

Dirty and Thirsty: The Struggle for Clean Water and Sanitation in Brazil and Nigeria

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Abstract

This article compares and contrasts the qualities of sanitation and water supply in Brazil and Nigeria. More than one third of Nigeria's population have little to no access to potable water. While the number of people without access to water and proper sanitation in Brazil is smaller than in Nigeria, there are great inequalities across each country. Those living in urban slums are typically left with scarce access and very poor sanitation. This article connects the lack of accessible water to poor sanitation in each country. Although both countries have seen progress in both issues, there are still a great number of people suffering. While analyzing these issues and their effects on the people of each country, this article will also analyze what led to the progress and how that progress can be continued.

I. Introduction

Water scarcity is an issue affecting the entire globe and it is likely to intensify in the future. With nearly one billion people in developing nations without access to safe water,¹ there is no debating the need for change. In the same right, there are about 2.5 billion people in the world lacking access to sanitation. Two countries that are not exempt from these issues and their effects are Nigeria and Brazil. Nigeria has become the country with the largest economy in Africa since 2014.² While Brazil is known to make up 33 percent of Latin America's economy.³ While both countries make significant strides in their overall developments, there are still gaping holes within the water and sanitation sectors. Not only are these sectors important to their increasing development economy wise, it is very crucial for the populations' health and wellbeing of both nations. In both countries these issues are most felt by those living in the rural areas- secluded from the resources found in the city.

¹ According to United Nations Children's Fund (UNICEF) and World Health Organization (WHO) (2017), 844 million people lack access to basic drinking water service.

² World Bank (2017).

³ World Bank (2017).

According to a World Bank (2016) report, Brazil is blessed with almost 20 percent of the world's water resources, however there are large populations within the nation that have very little access to safe water. Nigeria, on the other hand, has a much lower potential access to water, which only makes improvements in the water and sanitation sectors more difficult to achieve. The progress of increasing access to water in urban areas in Nigeria has become a large focus, though it has not been addressed consistently over the last few decades. While Brazil has seen progress, more needs to be achieved in order to handle the looming water crisis. This article closely examines the similarities and differences of problems in the water and sanitation sector in these two countries and attempts to offer insight on future tactics that may be successful.

II. Literature Review

Given that water and sanitation issues remain serious in Brazil and Nigeria, there are ample sources analyzing the individual sectors in each country. Ghisi (2005), Barreto et al. (2010) and Nobre et al. (2016) discuss the water and sanitation sectors of Brazil. Ademiluyi and Odugbesan (2008) and Muta'aHellandendu (2012) do the same for Nigeria.

- Ghisi (2005) analyzes the potential productivity of utilizing rain water in residential sectors of Brazil. The article discusses the average water availability in Brazil in comparison to the rest of the world. While most of Brazil's regions are at or above the world average in 2000, both the Northeast and Southeast regions are much lower than the world average. The article continues to note that because of Brazil's increasing population size, these regions will face extreme water scarcity as soon as the end of the 21st century. In order to resist the looming extreme water crisis, programs should be developed to harvest rainwater and reuse it within the population. Because Brazil's average rainfall is higher than the world average in all of its regions, this strategy could potentially solve the soon to be seen water crisis.
- Barreto et al. (2010) explain the results of an experiment, where interventions within the sanitation sector were tested for their effectiveness in Salvador (a Brazilian city). The intervention program, called Bahia Azul sewerage, was introduced in Salvador and the experiment tried to measure the levels of diarrhea and hookworm before and after the intervention program began. One of the results was that there was an overall decrease in diarrhea in the poorest region by 42 percent. This article exemplifies that intervention programs within the water and sanitation sectors, especially ones that are sustained, are extremely important for the populations, especially in the poorest regions.
- Nobre et al. (2016) discuss the recent droughts in southeastern Brazil that began in 2011 and continued through the time their paper was written. These droughts, as discussed in the paper, have had detrimental effects on many sectors in these areas. While agriculture being one of the most effected, others effected included hospitals and schools. The article notes that this drought has cost around 5 billion USD in the agriculture sector in 2014 alone. Nobre et al. highlight the impact of the lack of water access has on its population and economy as a whole and for its individuals.
- Ademiluyi and Odugbesan (2008) focus on the poorest regions of Nigeria and the lack of water and sanitation structures for the population. The article first examines the problems surrounding Nigeria's water and sanitation structure, like why there is no reliable source of water for the populations in the poorest regions, and whether these sources are vulnerable to drought or if they are contaminated. The contamination piece is related to the

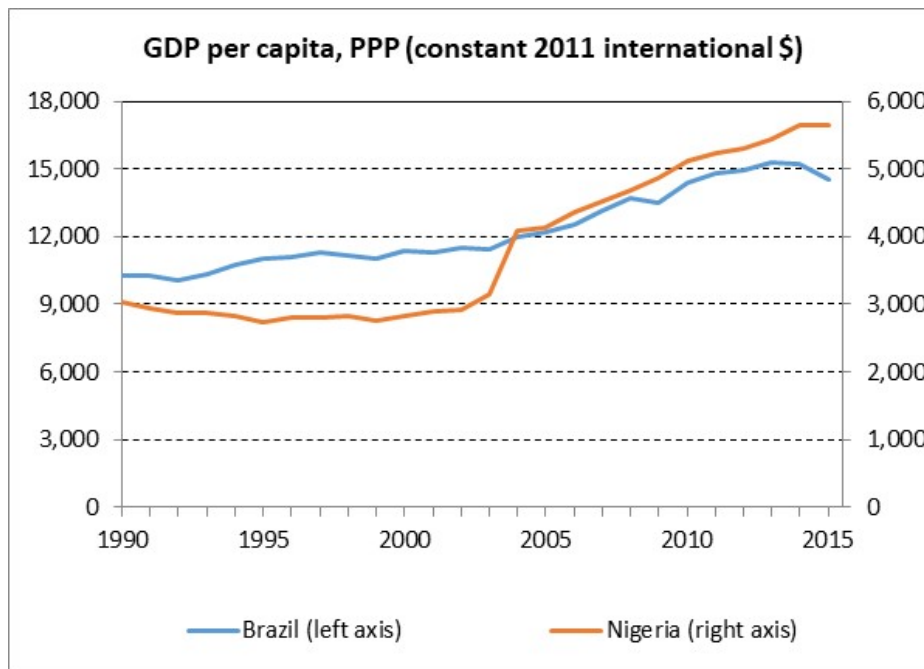
lack of a sanitation standard in Nigeria, as fecal matter cannot be properly disposed of and ends up within the already poor water supply. The article also discusses the lack of a sustainable fix for these poor systems.

- Muta'aHellandendu (2012) describes the increasing water issue in Nigeria, as water is becoming scarcer for many of those living in poverty ridden regions. The article shows that only 30 percent of the population have reliable access to clean drinking water. The article continues to discuss the impacts that the lack of water (and poor sanitation) has on the people of Nigeria, which include widespread malaria, diarrhea, hepatitis, hookworm, etc. The article concludes by recommending policies to have clean water reaching the majority of the population. As these impacts can make the difference between life and death, the need for these changes is emphasized.

III. Empirical Background

As Figure 1 shows, Brazil has seen solid increases in its GDP per capita, increasing from \$10,273 in 1990 to \$14,533 in 2015. Though Nigeria has made no progress from 1990 to 2003, it has made immense progress since, increasing from \$ 3143 in 2003 to \$5,639 in 2015. Overall, Brazil's GDP per capita is about three times that of Nigeria.

Figure 1: PPP-adjusted GDP per capita (constant 2011 international \$)

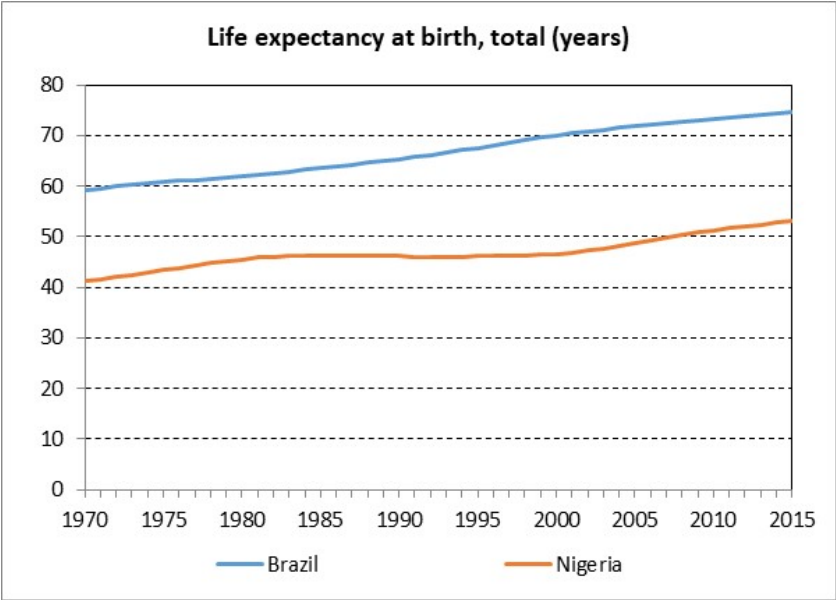


Source: Created by author based on World Bank (2017).

Given these large differences in income per capita, Figure 2 shows that there are also large differences in terms of life expectancy between Brazil and Nigeria. Both countries have seen increases in their life expectancy rates since 1970. While Brazil's has increased from 59.2 years to

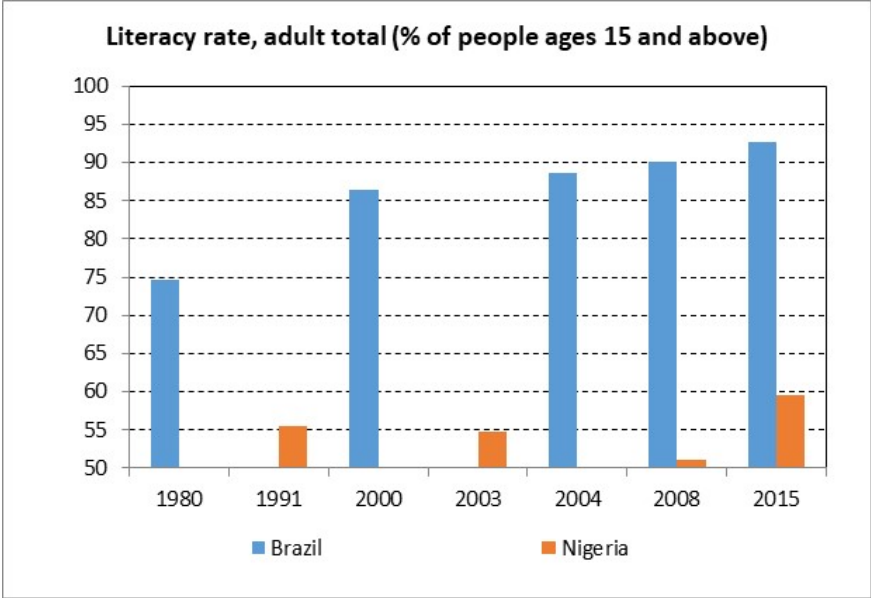
74.7 years, Nigeria’s has increased from 41.2 years to 53.0 years. In other words, Brazil’s life expectancy increased by 15.5 years, while that of Nigeria increased by only 11.8 years. One explanation for Nigeria’s lower progress are the lost decades of the 1980s and 1990s, during which Nigeria has not made any progress at all, and we also saw that in Figure 1.

Figure 2: Life Expectancy at Birth (in years), 1970-2015



Source: Created by author based on World Bank (2017).

Figure 3: Adult Literacy Rate (percent of people ages 15 and above)



Source: Created by author based on World Bank (2017).

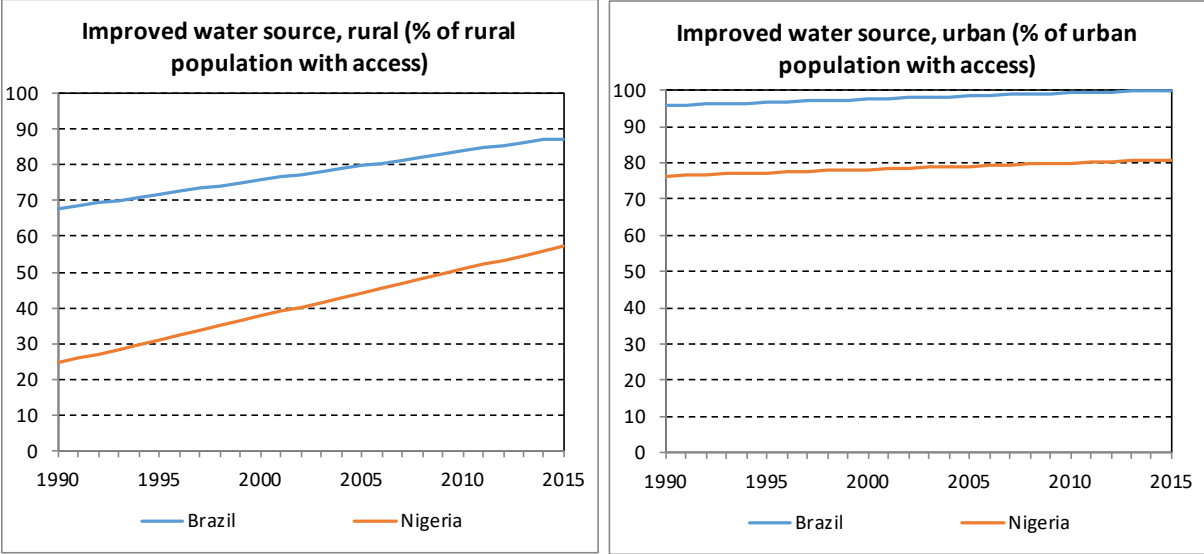
While data on literacy rates for each country were poorly reported in the past, Figure 3 still illustrates the relatively large progress made in Brazil compared to the relatively little progress made in Nigeria. Brazil has increased its adult literacy rate from 74.6 percent in 1980 to 92.6 percent in 2015, while Nigeria increased from 55.4 percent in 1991 to 59.6 percent in 2015. Nigeria’s data actually shows a relatively sharp decline from 54.8 percent in 2003 to 51.1 percent in 2008, which is inconsistent with both, the increase in GDP per capita as well as the increase in life expectancy during that period. Our next section will examine if the same is true for progress in the water and sanitation sectors.

IV. Discussion

IV.1. Access to Safe Water

Figures 4 and 5 shows, respectively, rural and urban access to safe water in Brazil and Nigeria. Comparing the two figures clearly shows that the lack of access to water is much more an issue in rural areas than in urban areas, especially in Nigeria. Though access to safe water is now considered to be a basic human right, for many decades more than 50 percent of Nigeria’s rural population and more than 20 percent of Brazil’s rural population had no access to drinking water.

Figures 4 and 5: Rural and Urban Access to Safe Water, 1990-2015



Source: Created by author based on World Bank (2017).

While there has been steady progress in both countries since 1990 (the first year such data is available), there have been many decades in which large percentages of the populations of these two countries lacked this basic human right. As of 2015, only 87 percent of Brazil’s rural population had access to safe water, while in Nigeria only 57.3 percent of Nigeria’s rural population had access to safe water.

In the rural areas of Nigeria, a reliable water source is a blessing, though one not found by many. As shown by Muta’aHellandendu (2012), although Nigeria has been involved in many large water supply projects, creating a sustainable water supply for the rural areas of Nigeria has not been achieved. Based on the data Abui et al. (2016) had, more than 50 percent of the country did not

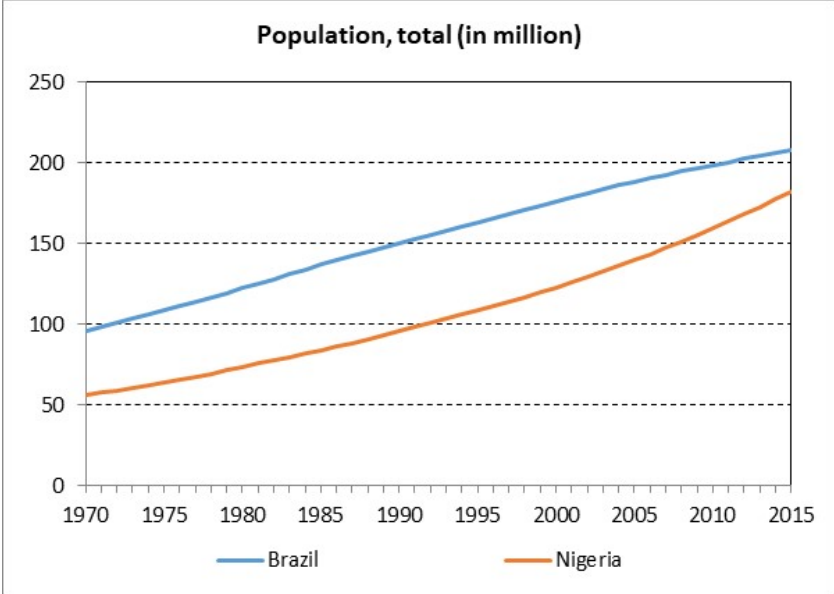
have safe access to water, and most of those were people located in the rural areas. Many of the population in these areas spend great amounts of time getting water from very distant locations. This far distance to any water source keeps children out of school and the adults of families out of work. On top of this, the water sources that are utilized by those in rural areas are not reliable, as they could be contaminated by fecal matter and other substances due to poor management (Ademiluyi and Odugbesan, 2008).

Though the problem of not having access to safe water continues to be a bigger problem in rural than in urban areas, many of Nigeria’s urban areas are still struggling, including the Greater Metropolitan area of Lagos (which has a population of about 21 million). Those living in Lagos today know of water scarcity all too well as only about 1 in every 10 people in Lagos has a consistent source of safe water. A bill passed in March 2017, which criminalizes the informal water sector, has been labeled as a “death sentence” for those not having access to the formal water sector. In doing so, the government has exacerbated water scarcity (Mosbergen, 2017).

The water situation in Brazil resembles the one felt by the city of Lagos in Nigeria. There is lots of water in Brazil, but the problem is determining a way to harness it safely and distributing it to the population for use. Creating new hurdles are the repeating droughts many large cities in Brazil face; Sao Paul being one of the hardest hit by the droughts (Nobre et al., 2016). These droughts are felt everywhere. However, two important reservoirs (in Cantareira and Alto Tiete) dropped to below 20 percent of their full capacity during August 2015 (Nikolau, 2015). Further advancing the issue in Brazil are man-made extreme losses of water, linked to deforestation in Brazil, which according to the World Bank (2016) has increased almost exponentially in recent decades.

While the two countries face vastly different obstacles, there is one that both countries (and almost every developing nation in the world) faces: population growth. As shown in Figure 6, both countries face rapidly increasing populations. Hence, the number of people needing access to water is also increasing, leaving both nations with another obstacle to climb.

Figure 6: Total Population (in million), 1970-2015



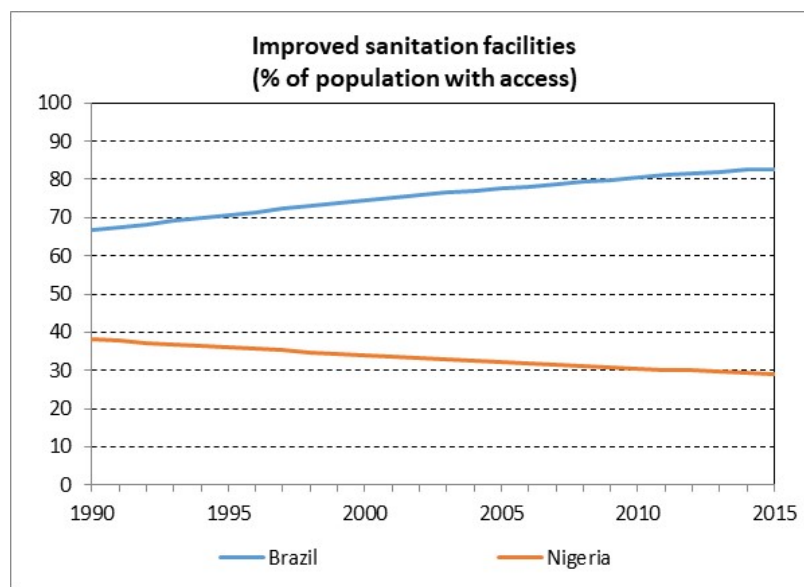
Source: Created by author based on World Bank (2017).

IV.2. Water and Sanitation

In both countries, the water and sanitation sectors go hand in hand. As water scarcity issues become more prevalent, the topic of sanitation also becomes more problematic. In both countries, rural areas that are already struggling to find a reliable water supply are also dealing with the issue of water pollution, partly due to lack of sanitation and the negative effects it has on the population. While we have referred to some sanitation issues in the previous sections, when the aspect of sanitation is more closely examined, it is clear that the sanitation sector is not just a subsection of water scarcity; it is its own entity causing its own set of issues.

In Brazil, a main issue of insanitary water is caused by industrial companies. Industrial pollution has led to multiple rivers being no more a source for drinking water (World Bank, 2016). On the other hand, in Nigeria, the sanitation problem stems mostly from fecal matter contaminating the water supply of the population. With this contamination not only does drinking water put the population at risk, the water they bathe in, wash their hands, wash their food, etc. is all dangerous. As detailed in Muta'aHellandendu (2012), contaminated water can lead to health issues such as malaria, diarrhea, hepatitis, hookworm and many more.

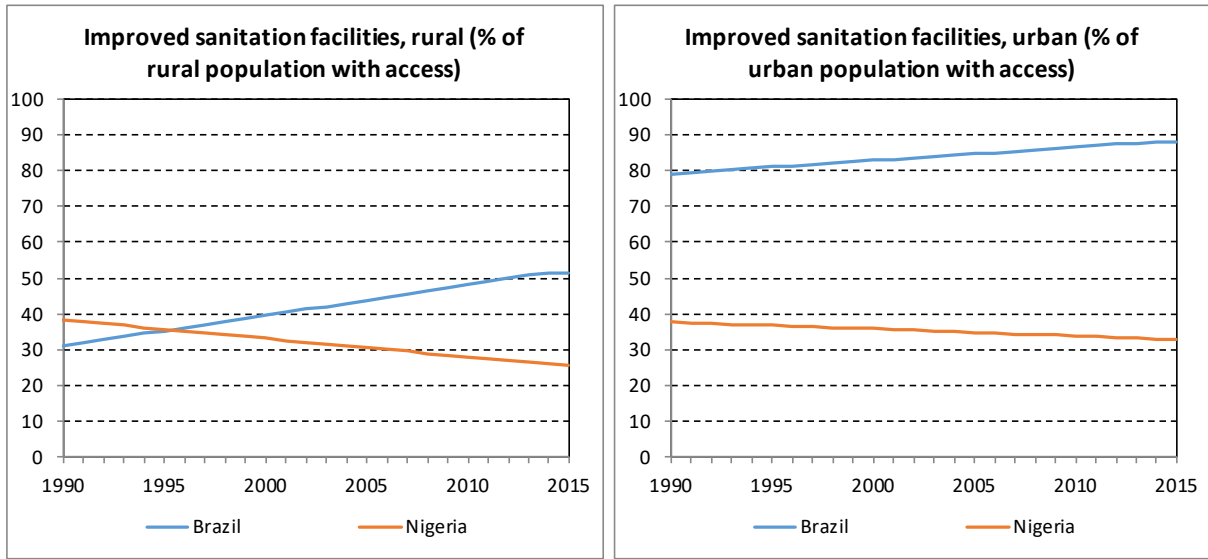
Figure 7: Access to Improved Sanitation Facilities, 1990-2015



Source: Created by author based on World Bank (2017).

Figure 7 shows that there has been significant progress made by Brazil, as their overall access to sanitation facilities has increased from 66.6 percent in 1990 to 82.8 percent in 2015. On the other hand, Nigeria has digressed in the population's overall access to sanitation facilities from 38.1 percent in 1990 to only 29 percent in 2015. As Figures 8 and 9 show, the largest issue for both countries is the access to sanitation facilities in rural areas. While Brazil has made substantial progress since 1990, still only slightly over 50 percent of the Brazil's rural population has access to sanitation facilities. In the case of Nigeria, since 1990, less of the both, the rural and urban populations have access to improved sanitation facilities, with the access rates having declined more in rural areas than in urban areas.

Figures 8 and 9: Rural and Urban Access to Sanitation, 1990-2015

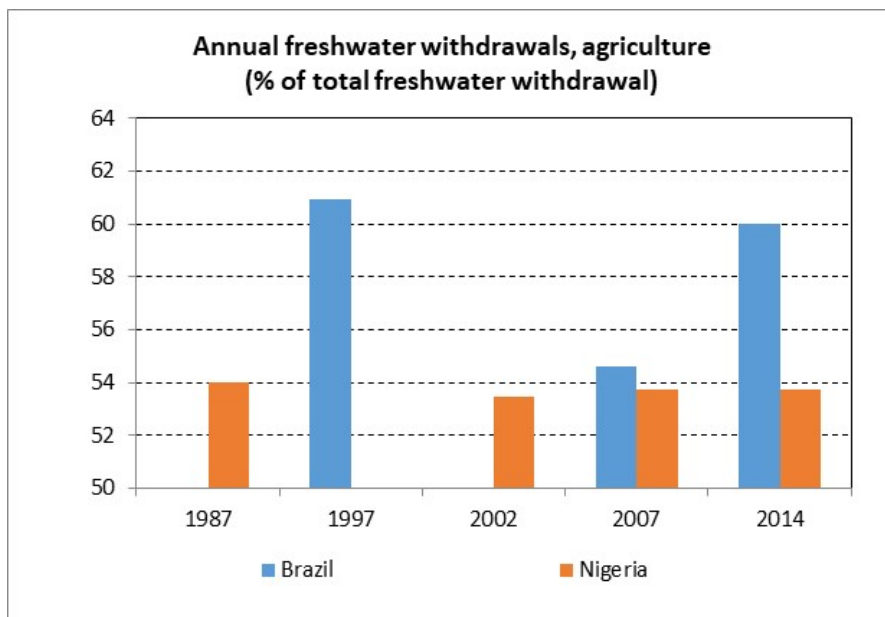


Source: Created by author based on World Bank (2017).

IV.3. Water, Sanitation and the Economy

The need for water and sanitation is crucially important for the livelihood of the individuals in each nation as explained above, but the water scarcity puts both country's economic growth in jeopardy. As shown in figure 10, both countries continue to use more than 50 percent of their fresh water supply for agricultural production.

Figures 10: Percentage of Annual Freshwater Use in Agriculture



Source: Created by author based on World Bank (2017).

Though both economies do not rely heavily on agriculture (Brazil has lots of industry and services, while Nigeria's economy is dependent on oil), agriculture remains a vital pillar in both countries' future economic success. With an increasing plausibility of a water crisis, this potentially leaves Brazil's and Nigeria's overall economic performances in trouble. In Brazil, past droughts have had an immense effect on its freshwater supply. As stated in Nobre et al. (2016), it was estimated that droughts have cost Brazil around US\$5 billion in one year alone. As shown in World Bank (2016), given that Brazil is the second largest food exporter in the world, Brazil's looming water crisis will have impacts on the entire world's food supply as well, especially those heavily reliant on Brazil's products.

As for Nigeria, the relationship between the economy and the water scarcity is not as direct. Nonetheless, the lack of water can have an immense effect on the country's GDP and economic performance. As mentioned earlier, in many cases the closest water supply to many families in Nigerian communities is a great distance away. Making the trip to get water for basic needs may take upwards of 5 or more hours each way, which takes children out of school and other family members away from job opportunities (Abui et al., 2016). In the long run, this absence due to the distance of water supplies will have a negative impact on the economy (Ademiluyi and Odugbesan, 2008). Or in worst case scenarios, people with an unreliable water source may fall ill from drinking contaminated water. Causing them to miss work and school for long periods of time depending on the illness (Abui et al., 2016). Whether the effect directly or indirectly related, the lack of access to safe water has a potentially detrimental effect on both country's GDP and economic performance.

IV.4. Successes and Failures: The Difference between Nations

Interventions to improve the water and sanitation sectors have been attempted in both nations. For Nigeria, these attempts date back to the year 1976 (Abui et al., 2016). As seen in the graphs above, Brazil's attempts throughout many years have actually lead to progress and improvement. Whether an intervention attempt succeeds or fails depends on a number of factors. In 1996, a successful sanitation sector intervention was seen by Northeastern Brazil. A great deal of construction work was done in order to reach the goal of improving sewage coverage in the region. Prior to the attempt, only 26 percent of families had adequate sewage coverage; after the intervention more than 80 percent of households in the region had sewage coverage. With the improvement in the sewage coverage, the number of those affected by related diseases decreased immensely (Barreto et al., 2010). While this is an example of a successful intervention in Brazil, very little success has been seen by attempted interventions in Nigeria.

There are many reasons why the improvements seen in Brazil are not seen in the country of Nigeria as well; poor fund management, undedicated government, educational issues, etc. A major issue is found in one of these reasons, undedicated government. If the government is not motivated to improve the water and sanitation sectors, there will be no improvement. In Nigeria, there is a pronounced issue with those finding power only wanting it solely for the power and the riches rather than the chance to improve the country and the cities within it (Abui et al., 2016). The difference in successes and sustainability of interventions is reflected in the developmental gap between the two countries (as was provided in the empirical background section above). Throughout many years, Nigeria has adopted multiple programs to improve the water and sanitation sectors from more than 15 different organizations, but has not seen major success (Abui et al., 2016). Although Nigeria has faced troubles in the past with improving the water and

sanitation sectors, there is no reason for the attempts to cease. The only way for Nigeria to find success and for Brazil to continue to have success is for both countries to maintain focus on the water and sanitation sectors until sustainable improvement is achieved.

V. Conclusion

If Brazil and Nigeria continue to work for progress in these sectors, innovative ideas and techniques will emerge. This innovation has already been seen in Brazil, for example the use of rainwater savings to attempt to solve the water crisis. Almost all of Brazil's regions receive an above average amount of rain, being able to trap this rain and use it for all different needs could be a solution that solves- or helps solve- the very real and dangerous water crisis that is still looming in Brazil. While this tactic will take construction of roofs better equipped to trap rainwater and not all people in every region will be able to attain the rain collection goal, this is still an innovative idea that can be sustained in many regions throughout Brazil (Ghisi, 2006).

There have been many ideas for the improvements of these sectors in Nigeria that have just not been implemented. Ideas such as drilling more concrete boreholes to insure consistent water supply, introducing wetlands to help with contaminated sources, etc. (Muta'aHellandendu, 2012). It may be many years before Nigeria finds success within its own regions as it is behind Brazil development wise, however, the key to improving the water and sanitation sectors is to keep the task one of the main priorities of the nation. Brazil should do the same, even though they have begun to see progress sustaining the progress through future droughts and crisis will be the hardest task.

More challenges are coming for these nations. Increased populations, increased deforestation, the increase use of natural resources, the increase of numbers of droughts; these all combine to create a very dangerous and almost inevitable crisis that almost every nation/region in the world will have to handle. Denying this crisis its due attention will only hurt the populations and economies of those nations more than that has already been done.

References

- Abui, Yunana Mba; Danjuma P. Garba; Bonet Rikichi; and Siaka Stephen (2016). The Challenges of Rural Water Supply in Nigeria. *Dynamic Journal of Environmental Science and Technology*, Vol. 1, No. 4 (May), pp. 24-30; available at: <http://journaldynamics.org/wp-content/uploads/2016/05/Abui-et-al2.pdf>.
- Ademiluyi, I. A. and J. A. Odugbesan (2008). Sustainability and Impact of Community Water Supply and Sanitation Programmes in Nigeria: An Overview. *African Journal of Agricultural Research*, Vol. 3, No. 12 (December), pp. 811-818; available at: <http://www.academicjournals.org/journal/AJAR/article-full-text-pdf/BA8A14E38382>.
- Barreto, Mauricio L.; Bernd Genser; Agostino Strina; Maria Gloria Teixeira; Ana Marluvia O. Assis; Rita F. Rego; Carlos A. Teles; Matildes S. Prado; Sheila M. A. Matos; Nueza Maria Alcântara-Neves; and Sandy Cairncross (2010). Impact of a Citywide Sanitation Program in Northeast Brazil on Intestinal Parasites Infection in Young Children. *Environmental Health Perspectives*, Vol. 118, No. 11 (November), pp. 1637-1642; available at: <https://ehp.niehs.nih.gov/1002058/>.

- Ghisi, EneDir (2006). Potential for Potable Water Savings by Using Rainwater in the Residential Sector of Brazil. *Building and Environment*, Vol. 41, No. 11 (November), pp. 1544-1550.
- Mosbergen, Dominique (2017). People Power Defeats ‘Death Sentence’ Water Bill in Nigeria — But the Fight Isn’t Over. *Huffington Post*, Internet Article (March 22, 2017); available at: https://www.huffingtonpost.com/entry/water-bill-nigeria-revised_us_58d246b1e4b02d33b746e817.
- Muta’ aHellandendu, Joseph (2012). Health Implications of Water Scarcity in Nigeria. *European Scientific Journal*, Vol. 8, No. 18, pp. 111-118; available at: <https://ejournal.org/index.php/esj/article/viewFile/288/319>.
- Nikolau, Lisa (2015). Water Crisis in Brazil: Why the Largest City in the Americas is Drying Out. Internet Resource, Humanosphere, Environment (December 15, 2015); available at: <http://www.humanosphere.org/environment/2015/12/water-crisis-brazil-largest-city-americas-drying/>
- Nobre, Carlos A.; Jose A. Marengo; Marcelo E. Seluchi; L. Adriana Cuartas; and Lincoln M. Alves (2016). Some Characteristics and Impacts of the Drought and Water Crisis in Southeastern Brazil during 2014 and 2015. *Journal of Water Resource and Protection*, Vol. 8 No.2 (February), pp 252-263; available at: <https://www.scirp.org/journal/PaperInformation.aspx?PaperID=63776>.
- United Nations Children’s Fund (UNICEF) and World Health Organization (WHO) (2017). *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines* (Geneva, Switzerland: United Nations Children’s Fund (UNICEF) and World Health Organization (WHO)); available at: https://www.unicef.org/publications/files/Progress_on_Drinking_Water_Sanitation_and_Hygiene_2017.pdf.
- World Bank (2016). *Brazil May Be the Owner of 20% of the World’s Water Supply but it is Still Very Thirsty* (Washington, DC: The World Bank); available at: <http://www.worldbank.org/en/news/feature/2016/07/27/how-brazil-managing-water-resources-new-report-scd>
- World Bank (2017). *World Development Indicators / Global Development Finance database* (Washington, DC: The World Bank); as posted on the World Bank website: <http://data.worldbank.org/data-catalog/> (downloaded on May 31, 2017)