the irrigation potential of the colony. Famous for his work on water public works projects throughout the British Empire, Wilcock's work on the Aswan Dam, pleased the British so much that they sent him to South Africa to assess the water situation of the colony. His report earned him a knighthood. Willcocks was a vital tool of the British empire, used to shape and modify their colonial landscapes to whatever they wished. In South Africa they wished to transform the arid landscape into something suitable for large-scale agriculture. His projects helped solidify colonial rule in South Africa and across the British Empire (Ozden, 2014).

In his report about water in South Africa, Willcocks suggested that all rivers in the country become public property, citing the failure of private projects elsewhere as the reason (*Irrigation in South Africa*, 1902). He did not mention the same projects the earlier article mentioned, perhaps because, despite his research on the country, he remained unaware of their existence and successes or perhaps they were not at the scale he imagined future South African irrigation projects to be. He lamented that the land was chronically underutilized, except for a minor part of the Cape Colony, and it needed intense water development to become profitable. Another aspect of his reasoning against private projects was that those who pay for them become impatient

to see a return on their investment and preemptively overuse their water resources. Wilcocks' notes that he looked to other countries to draw this conclusion, not the projects already attempted in South Africa (Irrigation in South Africa, 1902). If he had looked at previous works, which projects had succeeded and which projects had fallen through or become an economic burden, he may have made other recommendations. His plan involved using money from mining taxes to fund various irrigation projects (Irrigation in South Africa, 1902). He also believed land and water taxes were also to be crucial. These would encourage large landowners to make their land more productive. Not only would this help cultivate and irrigate the land, but it would also provide an opportunity to settle poor whites along the irrigation waterways (The Irrigation Report, 1902). This report spurred the next wave of irrigation projects in South Africa.

These projects sought to irrigate South Africa on a grand scale. Irrigation would allow agriculture, as well as mining, to support the country's economy. Irrigation schemes also had the immediate benefit of employing poor, white workers who could farm the land they irrigated. Native South Africans and other non-white people (namely Indian immigrants or people of Indian descent) also took part in the construction of some of these projects. However, they were not the demographic that the projects sought to aid, and they thus received poor treatment while working on the projects. They worked as a source of cheap labor because project managers did not view them as equal to their white counterparts (The Irrigation Report, 1902).

The Lifford Irrigation Scheme off the Fish River was one project that used people of distinct races as sources of labor. As suggested by William Willcocks, this project featured high government involvement. Though constructed on privately owned land, the Lifford Irrigation Scheme (1908) received government financing through the loan system, and Irrigation Department assisted in surveying the project. The Mooi River dam exemplified Wilcocks vision in its fullest form. It was a government irrigation project in its entirety, created not directly for irrigation, but to conserve the water supply of the river. This would make the Fish River more suitable for future irrigation. Unlike the Lifford Irrigation Scheme, this project only employed between 100 and 400 white people, depending on the stage of production (Irrigation: The First Big Dam, 1908).

A few years after the Lifford Irrigation Scheme, the government started work on the Hartebeespoort Dam. This irrigation scheme was in construction from 1916 to 1925 near Pretoria. This project, too, was highly racialized. It emphasized relief on poor whites, through use of white labor and resettlement of white people onto the land after construction was completed, to increase government support among the white working class. Projects, such as this one, created a barricade between people of color and the agricultural sector. Resettlement especially was detrimental because it blocked colored people from having access to arable land (Visser, 2018). The 1913 Land Act did something similar. It blocked black South Africans from owning land outside of "constitutionally defined 'tribal' reserves" (Woodhouse, 2018, p. 1-2).

The Kamanassie Dam near Oudtshoorn in the southwestern Cape mirrored the social aspects of the Hartebeespoort Dam a few years later in 1919. Besides creating a lasting water supply, they designed the project to employ and then settle poor whites. The Kammanassie Dam project had non-white workers employed during construction, but the treatment they received was underwhelming. They remained socially and physically apart from their white counterparts. Black workers lived sequestered in the black labor camp, across the river from the white labor camp that included improved facilities such as recreation areas and schools for children. Unlike white workers, management rarely allowed black workers to bring their families (Visser, 2018, p. 50). Before completion of the project in 1925, the government created a “civilised labour” policy which led to an even greater preference of white workers over black (Visser, 2018, p. 52).

Conversely, the Lower Tugela Irrigation Scheme in the Natal area aspired to aid African farmers, who had provided locally grown food to the area before the Langalibalele Uprising scattered the “market gardeners” (Whelan, 2019, p. 42-47). This scheme involved bringing water and infrastructure to a remote area of South Africa to develop and diversify the agricultural sector in the area. The irrigation scheme sought to dam the river and create canals on either side to increase the irrigated area. Unfortunately, creating the irrigation scheme involved breaking up large land ownings where African “squatters” lived. The Upper Tugela Irrigation Scheme was a similar project tailored to help poor whites. Together these projects make up the Winterton Irrigation Settlement on the Little Tugela River in what is today KwaZulu-Natal (Whelan, 2019).

The Winterton Irrigation Settlement project experienced moderate success. Despite setbacks such as food shortages in 1903 and 1904, droughts and intense rain in 1904, and tough terrain, the project continued until complete. It continues to operate to this day. It was also socially successful. It allowed for small communities to control their water supply, increasing “social and cultural cohesion” in settlers (Whelan, 2019, p. 63). This project was successful because of excellent planning and follow through. Before starting, developers considered the social aspects of the project. During the construction they adhered to that plan, even when faced with difficulties (Whelan, 2019). This project was almost unique in its success. Many other early twentieth-century irrigation projects were unsuccessful. They fell through or cost more money than they could ever hope to make. Rather than ease water issues in the country, the failure of these projects made problems worse.

Irrigation in early twentieth-century South Africa frequently failed to ameliorate the country’s water shortage. Officials proposed these projects with good intentions, to help poor farmers and bring water to the dry areas of the country, but the projects suffered from poor planning and follow through. Projects began preemptively, before the proper research on the project and area had been conducted (Farm Irrigation, 1907). The Kammanassie Dam, for example, provided jobs to poor whites, but failed to provide a consistent source of water to the area because “the land was unsuitable for permanent irrigation” (Visser, 2018, p. 57). A similar project, the Buchberg Irriga-

tion Scheme, constructed from 1929 to 1934 in the midst of the Great Depression, displayed similar results. It provided short-term employment, yet, because of low water levels, it partially shut down soon after completion (Visser, 2018).

Even before 1900, the government in South Africa had a history of failed projects. One project in 1882 at Van Wyk's Vlei cost £18,000 and failed to reach the necessary water level of 10 ft. They diverted a river to fill the dam for an extra £900. The project was almost a complete failure because of the poor understanding of the area. Very few settlers moved onto the land after the diversion, and the project produced limited profits (South African Irrigation Colonies, 1900).

The 1890 Douglas Irrigation Canal also failed. Work on the project began without sufficient surveying being done. During construction, the Public Works Department declared the area to be unfit for the project. Construction restarted elsewhere at a substantial cost. Before the shift, the Public Works Department suggested buying more land for the project to increase profitability. The suggestion went ignored and the interest the project paid was 5% instead of the possible 12% (South African Irrigation Colonies, 1900). The Sutherland Dam, from the same time period, was also a disaster. An engineer warned against the project, though the municipality began it anyway. The dam reportedly broke open almost immediately after completion (South African Irrigation Colonies, 1900).

Governmental failures to ease water concerns in South Africa extended beyond failed irrigation projects. In Johannesburg in 1909 millions of gallons of water went unaccounted for. Engineers present could not discover where the water was going. Miners and household gardeners were both suspected of stealing it. However, these were only rumors. Excessive rainfall inundated the city with water, instead of a drought, presenting another governmental failure in water control. It could deal with too much water, no better than it could deal with too little. In this instance, the walls and carpets of Johannesburg residents were soaked through (The Water Problem, 1909). Water contamination was another public concern. In Johannesburg, residents drank whisky or soft drinks in place of water, because of fears of contamination (The Water Problem, 1909). Misinformation about South African rivers and rainfall presented a unique complication in that it inhibited well-functioning irrigation schemes from being planned (Farm Irrigation, 1907). Without correct information about water levels in an area, irrigation projects were susceptible to drying up. Some dams held water, but rarely enough to become useful (Visser, 2018).

Other types of irrigation experienced mixed success. In some areas non-governmental projects from earlier years were in place and available, needing only to be properly used to be beneficial (Farm Irrigation, 1907). Other regions saw small scale irrigation developed in places of government irrigation projects. These projects made use of "flood irrigation and earthen furrows," but irrigation of this nature was inefficient and water costly (Visser, 2018, p. 57). Irrigating their land forced farmers to take out loans they could not afford. Crushing debt made it difficult for farmers to properly tend to

their land and crops which contributed to water use issues and poor crop yields (Visser, 2018). There were also alternative measures proposed to aid the water crisis such as well sinking. Well-sinking was an alternative option promoted by the government. This method involved drawing water from the ground instead of open water sources such as rivers. While it proved useful for providing water for stock, it was not effective for large-scale irrigation (The Irrigation Report, 1902). Some presented reforestation as another solution to drought. They viewed reforestation as a natural method of water conservation and as an idea with the potential to increase rainfall. Forests could act to prevent transpiration, locking water in the soil, as windbreakers, hindering evaporation from dams, canals, and other surfaces (Our Rainfall: Drying up of South Africa, 1909). A way to achieve this would be to plant hearty vegetation across surfaces that could not be irrigated, but could receive sufficient rainfall. To encourage this, some proposed that the government implement a tax on all landowners, which allowed the possibility of tax reduction if they forested a certain portion of their land (The Christian Express, 1916).

Education to combat the crisis was suggested. *The Times* noted how few farmers used modern scientific methods to water their crops, creating poor quality produce and excess water use. If educated on how to care best for each type of crop, farmers could reduce their dependence on irrigation projects. It also noted that if farmers focused on the quality of their crops over the quantity, expansion into European markets would become a possibility, increasing economic prosperity without straining water demand (Farm Irrigation, 1907). For education to improve the efficiency of irrigation and agriculture, professionals and farmers needed correct measurements of rainfall (The Christian Express, 1916). As stated previously, false measurements of rainfall and water levels led to the failure of dams and canals. It made it difficult to implement modern, location specific farming practices. If this information were accurate, farmers could alter farming practices and irrigation projects to suit the area, maximizing their usefulness. Another strategy was to make focus on soil remediation, targeting the ground during irrigation, not the crops. This improved the quality of the crops while reducing water usage. However, to do this also required the proper education. Farmers not only needed to know about their lands, but also how much water was the right amount, how much was too much, how to grow healthy crops, and instead of just plentiful crops, what were the newest ideas in agriculture. They needed the most recent information on the mechanics of water to improve the condition of agriculture throughout the country (Irrigation Problems: Treatment of Soils, Best Use of the Water, 1910).

Curiously, William Willcocks also suggested educating farmers on how to set up and maintain irrigation projects in his early twentieth-century report, though it never appears to have been implemented. In it he suggested creating “model irrigation farms” to send farmers to work as apprentices. Willcocks does not specify if the education would have been for all South Africans or only those of European descent. However, given the racially biased attitudes expressed during his evaluation it can be presumed he meant white, British-descended South Africans. These apprentices would learn

their craft under the supervision of experts in the field, then return home, educated on proper irrigation methods and ready to apply them to their own lands (The Irrigation Report, 1902). Why no one implemented this idea is uncertain. South Africa and Britain carefully heeded Willcocks' report in many aspects, but this suggestion received little attention. Perhaps they thought it economically unfeasible and the profits it would bring were not so great that they warranted its creation. This seems in keeping with the government's attitude towards irrigation. As seen previously, there was great emphasis on quick, cheap projects, preemptively started before conducting proper research. The state remained unconcerned with irrigation in the long term. Irrigation dealt with providing short-term relief to the poor and water-stressed areas. Irrigation schooling would not have immediately provided the same results as dam building or canal digging, the benefits of education took years to manifest, when apprentices had completed their education and applied it to their own lands.

Water inequality plagued South Africa during the early twentieth century. An arid climate and increasing water demand contributed to water scarcity. Access to water varied among people of different races. White populations possessed a distinct advantage over non-white populations when seeking water. White South Africans also benefited from public works projects aimed at increasing water security. Such public works projects included dams and canals and aimed to both protect against water scarcity and alleviate white poverty by hiring white workers and settling them near the finished projects. As apartheid began in the mid-twentieth century, water inequality remained stark and racially divided. Separate development increasingly marginalized black South Africans in their own, underdeveloped, and under resourced communities, whether in homeland areas or in segregated communities outside cities. Limiting water access became a popular technique for controlling restless populations (Piper, 2014). Droughts remained frequent and the climate arid, with little significant change (Wolski, 2018). The issues created by colonialism continued to cause issues for the country and its inhabitants throughout the 20th century. These include the reliance on large-scale agriculture, requiring the use of enormous volumes of water, in a primarily arid climate, and mining, which involved many ecological repercussions, and racial inequalities in almost every sphere of life.

CHANGE AND CONTINUITY IN RECENT YEARS

Irrigation projects, well-sinking, reforestation, and government control of waterways, did not solve South Africa's water problem. For example, a severe drought in 1992 and 1993 cost seventy thousand jobs and shrank the country's GDP (Piper, 2014). In 2017, Cape Town faced a drought so severe that it had a "Day Zero," when tap water would be shut off and water rationed (Wolski, 2018, p. 24). Citizens would be forced to go to "military guarded standpipes" for water rations (Cotterill, 2018, p. 7). Despite the efforts to secure water at the beginning of the century, water security was still an issue when apartheid ended, and continues to be so into the present day. This section examines the role of water in South African society in the years following apartheid, including its environmental concerns, continued droughts, water inequality

ity, and how modern South Africans view the ongoing crisis. I also restate why water is a social and environmental issue in South Africa, incorporating modern evidence to explain the water crisis. While discussing the underlying causes of water shortages throughout the country, there is a greater emphasis placed on scientific research because of the technological and methodological enhancements made since the early twentieth century. However, the most important underlying feature of drought has not changed: South Africa does not have a stable, continuous source of water, enough for both its people and its economy.

The fall of apartheid in 1994 ushered in a new era in South Africa, one where they would collectively address the inequalities of the past, including extreme water inequality. In the last days of apartheid, 70% of South Africans had access to a meager 11% of the water supply (Piper, 2014). The equalization process took many different forms when addressing social and political water concerns, such as the 1963 laws that pushed black South Africans to the “homelands” that struggled to maintain a regular harvest because of inconsistent and low levels of rain, educational and legal restrictions that favored white people, and lack of water control infrastructure in black communities (Brown, 2013, p. 274). Unfortunately, reforms were not always successful. Despite living in a nominal state of equality, marginalization of certain groups continued, forcing them to compete with those who had superior resources and understanding. The struggle for water equality is ongoing. Even during the most recent Cape Town drought, cries of inequality rang out. The situation is constantly developing as the country struggles for both equality and a sufficient water supply.

Initially, Nelson Mandela’s new government created the Reconstruction and Development Program to guarantee access to clean water for all. The plan was to occur in phases, the first being to provide at least twenty liters of water a day to every person within a radius of six hundred feet. Future phases planned on increasing the quantity of water and bringing it into homes. It also included economic initiatives to remove some burden placed on poor black communities marginalized during the previous system (Piper, 2014, p. 105). In 1998, the National Water Act addressed similar issues. This act developed logical goals, established water as a “national asset” and did away with previous “riparian rights” (Brown, 2013, p. 271-279). These goals included equal water access, sustainable water supplies, water control, protection of irrigation works, maintaining a clean and healthy water supply, and more (Woodhouse, 2018). Whether these goals have been met yet or will ever be completely achieved is up for debate. However, the chronicling of these desires shows that the country is both recognizing and taking steps to change its past water inequalities.

Despite a shift in government, some of the country’s most vulnerable view newly implemented water control measures as a new apartheid. Instead of discrimination based on color, it featured discrimination based on wealth. The poor consistently went without, while the rich enjoyed their luxuries. Water was accessible in rural areas and informal settlements, but only to those who could pay. While certain individuals found this tolerable and an improvement, others could not afford it. Instead,

they walked to rivers or watering holes, knowingly collecting dirty water because they could afford nothing else. The change in policy, brought about by apartheid's end, signaled vast social changes. The government promised everyone access to basic services such as sanitation and clean water, but the government wanted the poor to pay for these basic services. Water, specifically, was brought to new areas under the impression that the price paid by users would be enough to cover all costs, if not make a profit (Thompson, 2003).

Water payments became the standard for all South Africans after apartheid. With the shift to democracy, the country gained access to loans from the International Monetary Fund (IMF). South Africans needed the money to forge the new democratic society Mandela had dreamed of, but there were drawbacks. One condition for accepting the loan was paying back the debts of the old government, including those generated by water. After making the deal with the IMF, businesses entered black communities to extract the owed money. It privatized water. A company called Suez took control over Johannesburg water supply in 2000, raising prices by 55%. In the new system, townships faced consistently higher price increases. Companies gave some residents massive bills for past water use they had no hope of paying, others could not even afford to pay the initial connection cost. They added additional expenses to cover the cost of the Lesotho Highlands Water Project. This project was one of the largest water diversion projects in the world. It takes water from the water rich Lesotho and supplies it to South Africa. When it displaced many Lesotho residents they protested, until the South African military was brought in to end the resistance, killing at least seventeen people. The project is believed to have further impoverished the country. The added costs of the Lesotho Highlands Water Project had disastrous side effects. The World Bank recommended threatening to cut the water supply if people did not pay. Suez did so without warning. After water payments joined with housing payments, Johannesburg was able to use a violent security company to evict those who did not pay. The result of placing the weight of old debts on the poor was that, following apartheid, up to ten million South Africans went without water and the number of people with access to water decreased (Piper, 2014).

When water payments continued going unpaid, Suez introduced a meter system. This system involved placing meters in homes and communities which would turn on the water supply when paid for at the meter (using tokens). Britain banned the same system because of the public health concerns involved, such as not flushing toilets. Meters also posed a safety hazard, as house fires could not be put out if they did not own enough tokens (Piper, 2014). Soweto residents felt discontentment with this system and resisted the commodification of water in their community. The community was given water infrastructure but expected to pay for it after an individual used a certain amount. The water meters installed generated animosity from the residents who saw them as new tools of control. The idea behind them was supposedly less malicious. The government believed that part of being a dutiful citizen included contributing money towards the public good, therefore water was a right for those that were dutiful citizens. Meters also encouraged residents not to waste water needlessly, believing that

if they used it smartly, they would not go over the free limit. This encouraged water saving practices unfavorable for the community including less bathing and cleaning, and water reuse (Dawson, 2010). The environmentally friendly nature of these meters is questionable. However, this was how Suez marketed them, though it is unclear if they produced any environmental benefits (Piper, 2014). After gaining access to new rights and services after apartheid ended, not being able to afford the services frustrated the community. As some of the country's poorest, they did not have the financial means to bear this additional burden. It did not help that post-apartheid governmental policies designed to create more jobs, primarily created low-wage ones, where the workers could not make enough to sustain a healthy lifestyle. It also excluded them from fully enjoying their newfound citizenship. Indeed, the reality for many of the non-white poor was that the end of apartheid did not affect them strongly. Where once they faced exclusion because of race, they now faced exclusion because of money. They could not afford to pay the price of citizenship (Dawson, 2010).

Institutionally, water management suffered under the new government. The Water Users Association (WUA) disagreed about its day-to-day operations, preventing it from creating much needed change. Sometimes, control of local water supplies rested with multiple governing bodies. The overlap between groups caused tension between them and confusion all around. The Inkomati area saw this when the Department of Water Affairs and Forestry and irrigation boards argued over the purpose of the WUA. The result was that the irrigation boards did not deliver the funds to the Catchment Management Area, which hindered water management (Woodhouse, 2018). Often, this separation allowed for the exclusion of marginalized groups from water discussions (Woodhouse, 2018). Likewise, the organizations involved with water allocation created an at least seven-year hold on new allocations to black farmers because of a disagreement about whether the water supply could support a greater demand. Such a disagreement occurred despite there being evidence that aspiring black agriculturalists from homeland areas face greater challenges to receiving water than those with pre-existing claims to it. In other words, the system in place makes it easier for people with water access to keep it than for those seeking new water access to gain it (Woodhouse, 2018). The restitution process also suffered because of issues with farm ownership changes. Of the redistributed areas, many of the farms set up on the land could not endure the turbulence of the time and ultimately collapsed (Woodhouse, 2018).

Socially, the country was not ready for such a big shift. As previously mentioned, diversity initiatives struggled to meet their goals and relevant parties in water decisions faced exclusion. Issues also arose because of misunderstandings between those trying to share water control, and those being introduced to it. Central to this topic is that for many black South Africans, their primary concerns involved daily necessities, such as jobs, housing, food, and water, which the privileged elite in government were liable to overlook. Uncommon life experiences between the two groups created ideological rifts in inclusivity initiatives. The greatest obstacles in participatory water control was reconciling the ideas of experts with the needs of the people (Brown, 2013). When blacks were incorporated into the decision-making process, they remarked upon their

confusion with the discussions and how they felt out of place (Brown, 2013). Legally now allowed into powerful spaces, the environment remained hostile to their presence. Poor communication between governing bodies and the communities they were trying to help heightened tension in this situation (Brown, 2013).

Efforts to provide a voice to black farmers could be abused. Instead of creating outlets for them to list their concerns and demands, the situation allowed for governing bodies to speak for them (Woodhouse, 2018). There was also the possibility that water redistributed could end up back in the hands of white farmers. This was a possibility because the legal framework of water control did not adequately protect black farmers (Woodhouse, 2018). The difficulties in revising a decades old system that supported racial separation made immediate equality measures tricky. Conflict existed between the immediate desire for greater equality and the harsh reality that dismantling the system in place would take time. This was a central problem of water reform in the years after apartheid. The entrenched white power over water control, established during apartheid, continued afterwards. It limited the amount of progress possible, while creating a confusing environment for those that sought the basic right of water access. The efforts to implement participatory control over water failed because of prior power imbalances. Those who gained power during the apartheid era used it to stay in control afterwards (Brown, 2013). Beyond direct control of water, power over other resources, such as water specialists, remained with a primarily white population (Brown, 2013).

The continued water inequalities throughout the country created many social repercussions that strongly affected non-white communities. In 1992, at the end of apartheid, *The Times* published an article detailing South African's concerns and issues that came with a strained water supply. As people realized the population and standard of living, including water use would continue to rise, fears grew about the water supply drying up, predicting it would be completely gone by 2010. In homeland areas, residents relied on water trucks to supply water, which often involved waiting in lines and made communities reliant on fickle governmental institutions. Years of low rainfall created drought refugees, hoards of people fleeing their homes in search of water. These conditions heightened social tensions, with urban and suburban whites fearing their cities would become overrun with refugees in search of water (South Africa fights "water apartheid," 1992, p. 7).

Water inequality extended beyond simple access to water, following apartheid. The safety of the water varied from place to place and was more likely to be "unimproved" in homeland areas, impacting the health of the residents (Mettetal, 2019, p. 18). Pollution from dams, specifically, seeped into the water supply to the detriment of homeland communities. The tainted water supply caused an increase in infant mortality of up to 20% (though the prevalence of HIV/AIDS in the communities may increase this number) (Mettetal, 2019). Curable diseases are common in makeshift communities with deplorable living conditions. Among the more common causes of death of South African children is easily curable illness such as diarrhea or pneumonia

(Mathee, 2011). A 2001 cholera outbreak demonstrates the impact of water access on public health. Cholera, a disease transmitted through impure water and food, is fatal when the infected cannot retain enough water in their body, making it especially dangerous for communities that must walk long distances to reach potentially contaminated water. It was devastating in the poorest areas of the country, including rural areas with limited access to clean water and people living in very close proximity (Kline, 2000). Poor sanitation practices on behalf of water service companies facilitated disease outbreaks. Suez, the company that controlled water in Johannesburg, was also responsible for water treatment. It implemented unsafe sewage systems that allowed waste water to contaminate the rivers. It also required users to unblock their own sewage systems by removing waste with their own hands (Piper, 2014). Access to clean water for drinking, cooking, cleaning, and sanitation, could limit the prevalence of these diseases, as well as helping the ill recover.

Water safety is also compromised in areas that were the site of large mining operations. Mines can lead to acid mine drainage, which compromises a region's water supply. This problem is experienced all over the world, though is particularly problematic in South Africa, which experienced extensive mining during the colonial period, and is a water scarce country. Acid mine drainage occurs when metals exposed by the mining process mix with water and air to form sulfuric acid and dissolved iron. Once these chemicals have entered the water supply, they facilitate the dissolution of other heavy metals present in mines. To prevent flooding, early mines relied on gravity drainage, allowing for water to become contaminated as it ran through the rubble and then entered the water supply (What is Acid Mine Drainage, 1994). In South Africa, acid mine drainage occurred not just from the mines themselves, but also from the piles of debris created when gold was removed from ore (Gonah, 2016).

Acid mine drainage correlates with a host of water problems. The most direct is the elevated levels of sulphates and heavy metals. It hinders growth of plant (aquatic and otherwise) life, and subsequently animal and human life. At the level detected in some areas of South Africa the water is not safe for any use at all, from drinking to cooking to bathing. When the contaminated water flow reaches carbonate aquifers, the reaction of the two induces sinkholes, destroying precious aquifers in the water scarce landscape. It may also increase the rate of water contamination (Gonah, 2016). The cumulative effects of acid mine drainage make it one of the greatest threats to water security in South Africa. The combination of water scarcity and water pollution is potentially deadly to many of the country's most vulnerable including those in homeland areas. Those in water strained situations may face the choice of either drinking contaminated water or surviving with no water at all. Drinking the contaminated water may cause serious health concerns that are difficult to fix for those with limited access to the proper resources.

To address water inequalities required significant water reform. Woodhouse lists four major areas of water control in need of reform in the years following the end of apartheid, that sum up the obstacles the country must overcome to achieve equality. These

included systematic inequality of access to irrigated water supplies, “institutional dualism” that separated water access (specifically regarding large-scale farming) between white farm lands and ‘homelands,’ effects of land restitution claims on racial makeup of water and land access, and lack of diversity in the governmental organizations that controlled water (Woodhouse, 2018, p. 14). These areas of concern cover the most deeply rooted issues with water inequality that the country faces. Without addressing these issues, water equality is impossible. To fully overcome them will take years of work that continues to this day.

Fixing the first two areas of concern required the country to examine water and land access. Water reform came tied with land reform. People could not question the racial divisions of land without also considering water distribution between people of distinct races. Some suggest that water inequality was greater than income equality, though it would be more difficult to create water reform than land reform. A first step towards land, and therefore water reform, was to address the 1913 rules about land owning. In this new era, the country strove to give land back to its original inhabitants by providing government help in buying it. It also tried to improve “tenure security” for those on the “homelands,” (Woodhouse, 2018, p. 5). The Land Reform Act and Extension of Security of Tenure Act of 1996 and 1997 respectively, both aimed to “protect farm workers from eviction from houses and land they occupied on the commercial farms where they worked,” (Woodhouse, 2018, p. 5). The Extension of Security of Tenure Act (1997) acknowledged previous legal inequalities concerning tenure and land owing. It prevented unreasonable evictions off of tenured property because such evictions harmed individuals and society. While these measures did not directly address water issues, the land that was being redistributed most likely had access to greater water resources. The white farmers could have been the descendants of those who had built and settled along irrigation projects, reaping the rewards of water control. They had greater access to water than existed in the ‘homelands.’ Providing for land and housing security on the homelands protects a vulnerable population from homelessness and from losing meager water sources they have access to.

White farmers took part in solving land restitution claims, the third area of water concern, by willingly selling their land to the government who gave it to black South Africans who made claims to the land. This process saw initial success (meaning that redistribution of sizeable portions of land occurred) with later setbacks, such as the failure of farms on redistributed land and decreased land productivity (Woodhouse, 2018).

Water control diversity, like land distribution, saw both successes and failures. Governing bodies made efforts to be more inclusive, but misunderstandings and general confusion prevented true inclusivity. For example, for years the Water Users Association fought about its governance, membership, and its role, slowing diversity initiatives. Misunderstanding between specialists’ ideas and local needs existed. They recognized small scale agriculture as important but received no actual help in getting the water needed for it to succeed. These factored into the lingering water inequality

issues and illustrate one of the fundamental themes of water use after apartheid: the nation nominally sought to provide fair water access, but struggled to make any real change. At every step there were setbacks that delayed or derailed promising initiatives. Even matters as basic as quantifying water use and availability in specific areas required more resources than provided. The Inkomati area saw a similar issue. The Inkomati Water Management Area struggled with the mandatory reporting of water use (including the amount used and its source). To verify the data, it used satellite imaging to estimate the amount of irrigated land on a property. However, this process was financially draining and slow. It was so ineffective that in seven years (from its beginning in 2004 to 2011) the project redistributed absolutely no water “from existing commercial agricultural use” (Woodhouse, 2018, p. 15-22).

In some areas, there was tangible evidence of change. Rural regions of the country slowly gained access to running water, a desirable alternative to community members trekking to local sources. By 2000, new water infrastructure for distribution and filtration throughout the countryside of the Eastern Cape brought water to over 600,000 new users. Water still came from the river, only cleaned, filtered, and available in the community for the first time. Education about how to use the system and what they were paying for allowed for the indoctrination of the system, proving that education can be successful in instigating change. Explaining what the purpose of the payment was critical as during apartheid the few people with access to running water during apartheid would often not pay to express their frustration with the government and the services provided them. Retaliation came when the government shut off the water supply to misbehaving communities. Under the alternative system the installers explained that the charges were maintenance costs, not taxes. The benefits of local clean water sources were many, including saving people time by not having to walk to rivers and carry water back and preventing disease stemming from impure water consumption (Kline, 2000).

Following apartheid, South Africa struggled to achieve water equality. While some efforts were made, including implementing new laws and allowing for diversity in water management, the situation saw little improvement. Marginalization of non-white groups continued, only now based on financial status instead of race. Efforts to correct the wrongs of the past, by either redistributing land or incorporating non-white groups into water discussions failed because of miscommunication, confusion, or legal difficulties. The government failed to protect the interests of all its citizens in the years following apartheid, and so water inequality remained.

DROUGHT IN THE PRESENT DAY

Consider two recent rainfall records for Cape Town. In 2013, 1,100 mm of rain fell, while 2014 experienced less than half of that, only 500 mm. This is not a normal drop in the amount of rain received. Combined with poor water management and “over-exploiting most of its river systems” the country is in a precarious situation, needing to balance its water needs with a dwindling water supply (Cotterill, 2018, p. 7). This

type of shortage is an exceptional instance. The country had seen droughts before, but none this intense, and not in recent memory. Rainfall levels in 2017 may be the lowest seen since 1933 and the three-year period from 2015 to 2017 collectively received the lowest rainfall of any three years ever recorded in the 87 years of data collected. Statistical analysis of rainfall levels suggests that this period displays the lowest levels in 311 years (Wolski, 2018). By mid-2018, there was enough of a recovery to push “Day Zero” off until 2019 (Stoddard, 2018). But it never came. Imposing strict restrictions on water use (each person was to use only 50 liters of water a day) seems to have paid off (Stoddard, 2018). The crisis seems to have been averted. There is no longer a “Day Zero,” though water remains a concern. Readings of dam water levels for early February 2020 have shown a significant increase from the same time in 2019, yet with a drop in levels from earlier in the year (Head, 2020).

The unusually strong El Niño occurring in the Pacific is one of the immediate causes this drought is thought to be linked to. Yet, the impact caused by this heightened El Niño appears to be greater than the impact caused by similar strength El Niño events of the past. Low planetary current circulation from surrounding oceans worsened the drought by preventing moisture from reaching South Africa, as well as a strengthened circulation from northern parts of the continent (Blamey et al., 2018). Besides drier than normal conditions, the area experienced unusually high temperatures (*El Niño*, 2016). These factors influenced all of southern Africa, from South Africa to Madagascar and Swaziland. They all faced drought during these years, which wrought havoc on the agricultural sectors of their economy and the people who did not have the water they needed. Cape Town receives much attention because of its unique situation as a large, urban area without the resources to water its population. The extreme shortage in Cape Town may also be linked to its comparatively small (800 square km) water system that feeds it, making it susceptible to local climate conditions, and prone to drought (Muller, 2018).

Climate change is a popular explanation for the recent water crisis. Early analysis of South African weather patterns suggested this was a cause of their troubles, and that thinking remained throughout the century. There is some evidence that South Africa is experiencing gradual desiccation, with meteorological models expecting Cape Town to experience a decrease in rainfall levels by 2050. The fickle weather patterns that accompany climate change could prove detrimental to the situation (Muller, 2018). The South African Department of Environmental Affairs expects the country’s water supply to be the most sensitive area to climate change, causing powerful storms and unpredictable rainfall, as well as shifting runoff and soil conditions. In its 2016 report on National Climate Change, it dedicates an entire chapter to drought, the only weather conditions to receive such recognition (South Africa Department of Environmental Affairs, 2016).

However, climate change is not the only factor that led to “Day Zero.” It may not even be the most significant. South Africa has experienced severe droughts consistently throughout its history. In the early 1900s the government reacted to water shortages

by implementing irrigation projects, such as dams and canals. But these projects were poorly designed and carried through. Many of them failed to ameliorate water shortages. They forsook long-term benefits by hastily starting projects they could not use or complete, for short-term gains such as employment of poor whites. More recently, efforts to maximize water resources to meet demands from expanding industry and population shifted their focus to conservation of water and management of demand. Consequently, dam building in the early 2000s slowed, leaving the country vulnerable to water shortages. In 2009, the possibility of a drought in Cape Town received attention along with possible solutions, yet nothing occurred because of the cost associated with the projects (Muller, 2018, p. 175). One culprit that received blame was the Western Cape Water Supply System, which was accused of “poor planning and mismanagement,” and failing to take the steps necessary to prevent drought on such a scale (Wolski, 2018, p. 24).

AN EQUALIZER OR PERPETUATOR OF INEQUALITY?

Individual views of the drought and water security varied. Some Cape Town residents insist that the drought has brought the experiences of the poorest to even the wealthiest parts of the city. Others suggest that it has increased the gap between the haves and the have nots. To answer whether water shortages are equalizing, one must consider South Africans’ “normal” relationship with water. Experiences with water shaped what people determined to be water security or water scarcity. What was water scarcity for some, was security for others. For example, when water restrictions began, some felt it harshly, while others did not suffer. Those dwelling in temporary settlements or in townships regularly used less water than the amount allotted to the public during restrictions. Water scarcity is also a matter of how it affects people’s daily lives. It is determined by how much or how little water is accessible to those who need it (Meissner, 2018).

In the most unequal country in the world, water access varies dramatically. One source estimates that out of the 4 million inhabitants of Cape Town, one fourth of that (the poorest and most vulnerable) use 4.5% of the water resources. These are the people living in temporary settlements who had limited access to water to begin with. The ones most impacted by the drought are the middle class or the wealthy, who live in suburbs and can normally afford pools and gardens. Wealthy families are used to water always being there, they turn on the tap and the water flows. But the drought changed that. They could still turn on the tap, but only for a few brief seconds. Water was a national issue, not a household one and water conservation a priority. This strongly contrasts those who lived in informal settlements, like the townships. Inhabitants did not have the luxury of individual faucets. When they need water, they visit communal taps. Instead of using showers or bathtubs which rain down a seemingly endless supply of water, they use the water they collect in kettles and basins. One resident recalled having to switch from cleaning herself with two kettles to one kettle of water (Janssen, 2018).

The equalizing nature of this drought is brought to light when considering the racial intricacies of water access that existed before it began. As mentioned earlier, informal settlements use far less water than wealthy urban and suburban areas. These informal settlements, or townships, are predominantly composed of black residents and people of mixed race. Houses do not have running water inside them, so cutting back becomes less drastic. While wealthier areas must adjust to not flushing toilets or taking long showers, the inhabitants of townships never had those luxuries accessible to them. They also are used to lining up and waiting for water at communal sources that they then must carry home. Included in the plan for water use, if Day Zero ever came, was for water sources in townships to remain open, meaning that township residents never risked having no water at all (Seemungal, 2018).

Drought as an equalizer is illustrated by the social implications of the country's most recent drought. The people of Cape Town have seen a host of social changes since the drought began, impacting people of all races and statuses. The restrictions put in place to reduce water use were severe. The original water limit for every individual was 23 gallons per day, which changed to 13 gallons as the situations worsened (Jansen, 2018). The expectation was for the limit to fall to six gallons a day if nothing improved, though it never came to such extremes. To meet these requirements, residents of Cape Town had to forego washing dishes, using showers, baths and washing machines, and flushing toilets. They have been creative with using and reusing the precious water they have, including flushing the toilets with "gray water" collected from bathing or cooking. One resident noted that they had not flushed the toilet with tap water for over three months. Water wasting activities including washing cars and watering gardens were prohibited and anyone found violating these restrictions would be fined. The only way to continue with these activities was to buy water from elsewhere (Seemungal, 2018). But, residents of townships have faced similar restrictions for years, without drought restrictions being in place. When metered water came to Soweto, part of the education that came with it included water saving methods frequently used in the drought. A booklet distributed suggested measures like washing children together, turning off showers between rinses, and watering plants with recycled water (Dawson, 2010). These methods aspired to help save water and save money for the residents, unlike later restrictions which were only to help save water.

Unfortunately, water scarcity has changed cultural practices and weakened ties among kin groups and close friends, even while improving inter-class relationships. Insufficient water access left certain cultural practices in question. Communities had to choose between participating in cultural events such as festivals and weddings that used water, or foregoing events altogether. One option included water loss (through washing and cooking) and the other a cultural loss (giving up cultural practices for many years risked losing that practice altogether). Also, constant dissatisfaction with government and society over water issues appears in community life. It seeps into how people treat their friends and neighbors, tainting relationships based on who seems to have more than others. Even when the differences in water use between people are marginal, that the people who are involved in getting water to underdeveloped areas

are inaccessible and unable to listen to complaints creates bitterness throughout the community.

Individual relationships also experienced strain when community members turned away friends or extended family members in need of water, in order to keep their own family satisfied. Water costs and low supply made water too scarce to share among too big a group (Dawson, 2010). Withering of social networks was a process that began far earlier than 1994. With the rise of industrialization in South Africa, hordes of landless, unemployed, wandering masses changed community structure, as did the growth of slums (Heribert & Moodley, 2005). High levels of competition for work and few resources separated individuals from those around them. As with water shortages, the result was that households and individuals in a normally very social, interconnected community, turned inward, reducing their social presence to keep their needs met. This was a serious loss for poor South Africans, who often relied on extended social networks in times of crisis and demonstrates the expansive impacts of water shortages.

Tight water restrictions have caused rippling effects in South African society. Organizations installed tanks all over the cities and countryside to collect as much rainwater as possible. They were placed everywhere from malls to universities. Residents have been turning to natural springs, such as the Newlands Freshwater Spring near Table Mountain to supplement their water supply. They come with buckets and trucks to fill with water, though the possibility of overuse is always present (Seemungal, 2018). The drought brought about unprecedented water equality. Everyone had to adhere to restrictions, everyone took part in saving the city from Day Zero. When South Africans stood in line for water, they stood with the rich and poor, people of all races, backgrounds and social class. The primal need for water transcended all other differences.

CONCLUSION

Day Zero was the culmination of years of rain shortages throughout the country of South Africa. The drought that cultivated it was the latest in a series of droughts that stretches back far into South African history. While the cause of this drought is arguable, the pattern of drought seems to result from the country's arid climate. This climate promotes prolonged periods of dryness, with intermittent rainy seasons that do little to improve water problems. The drought that caused Day Zero is also the result of an arid climate, though the severity incorporates other factors. These may include an unusual El Niño effect, poor water management, and an increased water demand from an increasing population and standard of living. The exact cause is nearly impossible to determine, but it is likely that all three of the aforementioned factors played a role in bringing about Day Zero.

Day Zero and the accompanying drought highlight certain aspects of water control that have survived in South Africa since 1994. The impact of water restrictions put in place to prevent Day Zero have been felt more strongly in wealthy, often white, sub-

urban, and urban areas than in informal townships and rural areas (including homelands). This is because the South African middle and upper class used more water before the drought, for gardens, pools and lengthy showers, which they no longer have access to. Conversely, the lower class, including those in townships and homelands, may not have had access to clean, running water before the drought. Even a thirteen gallons a day water limit, may not have been unusual in such areas. An explanation for this involves a historic look at the location of water and its cost. Before and during apartheid, distribution occurred along racial lines. White areas benefitted from government provided water services more often than non-white populations. In the early era of dam building, they were the targets of settlement projects where they were expected to settle land alongside the dams and canals they were employed to build. The 1913 act that pushed native black populations to the undesirable homeland areas heightened water inequality, as it kept comparatively fertile and irrigated lands in white hands. Areas that possessed access to clean, running water from taps, felt frustrated by them. They saw them as a method of control, something for the apartheid government to shut off until communities fell back into line. This relationship changed little after 1994 with the privatization of water. The companies given control over water may have built more water infrastructure, but they turned it off as soon as people could not afford the expensive costs. These costs disproportionately impacted black populations in homelands who consistently saw a greater price increase than other areas. These factors have contributed to rural and informal settlement communities using less water than suburban and urban areas.

It is possible that the lower class is more vulnerable to water shortages. They may suffer if they cannot transport themselves to a spring or buy water from outside sources. They may also be more dependent on it if, for example, they run a small car washing business or rely on a small garden. These are real reasons that suggest that, while the drought impacts everyone, it does not impact everyone equally. Despite such intricacies, the general opinion is that water restrictions have provided a measure of equality across all social classes. This illustrates a point many have made, that drought has been an equalizer in a historically unequal country. Water shortages, though unfortunate, have brought people of all races together in an unprecedented way. Saving water is a struggle everyone is engaged in.

The water shortages seen in the most recent drought are tied to decades of governmental policies. Historic records show that the natural process of climate change was suspected of causing water shortages, though the primary cause may be more closely linked to human activity. Human activity in this case relates governmental policies of how they controlled water and how used land. Key water policies arose in the early twentieth century while Britain was consolidating its power over the country. The decision to turn South Africa into a source of mineral and agricultural wealth created a lasting impact throughout the region. Intensive mining for gold and diamonds had long-term health consequences when heavy metals contaminated the water supply in a process called acid mine drainage. Large-scale agriculture applied permanent stress on the water supply. Before British control, people living on the land were pastoral,

nomadic, or used small scale farming. The primarily arid climate seen in South Africa was (and still is) not suitable for such intensive farming without extensive infrastructure to control the needed water. Other solutions for water scarcity included planting forests to hold water in the ground and educating farmers on efficient farming methods, but few saw large scale implementation and success. Many water public works projects began but remained incomplete or were unsuccessful. They faced issues because of poor planning, lack of understanding of the terrain, and insufficient funds. These projects were implemented with racial biases in mind and benefited white populations while further disadvantaging non-white residents. One of the most influential government actions was the 1913 act which created homeland areas for black South Africans, pushed them onto undesirable land to give white settlers better access to arable, irrigated farmlands. Other actions included hiring only white workers to work on projects and giving the irrigated land from the projects to prospective white farmers. These actions resulted in a racially divided South Africa with high levels of water inequality and an inadequate ability to supply its residents with enough water.

Early 20th-century, racially-biased governments created a framework of inequality and prejudice that limited non-white access to clean water. This era saw the establishment of prejudiced policies, such as the preferential treatment of white workers and enhanced water access to white farmers, that created a lasting impact throughout the country. In 1948, the apartheid government inherited this racially biased framework and continued to expand upon the precedents it set. This included limiting non-white population's access to water and further marginalizing indigenous populations onto undesirable, water scarce land under the guise of separate development, a policy that had its roots in the 1913 Land Act which created "homeland" areas. Water inequality continued throughout the century until the fall of apartheid in 1994 suggested change in the country. However, change has been slow and the past inequalities and ongoing water difficulties (such as droughts) hinder water equality amongst different races. In the future, the country will continue to struggle with the legacy of colonialism and apartheid. The growing population and standard of living will continue to strain the water supply. Water control measures are of paramount importance to protect against these factors and reduce the chances of future water scarcity.

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