# WATER MANAGEMENT IN RURAL VILLAGES IN POOR COUNTRIES

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**Abstract** – Water management is a grave challenge to the underprivileged, especially in rural areas, in poor countries. The purpose of this paper is to analyze, through a case study and meta-analysis, the importance of water management in rural villages in poor countries as a means to improve population health and sustainable development. The results showed that water management for the poor countries needs to focus on the critical issue of access through a multi-sector partnership with the critical stakeholders.

**Index Terms** – Infectious Disease, Poor Countries, Rural Development, Sustainable, Water Management, Zika,

## I. INTRODUCTION

Water management is a grave challenge to the underprivileged, especially in rural areas, in poor countries. It is estimated that one out of six people in the world has difficulty to access safe water (Barton, 2016). The recentZikaepidemic among the poor in South America demonstrates again the importance of water management in these countries. Besides water-borne diseases, other water-related issues have caused the underdevelopment of the poor in rural areas. These include the droughts, a lack of access to water to meet basic needs and to sustain local economy, and pollution.One of the major goals of the United Nations is to achieve sustainable development by addressing the challenges facing the poor. The purpose of this paper is to show the importance of water management for the poor countries to improve population health and sustainable development.

The fact that the World Health Organization has raised its alert level for Zika in the beginning of February 1, 2016 by declaring Zika virus a public health emergency of international concern shows again the seriousness of water-borne diseasesfor the underprivileged in poor countries. According to CDC (2016) in the United States, the Zika virus infects humans through the Aedesaegyptimosquito. And the pregnant mothers and their babies are at the highest risks. Zika has caused serious morbidity to the newborns in their brain development, termed as "Microcephaly." Prior to 2015, the Zika outbreaks appeared in mainly Africa, and after May 2015, the infections have increased in Brazil and other South and Central American countries. According to the World Health Organization (2016), an official estimate showed that Zika has infected 3 to 4 million people and the victims have been the poor. To date, there is no effective treatment. Similar to Zika, other water-borne diseases, such as malaria, dengue fever, yellow fever, schistosomiasis, etc., have caused a large amount of morbidity and mortality among the rural villagers. To date, malaria, transmitted by the mosquito, has incurred the largest disease burden in the world. According to the WHO (2015), in 2015, there were 214 million malaria cases and estimated 438,000 malaria deaths. And 90 percent of the malaria deaths have occurred in sub-Saharan Africa. It is a major public health problem in more than one hundred countries. And it has caused an estimated $12 billion lost productivity in Africa (NetsForLife, 2015).

## II. METHOD

This research has applied a Harvard case method of analysis that examines data from ethnographic interviews, meta-analyses, and the data from scientific research and reports from credible media sources. The countries selected for analysis are the developing countriesaffected by water-related problems in poor countries in Africa, the Middle East, and Asia, such as Afghanistan, Brazil, Cambodia, Ethiopia, Kenya, Sierre Leone, Uganda, Yemen, etc.The resource-rich countries were also used as cases of comparison and contrast. The analysis focuses on: 1. The major development problems with wateraccess in the countries studied; 2. The causes of the problems. 3. The solutions of the problems and the recommendations to improve water management.

## III. RESULTS

Applying a Harvard Case Method of analysis, this paper demonstrates that water management poses serious challenges to poor countries especially in rural villages. The major problems are: the lack of means for water management in general. In specific, the problems include: accessing clean and drinkable water; the lack of means to clean up the water near residential areas to prevent water-borne diseases, such as malaria, dengue fever, yellow fever, and dengue; the lack of access to usable water for other purposes, e.g., for subsistence; and the lack of means to tackle water-related disasters, such as floods and droughts.These problems have posed a grave

challenge to the poor countries and have directly and indirectly contributed to other problems as poverty, population health problems, conflict, and population displacement. Therefore, the water-related problems have prevented the global community from achieving the sustainable development goals.

On the whole, a lack of access to water is a major challenge facing both the rich and poor countries. This is true even for the industrialized countries. For example, such resource-rich countries as Bahrain, Qatar, United Arab Emirates, and Saudi Arabia are ranked the highest in terms of water stress. In the United States, some states, such as California, Arizona, Nevada, etc., constantly face the problem of water shortage. Yet, unlike those rich countries that possess the means to resolve water shortage, for the rural villagers in other resource-destitute regions, the lack of access to safe and clean water is almost a daily challenge, let alone having access to a reliable water supply for other sustainable purposes. For example, in Ethiopia, the rural poor have mainly relied on the water in the natural environment, such as from the rain, streams, or rivers, for the basic water needs, such as drinking and cooking. The villagers in Cambodia often rely on the rain water for drinking. Yet, the water could be filled with dangerous parasites and the depository becomes a breeding ground for the mosquito carrying infectious diseases (Field observation. See also Barton, 2016). The lack of access to safe drinking water not only makes it difficult for the rural poor to meet daily needs but also affects population health. This problem has contributed to a high infant mortality.

A related problem is a lack of access to water for the subsistence purpose, such as irrigation or feeding the livestock. For example, for some regions in Africa, South America, Asia and the Middle East, (such as Ethiopia and Afghanistan), the natural disadvantage of being situated in geographical areas that face a high level of water stress is complicated by other deficiencies, such as poor water management, lacking infrastructure, and large-scale water disasters. In Eastern Africa, Uganda, Ethiopia, Kenya, Somalia, Djibouti, and neighboring countries constantly face the threat of irregular rainfall. In the Middle East, the Yemen population was estimated to have 120 m3 water available per person per year, much lower than the water poverty line of 1,000 m3 recognized by the World Health Organization (Fitch, 2015). The water shortage in 2015 also caused a famine for some population in Yemen. In Central Asia, in Afghanistan, with an average rainfall from 25 mm to 85mm from 1960 and 1990, is a notable case of water scarcity (World Bank Group, 2016). Worse, the recent climate change has further aggravated the water access issue.

The other problem that has aggravated the lives of the rural poor is the water-borne diseases that have continuously threatened the most vulnerable populations, especially the mothers and infants. The recent outbreak of the Zikaepidemic thathas caused serious damages to the newborns is only the tip of the iceberg and has exposed the everlasting dilemma facing the rural poor. Like Zika, such other water-borne diseases as malaria, dengue fever, shistosomiasis, yellow fever, and other neglected water-borne diseases have incurred a very large prevalence of morbidity and mortality for the rural poor. The rural poor often live near the water sources infested with the vectors of these diseases. The prevention against these diseases is not necessarily expensive by the standards of the industrialized countries, such as the detergents, mosquito nets, insect repellents, etc.; however, most of the rural poor simply do not have the means to access these preventive measures.

Another problem is the water-related natural disasters, such as droughts and famines. The 2011 drought in Eastern Africa incurred the deaths of 50,000 to 60,000 people in Somalia, Djibouti, Ethiopia, Kenya, Uganda and neighboring countries. In Ethiopia, the recent drought in 2016 has affected almost more than 20 percent of the populations. The affected populations have been so destitute of water for drinking and cooking themselves that they could not take into account the needs of their livestock and plantation. A large number of them simply destroyed the livestock or abandoned the animals on the roads. Those who have killed the livestock for food then faced famines themselves because the livestock and its derivatives, such as milk or eggs, had been an important source of their daily lives. Floods are regular occurrences for the countries that suffer from heavy rainfall from the monsoon season, such as those countries in South and Southeast Asia (e.g., Cambodia, the Philippines, Bangladesh, etc.).

What makes safe water even more scarce is the increasing pollution in almost every country. Pollution is a widespread problem in both the rich and poor countries. For example, in the United States, the media reported a major water crisis in Flint, Michigan in the beginning of 2016 because unsafe water has caused serious morbidity among the residents in the region (Lin, Rutter, and Park (April 8, 2016). In the US, it was also found that more than six million of Americans have been drinking water polluted by such toxins as lead. Water pollution also occurs in newly industrialized countries, such as India and China, as well as the poor countries, such as the Ivory Coast, Senegal, and Sierre Leone (See Gowen, 2016). For the industrialized countries, the pollutants are the derivatives in industrial products while for the poor countries,the pollutants come from the chemicals during the agricultural production process and mining. Yet, for certain poor countries, the water pollution could be caused by the electronic waste

(from the processing of unwanted electronic products from rich countries), as in Ivory Coast, Senegal, China, India, etc. (Ford, 2014). The water pollution poses an even more dangerous threat to these resource-limited settings because of the lack of the means and infrastructure to resolve water pollution. This has seriously affected population health. For example,in Sierre Leone, the life expectancy is only 56 years of age, as compared to an average of 78 or more in the United States (Barton, 2016).

The totality of the water problem poses a major barrier for the rural poor because it tends to generate a domino effect. The lack of access to safe and usable water affects the health of the population; makes it difficult to engage in sustainable economy and livelihood; impedes their access to other market opportunities for them to ride out of chronic poverty.

In terms of the causes for water-related problems, the major causes for a lack of access water to safe, clean and usable water are: first, there are natural disadvantages. Certain populations reside in areas where the dry climate is the norm and the water sources are scarce. These include the Middle East (Yemen, Jordan, Kuwait, Iran, Palestine, Lebanon, etc.), Western Sahara, Central Asia (such as Afghanistan), Parts of Asia (Northern and Western China), etc. Second, there lacks adequate infrastructure to capture, store, and transport water to the needy or the destitute areas. The necessary infrastructure includes, but is not limited to, the dams, reservoirs, wells, rain capturing systems, and functioning plumbing systems. The poor infrastructure issue is particularly serious for the rural populations in Africa, South America, and Asia.

The other causes can be grouped into short-term and long-term causes. The short-term causes could be the unexpected natural disasters or man-made disasters, such as systemic failure, large-scale droughts, conflicts of all kinds (domestic or cross-border, and unexpected epidemics or pandemics. The other mid-term to long-term causes could be governance, infrastructure inadequacy, chronic poverty, inadequate educational effort, public health inadequacy, and so on, in which and chronic poverty account for the most serious challenge to the rural poor.

Given all these problems, sustainable solutions in water management are urgent to improve the livelihood of the rural poor. First, in terms of the downstream solutions (which calls for immediate relief for water emergencies), all the critical stakeholders need to form efficient and effective partnerships to address the problems. The recent occurrence of the famine and drought in Ethiopia is a notable case in point. The partnership involving the UN agencies, foreign stakeholders, local governments, the nongovernmental agencies, and community member came together to provide food and water to the affected people. The other downstream solutions could be providing critical medicines to those affected by the water-borne diseases. For example, in the case of malaria, the most important medicine is coartem, a life-saving medicine for the malaria patients. For the upstream solutions (which focus on the capacity building for the affected communities), the critical stakeholders, especially the government, needs to improve the capacity of the affected communities to access water. Specifically, it requires a long-term commitment and investment in water management, such as improving the transportation, building the dams, reservoirs, water networks and pipes, rain water collection facilities, community pumps, purification system, community wells, emergent water storage systems, etc.

Competent water management is the most needed solution for the rural poor. It makes a large difference to resolve the water crisis. According to the World Resource Institute (2016), Singapore, a major emergent economy, has the highest water stress ranking because it is densely populated and has no freshwater lakes or aquifers and its water demand is much more than its supply. Yet, the water management in Singapore is widely regarded as a success due to its investment in technology, forging international collaboration, and responsible management. It is able to meet the national demand by drawing its water sources from the advanced rainwater capture systems (20%), imports from Malaysia (40%), recycling grey water use (30%), and desalination (10%).

The other example is the Africa Heartwood Project, which has demonstrated an efficient approach of well management by local communities. And from 2008 to 2014, it has completed 17 successful village water projects in West Africa, Ghana, and Liberia and has served 3,700 people. The project cost only an average of $3,000 to $7,000 per project (Africa Heartwood Project, 2014).

## CONCLUSION

Water management poses a serious challenge to rural development in poor countries. It has incurred serious consequences for the health and wellbeing of the rural population. The purpose of this paper set out to analyze the water problems for the rural poor in certain resource-poor countries, through a Harvard Case Method, andto propose possible solutions to support the sustainable development goals of the United Nations in rural villages. This paper has demonstrated that water management problem is one of the most serious challenges to sustainable development. To resolve this problem, we need to

generate the top-stream, up-stream, and down-stream solutions via multi-sector partnerships, such as improving poverty, infrastructure building, and providing immediate relief.

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