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Water Shortages and Climate Change In The Face Of COVID-19 in Zimbabwe.

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Abstract: *Water is an important resource for sustainable livelihoods. Water is used for various household chores and livelihoods among urban households. Developing countries have been adversely affected by climate change which has had negative impacts in the availability of water. Developing countries have been hard hit by the water challenges compared to developed ones. Urban livelihoods have suffered due to water shortages and the COVID19 Pandemic in the context of water shortages has made populations from developing countries more susceptible to COVID19. In addition, this paper aims at bringing forth the link between climate change, water shortages, livelihoods and COVID19. It concludes that, water is an essential resource towards development of rural livelihoods as well as reducing the risk of COVID 19 among urban households.*
Key words: *Water shortages, Climate change, Livelihoods, COVID-19.*

I. INTRODUCTION

Global water demand is increasing at approximately 1% per annum, whilst between 4.8 and 5.7 billion people are projected to live in areas that are potentially water scarce for one month per year by 2050 (UN-Water, 2019a). Gambe (2019) points that globally, water poverty has become more of the poverty of women as compared to men. Globally, climate change is amongst the different drivers impacting the water resources (Ndlovu et al. 2020). Extreme events make significant contributions towards water depletion and scarcity both in quantity that is availability and quality (Haile 2020). Climate change causes incidents of flooding and droughts which are directly related to water resources quantity and quality (Phiri et al 2014). The increase in temperature will increase transpiration. Climate change is altering the global water cycle and water availability is likely to become more variable and unpredictable (Cooper 2020). It is therefore coming to clarity now that no one can be sure of what climate change may reveal in the near future. Lalika (2020) says water for life and livelihoods are two of the foundations for human development. This means water is a fundamental for the day-to-day survival of people.

Dos Santos et al (2017) asserts that nearly one in ten people across the globe is without access to an improved drinking water source and Least Developed Countries (LDCs) especially in sub-Saharan Africa (SSA) are the most affected, having disproportionately more of the global population without access to clean water than other major regions. In addition, Dos Santos et al (2017) states that distribution and allocation of water will be affected by climate-induced water stresses and other factors such as poor institutions, ineffective governance, and weak political will to address scarcity and mediate uncertainties in future supply. Brazier (2015) argues that countries in sub-Saharan Africa are likely to suffer the most devastating impacts of climate change as a result of their geographical location, low incomes, low technological and institutional capacity to adapt to rapid changes in the environment, as well as their greater reliance on climate-sensitive renewable natural resources sectors such as water and agriculture (Eboh, 2009, Besada and Wener, 2015). Climate change has been defined by the Intergovernmental Panel on Climate Change, IPCC (2001) as statistically significant variations in climate that persist for an extended period, typically decades or longer.

Climate change in Zimbabwe has been experienced over the years (Brazier,2015) and USAID (2019) highlights that key observations in climatic conditions involve "increased temperature of 0.9°C between 1901 and 2012, with most warming occurring after 1980 (0.3–0.5°C), increase in number of hot days and fewer cold days since 1950; an increase in the daily minimum and maximum temperatures between 2.6°C and 2.0°C,

respectively, a decline in rainfall of 5 percent since 1915 and increased temporal and spatial variation of mean annual rainfall particularly during the rainy season, increased frequency and length of dry spells during the rainy season , drought increasing its severity over the past decade and there has been no significant trends in number of heavy precipitation day between 1955 and 2003". Pahwaringira at al (2017) asserts that water crises are common in most of Zimbabwe's areas especially the urban areas and climatic changes can be a serious threat to reduce poverty and achieve sustainable development. Furthermore, Haile (2020) posits that "the earth's total water resources reserve is said to be limited, becoming depleted and a more precious commodity over time, due to different stressors or drivers which include climate change and variability impacts".

According to Mukuhlani, (2013) in Zimbabwe, the second largest city called Bulawayo has been the hard hit by water shortages due to geographical location and climate change. Matabeleland is experiencing water shortages as most dams during rainy season do not reach their maximum capacity. Musemwa (2008) argues along the same lines and reveals that Bulawayo's water scarcity problems are caused by poor rainfall because it is located in a semi-arid region and the fact that all of its supply dams are located in one catchment area means that if the region faces a drought then the dam inflows would be in jeopardy.

Although many scholars such as Alagidede et al (2016), Bett et al (2017), Rao (2019) have noted that consequences of climate change are rated to have significant direct and indirect effects, Africa has contributed little to the magnitude of the global problem yet it stands to bear some of the serious consequences (Phiri et al, 2020). The climate changes' direct effects are expected to affect soil, land cover, and hydrologic systems by increasing temperature, high evapo-transpiration potential and great variability of rainfall in terms of timing, form and quantity expressed by increasing frequency of extreme events such as floods and droughts (Hamed,2018). Besides the direct effects of climate changes impacts on surface water availability and its suitability for utilization, the assessment of climate variability consequences on groundwater resources is still more complicated (Roche, 2017).

WWAP, (2015) note that water is the source of life and a fundamental basic human right. Since the beginning of the twentieth century, the Earth, with its varied and rich life forms, with over six billion humans, has been facing water shortages (WWAP, 2015). Around 70 percent of the earth is covered by water; of more than 2.5 percent is freshwater and only 0.5 percent is available groundwater or surface water that humans, plants, land animals and freshwater birds can access (WWAP, 2015). Orutola, (2020), argues that the availability of water varies across countries and the situation is complicated by frequent droughts and inappropriate water management mechanisms. Orutola, (2020) adds that water demands is likely to occur among developing countries where population growth and industrial development is still occurring.

Definition of key terms

Water shortages: UN Water, (2018) asserts that water scarcity refers to the situation where water is not sufficient to sustain normal requirements. UN Water, (2018), also notes that scarcity of water may mean physical unavailability and failure of institutions to ensure that populations have access to adequate water. Burek et al, (2020) also notes that almost half of the global population, are living in water scarce areas. This shows that water shortages are a global phenomenon.

Livelihood: Chambers and Conway, (1991) notes that, "a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base." The UK Department for International Development (DFID), notes that in order to understand how people can develop and maintain livelihoods, the academics and practitioners developed the Sustainable Livelihoods Framework (SLF) (Krantz, 2001). This framework is an analysis tool that helps to understand the factors that can affect a person's livelihood. Krantz, (2001) asserts that the Sustainable Livelihoods Framework views livelihoods as systems that provide a way to understand, the assets people draw upon, the strategies they develop to make a living, the context in which a livelihood is developed and the factors that make a livelihood more or less vulnerable. Livelihood assets include, tangible assets such as food stores and cash savings, as well as trees, land, livestock, tools, and other resources and intangible assets such as claims one can make for food, work, and assistance as well as access to materials, information, education, health services and employment opportunities (Krantz, 2001). Assets may also be categorized in the following ways such as human, physical, social, financial and political capitals.

COVID-19: The epicenter of the new coronavirus disease 2019 (COVID-19) was originated in China. The first 27 cases of upper respiratory or pneumonia cases were reported on December 31, 2019 in Wuhan city located in the province of Hubei, China (Tan et al., 2020). Studies have shown that COVID-19 can be transmitted from human-to-human transmission with the incubation period is believed to be within 14 days (Li et al., 2020; Wang et al., 2020). The outbreak was declared as a global pandemic by WHO after a human-to-

human transmission is spreading fast like wildfire with a high reproduction number of R0 (a measurement of how many people one human can transmit to other human beings after being infected).

Climate Impact On Water Shortages

Climate change is associated with changes in both surface and groundwater supply for domestic, agricultural, industrial, and tourism uses, including irrigation, navigation, and fishing, etc. (Ziervogel et al, 2014, Hamed,2018). Climate change therefore poses a significant threat to water resources, food security, health, infrastructure, as well as its ecosystem services and biodiversity. According to Odunuga (2010), vulnerability is exacerbated by the region's low adaptive capacity, widespread poverty and low technology uptake. Africa as a whole is one of the most vulnerable continents due to its high exposure and low adaptive capacity. For much of Africa, knowledge about recent climate change is limited, due to weak climate monitoring, and gaps in coverage that continue to exist. The first section of this paper will therefore explore the various impacts of climate change on water shortages such as the agricultural, social, economic and environmental impacts.

Agricultural Impact

Some of the most observable and potential effects of climate change on water resources in Africa according to Urama (2010) include: flooding, drought, change in the frequency and distribution of rainfall, drying-up of rivers, melting of glaciers, receding of water bodies, landslides, and cyclones among others. The term drought may refer to a "meteorological drought (precipitation well below average), hydrological drought (low river flows and low water levels in rivers, lakes and groundwater), agricultural drought (low soil moisture), and environmental drought (a combination of the above)" (Bates et al., 2008). According to Sangombe (2015), Zimbabwe has experienced at least 23 droughts between 1950 and 2013 and the increase in these including natural hazards can be attributed to climate change.

Droughts have both direct and indirect consequences for human livelihoods as approximately 80% of Zimbabweans depend on rain fed agriculture for their livelihoods and the country's developmental hopes are pinned to a successful rainy season (Madzwamuse, 2010., Makate, 2017). Direct consequence refer to crop loss, which can cause starvation if alternative food sources are not available and in a rural set up low agricultural productivity will mean reduced household income. Furthermore Madzwamuse (2010) and Ncube et al (2018) assert that animal live weight falls as grazing becomes scarce, susceptibility of livestock to diseases and death rates increase as a result of water shortages. In addition, Brazier (2015) highlights that during the 2012 drought, Zimbabwe experienced a lot of heat waves and many small domestic animals and fowl died in areas like Kariba as a result of heat stress whilst in 2015 about 60% of cattle herds perished in some areas (Hamed,2018).

Social Impact

According to Odunuga (2010), the vast majority of Zimbabwe's water (80 per cent) is used in the agricultural sector followed by the urban and industrial sector (15 per cent), rural authorities (2 per cent), conservation (2 per cent) and mining (1 per cent) (GoZ, 2010). Indirectly, water shortages contribute to the spread of disease, because people lack water for basic hygiene especially now during the Covid-19 era (Van der Voorn,2020., Watson 2020) where washing hands is paramount to stop the spread of the pandemic. Hayes (2018) also argues that water shortages impact the physical and mental health of people as water rationing is affecting the citizens of Zimbabwe and access to safe and reliable water and sanitation has fallen to approximately 40–60 per cent nationwide (Goz, 2010).

Merten (2016) argues that some of the social impacts of water shortages include the cultural and social disruption whilst Fieorella et al (2019) notes that decreasing availability of natural resources such as water and land leads to transactional sex. A research study conducted by Fieorella et al (2019) show that from the articles published about an exchange of natural resources for sex, two-thirds of articles focused on sex-for-fish exchanges, agricultural land being 12% as well as food, water, and fuel in emergency contexts all being 12% and this raises questions for water crises on the social impacts of Bulawayo, Bindura and Harare where water rationing is becoming a problem (Cashaya,2017, Pahwaringira, 2015, Bisung, 2017). It is clear that the adverse effects of climate change on water shortages are trickling down to moral erosion and Fieorella et al (2019) notes that this will later increase incidences of unplanned pregnancies and a spread of sexually transmitted diseases. Water shortages also increase poverty and conflict for example the potential conflict areas such as the lower half of the Niger River and the Volta Basin (Anyadike,2009). Furthermore GoZ (2010) allude that approximately 65 per cent of the water facilities in the rural areas are non-functional which also results in rural to urban migration as well as poverty as a result of low production in rural areas.

Economic Impact

Water shortages as a result of climate change have resulted not only in social problems arising but economic problems too especially for water related activities under the tourism and recreation sector which have experienced losses. The United Nations Convention to Combat Desertification (2019) and Dube and Nhamo (2019) concur that in October 2019, the highest temperatures were recorded thus lowering water flow in Victoria Falls signaling that climate variability and change trends have potential effects on the tourism industry as low flows result in fewer visits and a shorter rafting season yet Victoria Falls is an important tourist destination in Zimbabwe. Other summer recreational activities like fishing and boating have also been affected by the depletion of water in lakes and reservoirs such as the river Sengo and the Cleveland dam (Dube and Nham.,2019). The energy sector is yet another prominent area most vulnerable to water shortages and reduced flows as Urama (2010) asserts that 80% of the country's energy comes from Lake Kariba Power Station. The scholar further alludes that in the most well documented drought of 1991/2 Lake Kariba levels dropped about 40% of its full capacity and electricity production was reduced to about 30% thus the country had to import electricity from Democratic Republic of Congo (Nest,2001). Lately Zimbabwe has been buying electricity from South Africa's Eskom and Hydro Cahora Bassa of Mozambique thus signaling the negative impacts of water shortages as a result of climate change on Zimbabwe's economy.

In addition drought affects the country's disaster preparedness as it takes about three seasons for the system to fully recover from a severe drought as evidenced by the 1991/2 drought (Urama,2010;Brazier,2015).Some of the economic impacts therefore include the manufacturing sector witnessing water and electricity shortages meaning increased importation of food, revenue shortfalls and reduction in economic development (Maia, Vivas and Serralheiro,2015). Bates et al (2008) also highlights that in sub-Saharan Africa, 42 per cent of the population is without access to improved water resulting in health problems and poor health increases vulnerability and reduces the capacity of individuals and groups to adapt to climate change.

Environmental Impact

Environmental impacts of water shortages according to Adams et.al (2012) range from loss of ecosystems, loss of biodiversity, loss of water bodies and desertification. The reduced precipitation as a result of climate change results in a disruption of ecosystems and death of wildlife species and this was noted during the 1991/2 drought where a lot of animals were translocated from the National Parks such as Gonarezhou Park to private game reserves such as Save Valley Conservancy where resources were available for artificial water provisions (Urama.,2010). Environmental impacts have been also highly felt in rural areas where wells and dams have dried up resulting in people walking long distance to access their basic right to water and this has also questioned the issue of sanitation and hygiene (Nest, 2001.,Anyadike, 2009) .Benson and Chadya (2005) argue that cases of these water problems resulting in long distances to access water have also been noted to besides the time lost on income generating activities and other roles, the violation of women's bodies has become common as the vulnerable can be raped along the way. School going children are also affected by these distances as they arrive at school tired and for those who fetch water after school, they have less time to study (Cherutich, 2015).

The World Bank in partnership with the Government of Zimbabwe has produced a report predicting that climate change is likely to cause an annual rainfall decrease in all Zimbabwean catchments, with Runde and Mzingwane catchments average rainfall decreasing by 12% and 16% by 2050 and 38% likely decline in national per capita water availability by 2050 (Brazier,2015). Moreover, Matenga (2019) assert that wetlands play a number of functions, including water purification, water storage, processing of carbon and other nutrients, stabilization of shorelines, supporting more than 125,500 freshwater-dependent species however they are also among the ecosystems most vulnerable to climate change.

II. Water Shortages And Livelihoods

Water and livelihoods are essential foundations for human development. UN, (2015) reveals that people in rural Africa, Asia and Middle East do not have access to safe and clean drinking water. This however is against the right to safe drinking water (UN, 2015). Scarcity of safe drinking water burdens the workload of women and men; however, the burden lies more on women compared to men (Gambe, 2019)

Causes of Water Scarcity in Bulawayo

Mukuhlani *et* al, (2014) notes that there are quite a number of factors which have contributed to the city of Bulawayo to experience water shortages and these factors are entangled and correlated and have been worsened by the structural collapse of the institutional and technical capability of both the central and local governments. The most dominant contributing factor has been droughts which have affected the amount of rainfall and failure to harness and preserve water resources has worsened the water challenges in Bulawayo

(Mukuhlani *et al*, 2014). However, siltation of dams, population growth and ZINWA-BCC conflicts have made the city vulnerable to water shortages. Gambe, (2019), states that Bulawayo's water scarcity problems are caused by its geographical location, as it is located in a semi-arid region and all its dams, about five dams are located in the same catchment area. Thus, this means that when there are little rains all the dams will fail to reach their maximum capacity. Bulawayo has experienced population growth recently, the last dams were built in 1976, meaning since 1986 Bulawayo needed a new dam.

UN, (2015) notes that in rural areas around 65% of women collect water and 10% of men are involved in water collection whereas in urban areas around 33% of women and 10% of men are involved in water collection. Besada and Wener, (2015) also argue along the same lines and they reveal that women are burdened with water collection duties which affect their active participation in the formal labor market. Tobio, (2017) notes that women in Italy that are not active in the labor sector are those who are less educated. Exclusion of women in the labor market increases gender disparities which results in women being poor.

Urban Agriculture

Water challenges have disrupted urban activities which include market gardening. Most households in cities such as Bulawayo have gardens where they cultivate vegetables such as tomatoes, tsunga and carrots for household consumption as well as to earn an income each month. To add on, Mukuhlani (2014) in his study reveals that most households usually sell surplus to street vendors in the area. This has helped women in these households to earn money for personal use. However, with the shortages of water in the city, livelihood activities such as gardening have not been possible, women reveal that since the inception of water rationing, their production levels have dwindled. Gambe, (2019) argues along the same lines and reveals that women in Harare have faced water challenges which have reduced the time they spend on production activities such as vending as they devote most of their time to water collection. Gambe, (2019) reveals that there has been a loss of income among women as they have turned their attention to fetching water and less focus on income generating activities, for instance, women delay to go and purchase their products and by the time they get to the market high quality goods would have been finished and they buy low quality products which does not bring much money to the household. Gambe, (2019) notes that one woman in Harare reveals that since the water challenges began, she has been earning around $12 compared to $23 a day, during the days when water was available. Hence, this clearly shows that water shortages have negative impacts on the livelihoods which then affects the income that a household can get a day.

Economic effects

The population under the City of Bulawayo have been left unemployed since the de-industrialization which occurred in 2000-2008(Mukuhlani *et al*, 2014). Most of these people have embarked to agricultural activities so as to be able to earn a living. Mukuhlani *et al*, (2014) adds that, water scarcity has had negative impacts in the economic sector as it greatly affected economic activities in the area such as small-scale activities in Bulawayo were affected such as in brick-molding. The Bulawayo City Council has been strict against entrepreneurs who use clean water for brick molding. The business has been booming as most people prefer getting their materials from the informal sector. However, the water challenges have affected their businesses as they cannot produce more bricks and this has pushed them to engage in illegal deals so as to sustain their livelihoods (Mukuhlani, *et al*, 2014). Unemployment rates have remained high as most industries are not employing. Water distribution has negative effects on the livelihoods of the urban poor.

Gender and water shortages

Gambe,(2019) notes that gender balance in water management is important so as to fully understand the roles played by men and women. Khosla, (2004) connotes that women and girls are responsible for water collection at household level. In rural areas they travel long distances in search of water whereas in urban areas they spend time queuing for water at water points. This hinders women and girls from taking part in productive activities such as income generating activities, education, socio-political activities and recreational activities (Oman *et al*, 2007). Gambe, (2019) argues along the same lines and reveals that, women and girls in Zimbabwe spend around 4 to 6 hours a day collecting water for household use. The time spent by women and girls fetching water has put a burden on them and has reduced equal opportunities between men and women as women can no longer take part in economic activities (Gambe, 2019). Girls usually collect water mornings before schools and afternoons after school, fatigue associated with such activities have reduced concentration levels among girls as they tend to sleep during lessons due to fatigue (Gambe, 2019). Thus, this clearly shows that women and girls are at a disadvantage due to water challenges as they participate less in income generating activities and education among girls compared to men and boys who are less involved in water collection roles.

Positive Effects

However, there are positives that have come into the picture due to the water shortages among entrepreneurs. Some of the unemployed youths are now selling water as a livelihood activity. For instance, a 20-liter bucket goes for about $2 United States Dollars. This kind of business has become a livelihood among women, they sell vegetables and compliment using the water business. Also, these youths have found business among people who are extending their houses. It can be argued that the water shortages have opened doors of employment among these youths, however its sustainability is questionable. Also, in parts of Bulawayo, youths are charging residents' money when guarding the boreholes during the night so that they do not get vandalized. Gambe, (2019) asserts that in Harare, people now sell water at 20 cents, $1 for 5 buckets of water, hence this shows that the water challenges have driven certain individuals into the water selling business. The water shortages have had drastic effects among the general populace, a few youths and women have taken the water challenges to their advantage and they have decided to create employment out of it.

III. Water Crisis And Covid 19

Cooper (2020) posits that measures to suppress the Covid-19 pandemic, including hand-washing, self-isolating and lockdowns assume that societies, communities and households have sustainable access to acceptable amounts of adequate quality water. However, across developing countries, water insecurity is increasing, with the poorest and most vulnerable particularly at risk. Like much of the rest of the world, Zimbabwe has confronted the COVID-19 pandemic with stay-at-home orders and advice to practice social distancing and frequent handwashing, hoping to prevent a wave of infections that would overwhelm the national health-care system (Mavhunga, 2020). Nonetheless, the country entered the COVID-19 period with pre-existing challenges that were and are a threat to an effective response to the crisis (Moyo-Nyede and Kugarakuripi 2020). A lack of water has been a frequent problem in cities as well as rural areas (Dzirutwe, 2020; Moyo, 2019; Kingsley & Moyo, 2019; Mbugua, 2019), which has exacerbated handwashing and staying at home difficult.

Zimbabwe government measures to combat COVID-19 should include urgently providing continuous and affordable access to sufficient safe water to people across the country. Long before the coronavirus pandemic, much of Zimbabwe suffered a severe water and sanitation crisis. The Human Rights Watch (2020) argues that "the Zimbabwe government needs to ensure an uninterrupted supply of safe water for everyone, or face magnified health risks as people seek alternative, unsafe water sources. COVID-19 has made an already dreadful and hazardous water crisis even more urgent in Zimbabwe. Failure to provide sufficient safe water would severely undermine the government's efforts to fight the virus and protect people's lives (Human Rights Watch 2020). The water crises in Zimbabwe has seen some suburbs having four months of dry taps despite water being a vital weapon to prevent COVID-19, households resorting to using less water due to lack storage facilities & long queues at boreholes, residents failing to obey the lockdown regulation as they queue at water points in crowds, Lack of soap at households affecting the implementation of safe hands and its effectiveness and lack of access to water is among the challenges people in Zimbabwe are facing to fight COVID-19(Zvogbo and Pierre 2020).

Recommendation

Government action in Zimbabwe to tackle Covid-19 should urgently include providing people across the country with ongoing and affordable access to adequate clean water. As part of its social cooperation commitments, the business community can also complement government efforts by helping to resolve the water crisis. For example, Busy Corner Chillspot Carwash in Bulawayo provides Paddonhurst residents with free clean water (The Chronicle Newspaper 2020). Residents should fully utilize water harvesting techniques so as to gather as much water as they can.

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