

Sustainability of Global Water Access and the Many Challenges of Developing Nations: An Overview

Timothy O. Ogunbode*

Environmental Management and Crop Production Unit, College of Agriculture, Engineering and Science, Bowen University, Iwo, Osun State, Nigeria

Abstract

The remarkable success recorded at the end of Millennium Development Goals in 2015 was a laudable one and so its sustainability becomes desirable, having hit 90% accessibility globally. Thus, the current global target through the United Nations initiated programme called Sustainable Development Goals (SDGs) is on course to ensure that there is no setback in the sector. This paper reviews various challenges which may hinder the enduring sustenance of the success realized in the water supply subsector in the developing nations. Relevant literatures were considered and reviewed, and desk check was carried out. It was discovered that if water access in most developing nations will be sustained then attempts should be made to attend to the myriads of socioeconomic challenges as they could render the global efforts towards water accessibility almost a waste. Apart from this, developing countries should gear up to pursue subduing all these challenges in order to keep up with their developed nations counterpart.

Keywords: Sustainability • Water access • Developing Nations • MDGs. SDGs

Introduction

Water scarcity may become another unforeseen future pandemic especially in sub-Saharan African and Asian countries if measures are not taken to abate the alarming trend in the population growth and urban expansion which exacerbate its influence on human water need. The significance of water to human survival and well-being cannot be overruled because of its use in domestic, industrial, aesthetic/recreational, agricultural activities [1-4]. The settlements in early civilization were partly and significantly attached to unobstructed access to water. Thus it is in recourse to this fact that the rise, development and the growth of early settlements were connected to sources of water such as rivers, streams, brooks and so on [5-9]. It is also in pursuit of this fact that all stakeholders including local, national and international organizations, philanthropists, religious bodies, institutions, industries, government at various levels and so on have found it dim fit to ensure that the resource in question is made accessible to man for its varied uses. Researchers in diverse areas of field but in water related areas are also in persistent investigations on matters relating to water sources, network, infrastructure, access, quantity, quality, flow patterns, availability and so on. Human access to water or otherwise has been found to have unquantifiable impact on its livelihood such as wealth creation, health status, performance at work, hygiene/sanitation, time management, industrial production and so on.

However, despite the relevance of water to human livelihood, it is noteworthy that the resource has become out of the reach of man, especially in the developing world [10-12]. This assertion contradicts the seemingly visible sight of water present almost in sufficient quantity across the globe as water forms about 96% appearing in open surfaces, oceans and seas, rivers/streams, lakes, ponds, brooks, springs, and subsurface sources which are reached and exploited through deep boreholes and dug-out wells. The out-of-reach of this

resource for man manifests in diverse ways despite the fact it is sighted and even, at times posed environmental hazard to his existence. Among the ways in which the scarcity of this resource has manifested include high mortality rate among children due to water-associated diseases, substantial economic time spent in searching and obtaining it, poor sanitation and hygiene, dilapidated water infrastructures, prevalent water rationing in homes, crisis at water points, prevalence of water-borne diseases and water-associated deaths among others [13-15].

Water resource access in developed and underdeveloped nations compared

The developing nations are more burdened with water accessibility palaver when compared with developed countries. Statistics have shown that nearly 100% accessibility predominate such countries as Germany, Sweden, England, France, United States of America, Japan, to mention but a few. In contrary, many developing nations are still groaning on how potable water could be made accessible to its citizenry. For instance, 70%, 59% 50%, 42% and 40% in Somalia, Madagascar, Chad, Nigeria and Togo respectively still lack access to improved water sources. lamented on the deplorable condition of water supply in Nicaragua and Honduras among the Latin American nations indicating water rationing and intermittent supply for an average of 6 hours per day and pollution as some of the challenges confronting the country. The UN's report as at the end of Millennium Development Goals in 2015 revealed that global access to improved water had risen to 90% from pre-MDGs access of 76%, though with disparities among the nations. The causes of the variations among nations are diverse but more pronounced in the sub-Saharan region and the middle east comprising countries like Sri Lanka, Indonesia, Malaysia, and so on. Despite international collaboration in tackling poor water access, the UN targets were still confronted with myriads of obstacles in many of these nations. In most of these countries, internal politics and economy pose hindrances to effective implementation of the global targets. Many of these countries have the challenge of unhindered policy implementation, most often attributed to political ideology differences and the need to embark on those programmes which were promised during their campaigns, which at times may not be congruent with the international target. At times funds are misappropriated and or diverted to private purses. Thus, the counterpart funds which ought to be were not. In developing countries, the perception on water and its availability also affected the poor post-MDGs report. Water is perceived to be free for all and so no one expects to inject any extra effort, especially in term of finance into its management, this seemingly influence the decision of the government on this sub-sector at various levels. No wonder

*Address for Correspondence: Timothy O. Ogunbode, Environmental Management and Crop Production Unit, College of Agriculture, Engineering and Science, Bowen University, Iwo, Osun State, Nigeria, Tel: 08064796590, E-mail: timothy.ogunbode@bowen.edu.ng

Copyright: © 2021 Ogunbode TO. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

that pipe-borne water network development in most developing countries has been neglected in preference for ground sources, both in the urban and rural areas. In corroborating this assertion report has shown that Nigeria regressed in access to piped water service on premise in urban areas as it dropped from three in every ten persons in 1990 to even less than one in 2015, the decrease that was attributed to rapid urbanization, lack of investment and institutional constraints in the expansion service [16].

Efforts towards achieving accessibility to improved water

There is no doubt that the United Nations and other stakeholders in water resource availability at various administrative levels are proactive enough to ensure that the successes achieved at the end of MDGs in various sectors and subsectors of global economy including water access in 2015 demand sufficient maintenance for its sustainability. Thus, the current global pursuit is embedded in Sustainable Development Goals (SDGs) by 2030. Sustainable water access is goal number 7 on this pursuit. In like manner, countries around the globe are being sensitized to ensure that water access level achieved so far is maintained so that human race enjoys adequate water supply for its varied purpose. For instance, countries like India, Pakistan, South Africa, Kenya, Brazil, Cuba, Malaysia, Nigeria and Egypt among others now role out programmes involving local communities that will ensure proper maintenance of water facilities in their various domains. Community leaders are being made responsible for the water infrastructure in their communities. Apart from this, funds are provided regularly for such maintenance and campaigns and regular water-related education is carried out. This is partly to change the orientation of people and their perception on water as a resource for better.

However, despite of all these efforts, developing nations are still overwhelmed by many other challenges which need kin attention of all stakeholders as it influences water access subsector if the pursuit on sustainable goals will be fulfilled.

Challenges of water access in the developing nations

Poverty: One of the perennial problems facing most developing nations is poverty and this has eaten deep that its consequences are multidimensional in these nations. According to Ndulu Benno J, and Stephen A O'Connell [17] stated that at the turn of this millennium, nearly half of the sub-Saharan African population fell below an income poverty line of \$1.50 per day, thus United Nations Development Programme (UNDP) (2017) opined that the September 2015 adoption of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) is a laudable decision for considerable attention to income inequality in the sub-Saharan Africa region. Household with such penury income will hardly be able answer to the call for contribution towards water infrastructure maintenance in the face of the demand for other necessities of life. This is partly responsible for a high rate of water-associated sicknesses and deaths in developing nations. Angoua et al. revealed that socioeconomic status and settlement characteristics appear as the main indicators of poor access to reliable water and sanitation in peri-urban settlements of Cote d'Ivoire. Furthermore, the consequences of high poverty level in water access subsector in sub-Saharan region include the high economic time spend in searching for water. Ogunbode TO, and IP Ifabiyi [4] noted that rural dwellers often prefer to travel far into the forest in search of water rather than contributing to the water facilities provided for them within their habitation, majorly attributed to poor income level. Saimy Intan Sazrina and Khalid Rasyikah Md [18,19] established that people in the rural areas in Malaysia and India resulted to surface sources, the source of which integrity and fitness for human is doubtful because of lack of capacity to carry out routine maintenance of water infrastructure provided for them. Similar observations were made by Nair Shadananan and Kumar S Vijay and GK Bharat [20,21] in India and so recommended that appropriate authorities, local and national should see to the proper use of the local resource through clear and comprehensive relevant policies.

Illiteracy: Several scholars have established the correlation between water use and level of education [3,22-24]. They revealed that water access is influenced by the consumers' level of education. Thus, the higher the level of education, the better the access to improved water facilities. However,

one of the banes confronting underdeveloped world is low level of education. Akoteyon and Isaiah Sewanu [24] revealed that the level of education among other factors correlated significantly with the dependent variable, Daily Water Consumption (DWC). Reniko Gondo and Oluwatoyin D Kolawole [25] also corroborated this view when they discovered that of all the respondents involved, those respondents that had tertiary education consume 51-60 liters per capita per day. This is in contrary to water consumption per capita per day for those respondents with primary (20-30 liters per capita per day) and secondary education level (31-50 liters per capita per day). The explanation for this revelation is on the premise that high levels of education always lead to a better understanding of the scarcity problem through a high level of income associated with high levels of education makes those with high education high consumers of domestic water. Mores, high income avails the opportunity of possessing both indoors and outdoors water-consuming infrastructure and gadgets [26].

Sustainable policy-Political influence/Water is free syndrome: Water is presumably a natural endowment which is available to man in three states of matter. This has greatly affected the traditional perception of man on water availability, being a free gift of nature that requires nothing to be accessible. Though the perception may be rightly conceived by virtue of the existence, however, water present both on surface as streams, rivers, seas and oceans and so on and or subsurface as ground water reached through digging and excavation and or through precipitation as rainfall, snowfall, dew, frost and so on can only be beneficial to man health-wisely if existed and consumed at their human-fit and right quality. Water issue has also become politicized in most developed nations that water provision and accessibility can only be achieved if and only if the community is connected to the people in high power positions, otherwise, the community may not enjoy the pleasure of the party in power for the period of their administration. Party politics has bedeviled the provision and even the maintenance of the pre-existing water infrastructure in many African countries to the level that water provision has almost become a mirage for many communities because of no affiliation to the government in power. So also, several water provision equipments have become moribund by reason of abandonment as a result of change in power [27]. For instance, Onolememen, Michael Oziegbe and Olufemi Adedamola Oyedele [28,29] noted that the sustainability of policies relating to water sub-sector have suffered from continuation due to change in power among the parties. Continuation of policies in water sector are often jeopardized by change in power noted as a result of lack of established institutions, especially in water subsector, its development has been hampered in such a way that implementation of programmes and policies are truncated over years.

Maintenance culture and vandalism: Another consequential effect of poverty as discussed above is the incapacitation of government and communities in maintaining water infrastructures while, even where attempts are made to actualize maintenance programme in water sub-sector, water equipment are often stolen or at times vandalized [30], especially in the course of construction works. Eneh Onyenekenwa C and Precious A Nnaji [31] noted that water access has been greatly hindered as a result of vandalisation of water supply equipment such as pipes, power generators and other related accessories.

Dilapidated infrastructures: The implications of lack of maintenance culture and vandalism also manifest in the status of many water facilities in developing nations. In Nigeria and many other sub-Saharan nations, most water pipes, pumping machines and other related equipment are in bad state as a result lackadaisical attitude towards maintenance, especially on the part of the government and their agencies saddled with the responsibility of water resource management. Pipe network have become decomposed and remain unreplaced, thus leading to water leakage in substantial volume at times. The dilapidated pipe-borne water network in most of these developing nations could also be traced to the change in source preference of the management agencies in favour of ground water development which seems relatively cheaper. Today, large proportions of people in most of underdeveloped countries rely on sub-surface sources for their domestic water use, both in the rural and urban settlements as a result of poor state of pipe-borne network [32]. In Nigeria, access of homes to pipe-water network had been observed

to have fallen drastically from three in every ten persons in 1990 to even less than one in 2015 partly due to the dilapidated infrastructures. Similar situations also prevail in other countries such as Madagascar, Kenya, Yemen, India, Argentina, Peru, Cuba among others where this universally acclaimed best water source has been abandoned almost totally [33,34].

Mismanagement/misappropriation of fund: Another endemic challenge which has had pronounced impact on the access to improved water facility in most underdeveloped nations is misappropriation and or diversion of budgetary allocation of this sub-sector to other uses over years. Reported that billions of dollars allocated to water resource development were either misappropriated or diverted to private purses in countries. He further reiterated that there is correlation between corruption and access to improved drinking water in sub-Saharan Africa like Nigeria, Togo, Mali, Sudan, South Africa. Thus, the more corrupt a country is, the smaller the fraction of its population that has access to improved drinking water. Water access had hence, been seriously and negatively affected as many water projects were either abandoned half-way implementation or end up at commissioning stage [35]. He further lamented that water access may be far from realization partly because of the high level and unabated leakage of existing resources. It was emphasized that much of the funding available in the ministries, local governments (LGs), utilities and village administrations many African countries is being diverted by public office for private gains. This situation has subjected people to search for water far in the forest and oasis, the consequential effects of which include increased water-related illnesses and deaths, among the young. Apart from this, many of these countries have failed in meeting up with their respective contributions as laid down in international treaties on water resource development, the reason not far from diversion of public resources to private uses. This is a limiting factor to the improvement of water access sub-sector [35] and remarked that corruption could reinforce inequitable water policies and divert resources away from projects designed to benefit the poor, and as such, may have more profound negative on the poor's access to improved water sources. World Water Development Report in 2006 cited corruption as the primary reason why over a billion people lack access to improved water supply. Gonzalez de Asis Maria, et al. [36], in their study in South Asia and World Bank's study on Africa and India, established that had undermined efficiency expected in water and sanitation sector by 20-40 percent. Also Davis Jennifer [37] discovered that bid-rigging in construction contracts results in acceptable bids inflated by roughly 15 percent and that side payments and kickbacks amounting to 10 percent of contracts. Based on these findings, Estache Antonio and Eugene Kouassi [38] submitted that if the water utilities in Africa were operated in corruption-free atmosphere in Africa and India, costs of production would be reduced by an astonishing 64 percent. In addition, philanthropic response to water development has not been so substantial in developing countries for lack of education on the significance of philanthropy in human development, self-centeredness, money laundering, fear of unknown future for what comes about relatives and so on.

Reliance on international and regional aids towards water management: Despite, the fact that many of the developing nations are no longer under colonialism, there is still a strong bond to their respective imperial colonialists. Most of these nations rely heavily on their past colonial masters for the provision of basic amenities and or funding, including water access sub-sector [39]. This reliance could hinder sustainable water accessibility in developing nations in the situation of failure of such grants and aids. Many international institutions have created interests in the development of water resources in developing countries to ensure that the resource accessibility improves. The Rural Water Supply and Sanitation Initiative (RWSSI) is one of the regional initiative domiciles in African continent. The Initiative is hosted by African Development Bank (AfDB). It is a regional response to rural water supply in Africa since 8 out of 10 people live in rural areas. Its objective is to accelerate access to drinking water supply and sanitation in rural Africa in order to attain the Sustainable Development Goals (SDGs) and the African Water Vision targets. The Bank had spent up to €1.53billion in financing 53 RWSSI programmes in 35 countries. Also, there is Cooperation in International Waters in Africa (CIWA) hosted by World Bank, Global Water Initiative hosted by International Institute for Environment and Development among others. All these initiatives could fail for whatever reason either on the part of the host or

on the recipient ranging from other commitments or focus on the part of host while misappropriation of fund and inability to contribute the counterpart fund on the part of the recipient.

COVID-19 Pandemic: Another more recent challenge which could pose a serious threat to the sustainability of global access to improved water in the third world is the ravaging COVID-19 pandemic. Tortajada Cecilia and Asit K Biswas [40] in corroborating this assertion stated that COVID-19 will unquestionably delay achievement of the [Sustainable Development Goals \(SDGs\)](#), the latest global attempt to improve the quality of life of billions of people around the world by 2030. According to these authors, countries in Africa and South Asia, with some 85% of the world's people live, face particularly daunting challenges to access clean, drinkable water. They further added that developed countries are increasingly facing similar concerns. After catastrophic experiences with water utilities in Flint in 2014 in the US, and in 2000 in Walkerton, Canada, which seriously affected the health of a large number of people, millions in these two countries are now using point of treatment systems in their homes to further purify city water. They are also buying bottled water because they perceive it to be cleaner and safer. Presently, this disease has claimed thousands of lives across the globe, with yet-to-be-developed cure or vaccine. This pandemic did not exclude the developing nations, as it is envisaged that the region might be most hit by the virus if not checkmated through vaccines and or cure drugs. The reason for this proposition may not be far-fetched in view of the various and prevailing avenues for the spread of the virus which are visible in these countries. For instance, in their descriptive analysis submitted that the sharing of improved water sources in may encourage the spread of corona virus in Nigeria [27]. These authors discovered that about 68% of the urban population still depends on sharing water points which are often provided by the government or its agencies, donors, which may be local like politicians, philanthropists, religious bodies and or international agencies due to the level of poverty. Another scholar in India also revealed that poor health facilities in most urban centres in the southern province may deteriorate by the spread of the virus. They revealed that long queues still characterize health delivery in most hospitals. Similarly, Ahmed Nizam Uddin et al. and Van den Berg Caroline et al. [41,42] respectively, corroborated this discovery with the situation in Bangladesh and Sri Lanka. In addition, if social distancing remains one of the ways of controlling the spread of corona virus, and also, relevant drugs and vaccine are yet to be discovered, third world nations, access to improved water facilities still remain an avenue for the spread of this virus.

Climate (Seasonality of rainfall): The seasonality of rainfall may pose threats to access to potable water in the developing nations [43-48] respectively revealed that access to water in Yemen and Malagasy has been hindered for many citizens as a result of scarcity of water caused by erratic rainfall. Thus the people affected had to resort to brooks and other unhygienic water sources for domestic uses in most of the rural communities as a result of replenishment through rainfall. Also, Pakistan, having being ranked tenth in the Global Index of Fragile States in 2014, the availability of access to improved water may become a serious challenge. With the current climate change across the globe, many countries may suffer from inadequate water supply while some may experience excessive water supply, both of which are not environmental-friendly because scarcity leads to inadequate water for human access while the excessive supply leads to flooding.

Discussion and Conclusion

A review on various socioeconomic challenges which could militate against the sustainability of the MDGs achievement recorded in water access subsector in 2015. The success recorded at the end of Millennium Development Goals in 2015 was a laudable one and so its sustainability becomes the current global target through the United Nations initiated programme called Sustainable Development Goals (SDGs). This paper reviews various challenges which may hinder the enduring sustenance of the success realized in the water supply subsector in the developing nations. Relevant literatures were considered and reviewed, and desk check were carried out. It was discovered that if water access in most developing nations will be sustained then attempts should be made to attend to the myriads of socioeconomic challenges as they could

render the global efforts towards water accessibility almost a waste. Apart from this, developing countries should gear up to pursue subduing all these challenges in order to keep up with their counterparts in the developed world.

References

- Howard Guy and Jamie Bartram. "Effective Water Supply Surveillance in Urban Areas of Developing Countries." *J Water Health* 3(2005): 31-43.
- Hunter Paul R. "DKK.". *Water Supply and Health PLoS Medicine* 7(2010): 1-9.
- Ogunbode Timothy O, and Paul I Ifabiyi. "Determinants of Domestic Water Consumption in a Growing Urban Centre in Osun State, Nigeria." *J Environ Sci Technol* 8(2014): 247-255.
- Ogunbode TO, and IP Ifabiyi. "Domestic Water Utilization and Its Determinants in the Rural Areas of Oyo State, Nigeria Using Multivariate Analysis." *J Arts Soc Sci* 3(2017): 1-13.
- Yevjevich, V. "Water and Civilisation." *Water International* 17(1992): 163-171.
- Bazza Mohamed. "Overview of the History of Water Resources and Irrigation Management in the Near East region." *Water Science and Technology: Water Supply* 7 (2007): 201-209.
- Angelakis AN, Mays LW, De Feo G and Salgot M, et al. "Water and Wastewater in Ancient Civilizations." *Global Trends and Challenges in Water Science, Research and Management: A Compendium of Hot Topics and Features from IWA-SG (2012):* 90-94.
- Driaux Delphine. "Water Supply of Ancient Egyptian Settlements: the Role of the State. Overview of a Relatively Equitable Scheme from the Old to New Kingdom (ca. 2543-1077 BC)." *Water history* 8(2016): 43-58.
- Baba Alper, Chr Tsatsanifos, Fatma El Gohary and Jacinta Palerm, et al. "Developments in Water Dams and Water Harvesting Systems Throughout History in Different Civilizations." *International J Hydrology* 2(2018):150-166.
- Hutton Guy and Mili Varughese. "The costs of meeting the 2030 sustainable development goal targets on drinking water, sanitation, and hygiene" *The World Bank* (2016).
- Treacy Josephine. "Drinking Water Treatment and Challenges in Developing Countries." *The relevance of hygiene to health in developing countries* (2019).
- Simelane Maswati S, Mduduzi Colani Shongwe, Kerry Vermaak and Eugene Zwane. "Determinants of Households' Access to Improved Drinking Water Sources: A Secondary Analysis of Eswatini 2010 and 2014 Multiple Indicator Cluster Surveys." *Adv Pub Health* (2020).
- Calow R, and N Mason. "The Real Water Crisis: Inequality in a Fast-Changing World." *Overseas Development Institute Framing Paper, London* (2014).
- Obeta Michael Chukwuma and Cletus Famous Nwankwo. "Factors Responsible for Rural Residential Water Supply Shortage in Southeastern Nigeria." *J Environ Geogr* 8(2015): 21-32.
- Hertel T W and J Liu. "Implications of Water Scarcity for Economic Growth (OECD Environment Working Papers)." (2016).
- Brazys Samuel, Johan A Elkin and Gina Kelly. "Bad neighbors? How co-located Chinese and World Bank development projects impact local corruption in Tanzania." *The Review of International Organizations* 12(2017): 227-253.
- Ndulu Benno J, and Stephen AO'Connell. "Policy Plus: African Growth Performance, 1960-2000." *The Political Economy of Economic Growth in Africa* 2000(1960): 3-75.
- Saimy Intan Sazrina and Nor Ashikin Mohamed Yusof. "The Need for Better Water Policy and Governance in Malaysia." *Procedia Soc Behav Sci* 81(2013): 371-375.
- Khalid Rasyikah Md. "Review of the Water Supply Management and Reforms Needed to Ensure Water Security in Malaysia." *Int J Bus Soc* 19(2018): 472-483.
- Nair Shadananan. "Challenges in Urban Water Management in a Changing Environment Case Study from a Growing Tropical City." *Novatech* (2010).
- Kumar S Vijay and GK Bharat. "Perspectives on Water Resource Policy for India." *The Energy and Resource Institute* (2014).
- Ward, Michael, Hang To, Thomas Kompas, and Quentin Grafton. "Determinants of Residential Water Consumption: Evidence and Analysis." (2011). Aho MI, Akpen G and Iwuwe P. "Determinants of Residential Per Capita Water Demand of Makurdi Metropolis." *Niger J Technol* 35(2016): 424-431
- Akoteyon and Isaiah Sewanu. "Factors Affecting Household Access to Water Supply in Residential Areas in Parts of Lagos Metropolis, Nigeria." *Bulletin of Geography Socio-Economic Series* 43(2019): 7-24.
- Reniko Gondo and Oluwatoyin D Kolawole. "They don't read metres, they only bring bills": Issues surrounding the installation of prepaid water metres in Karoi town, Zimbabwe." *S Afr Geogr J* 102(2020): 356-371.
- Mapetere Kenias, Tanyaradzwa Chigonda and Evans Chazireni. "Water Demand Management Options in Masvingo City, Zimbabwe." *J Soc Sci Res* (2019).
- Ogunbode Timothy Oyebamiji. "Pattern of Domestic Water Utilisation and Management in Selected Rural Areas of Oyo State, Nigeria." PhD diss., University of Ilorin, USA, (2015).
- Onolememe, Michael Oziegbe. "The Impact of Leadership on the Governance of Infrastructure Development in Nigeria." (2015).
- Olufemi Adedamola Oyedele. "Policies and politics of infrastructure provisioning in Nigeria: 18th International Conference on Population and Development" United Kingdom. 7(2016): 23-24.
- Kayaga Sam and Ian Smout. "Water Loss Management for Utilities in Low Income Countries: Case Studies from Four African Water Utilities." (2007).
- Eneh Onyenenwa C and Precious A Nnaji. "Challenges To Regular Urban Potable Water Supply In Africa: A Study Of Enugu Metropolis In Southeast Nigeria." *Sust Hum Dev Rev* 8(2016): 39-62.
- Bwire Godfrey, David A Sack, Atek Kagirita and Tonny Obala, et al. "The Quality of Drinking and Domestic Water from the Surface Water Sources (lakes, rivers, irrigation canals and ponds) and Springs in Cholera Prone Communities of Uganda: an Analysis of Vital Physicochemical Parameters." *BMC public health* 20(2020): 1-18.
- Egbinola Christiana N. "Trend in Access to Safe Water Supply in Nigeria." *J Environ Earth Sci* 7(2017): 89-96.
- Water UN. "The United Nations World Water Development Report 2019: Leaving no One Behind." (2019).
- Water Integrity Network and WaterLex. "Corruption and Human Rights to Water and Sanitation." (2013).
- Gonzalez de Asis Maria, Donal O'Leary, Per Ljung, and John Butterworth. "Improving Transparency, Integrity, and Accountability in Water Supply and Sanitation: Action, Learning, Experiences." Washington, DC: World Bank 2009.
- Davis Jennifer. "Corruption in Public Service Delivery: experience from South Asia's Water and Sanitation Sector." *World development* 32(2004): 53-71.
- Estache Antonio and Eugene Kouassi. "Sector Organization, Governance, and the Inefficiency of African Water Utilities." *World Bank Policy Research Working Paper* 2890(2002).
- Bayu Tidar, Hyungjun Kim and Taikan Oki. "Water Governance Contribution to Water and Sanitation Access Equality in Developing Countries." *Water Resources Research* 4(2020): e2019WR025330.
- Tortajada Cecilia and Asit K Biswas. "COVID-19 Heightens Water Problems Around the World." *Water International* 45(2020): 441-442.
- Ahmed Nizam Uddin, Mohammed Alam, Fadia Sultana and Shahana Sayeed, et al. "Reaching the Unreachable: Barriers of the Poorest to Accessing NGO Health-care Services in Bangladesh." *J Health Popul Nutr* 24 (2006): 456-466.
- Van den Berg Caroline, Subhrendu Pattanayak, Jui-Chen Yang and Herath Gunatilake. "Getting the Assumptions Right: Private Sector Participation Transaction Design and the Poor in Southwest Sri Lanka." (2006).
- Turrall Hugh, Jacob Burke and Jean-Marc Faurès. "Climate Change, Water and Food Security. No. 36. Food and Agriculture Organization of the United Nations" *FAO* 2011.
- Misra Anil Kumar. "Climate Change and Challenges of Water and Food Security." *International "Int J Sustain Built Environ* 3(2014): 153-165.
- Pervez Md Shahriar and Geoffrey M Henebry. "Assessing the Impacts of Climate and Land Use and Land Cover Change on the Freshwater Availability in the Brahmaputra River Basin." *J Hydrol Reg Stud* 3(2015): 285-311.
- Payus Carolyn, Lim Ann Huey, Farrah Adnan and Andi Besse Rimba, et al. "Impact of Extreme Drought Climate on Water Security in North Borneo: Case study of Sabah." *Water* 12(2020): 1135.

46. Glass Nicole. "The Water Crisis in Yemen: Causes, Consequences and Solutions." *Global Majority E-Journal* 1(2010): 17-30.
47. Bastaraud Alexandra, Emeline Perthame, Jean Marius Rakotondramanga and Jackson Mahazosaotra, et al. "The Impact of Rainfall on Drinking Water quality in Antananarivo, Madagascar." *Plos One* 6(2020): e0218698.

How to cite this article: Timothy O. Ogunbode. "Sustainability of Global Water Access and the Many Challenges of Developing Nations: An Overview". *Hydrol Current Res* 12:330 (2021)