

Development of Water Infrastructure in Cambodia

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ABSTRACT: Cambodia is currently ranked sixth in the world in GDP growth. The growth has been assisted by three factors: economic aid received from other countries, contributions from non-governmental organizations (NGOs), and internal reform. Despite these advances, Cambodia continues to be hampered by the long-lasting damage caused by twentieth-century events: the bombing by the United States during the Vietnam War, the genocide under the Khmer Rouge, and the take-over of the country by the Vietnamese. Cambodia in the 1990s was suffering not only significant loss of basic infrastructure, but also a shortage of human talent due to the systematic destruction of its intellectual class. This paper focuses on deficiencies in one aspect of infrastructure: the lack of systems to deliver clean, sanitary water to the country's urban and rural areas. Clean water is necessary for the health of the citizens as well as industrial development. Water-borne disease adversely affects the well-being and productivity of workers; clean water is also essential for most industrial processes. The problem is especially acute in rural areas, where water is necessary for agriculture. Developing clean water systems requires expertise as well as money to locate, filter, and transport water. This paper will propose concrete steps Cambodia should take to improve its sanitary water infrastructure.

KEYWORDS: Cambodia, clean water, infrastructure, allocation of economic resources

Introduction

In order for Cambodia to continue economic growth, it must address its inadequate infrastructure for the delivery of clean, sanitary water for use by its citizens, industries, and farms. Access to clean water is essential for the health of a society. The reasons for Cambodia's inadequate infrastructure have to do with political and social turmoil that occurred during the second half of the twentieth century. As a result, Cambodia lacked an administrative, professional, and technical class that could design and implement a system for obtaining and delivering clean water where it is needed. We will analyze the problem and suggest solutions to help Cambodia improve its standing in the global economy.

1. Brief Review of Relevant History of Cambodia

The first humans to settle in Cambodia were Stone Age hunters and gatherers. Farming was later introduced into Cambodia in the periods around 2,300 BC. The ancient farmers used stone tools as well as weapons, which were made from bronze. The first civilization was realized in the periods around 150 AD, as facilitated by the Mekong River delta in South Vietnam. With civilization, kingdoms were established, including the Khmer empire, which was primarily supported by agriculture. In the 1850s, Cambodia became a colony of France, which controlled Southeast Asia.

Following World War II, Cambodia continued to be a colony of the French. Events in neighboring Vietnam had a profound effect on Cambodia's future. Three significant developments during the second half of the twentieth century shaped and influenced Cambodia's current situation: the bombing by the United States incidental to the Vietnam War, the rise of the Khmer Rouge and the purging of the intellectual class, and the invasion of Cambodia by the Vietnamese.

A. U.S. Bombing

The four-year-long carpet bombing from the skies over Cambodia was started on March 18, 1969, by the U.S. The bombing was an attribute of the Vietnam War. The United States, as part of its strategy, attacked a network of North Vietnamese supply routes that crossed through Cambodia. In the process of the progression of the war, the U.S. deliberately invaded both Cambodia and Laos with an attempt to disrupt the routes (Sutter 2019, 235). The U.S. dropped an estimated 2.7 million tons of bombs on Cambodia, resulting in the displacement of 30% of Cambodia's population.

B. Purge by the Khmer Rouge

The destruction of Cambodian society by the Khmer Rouge took place between 1979 and 1985, when the despot, Pol Pot, gained ascendancy. Pol Pot's regime marked the most destructive and lethal period of Khmer history. In an effort to create an agrarian revolution, Pol Pot destroyed the Cambodian culture and civilization. His actions caused a concomitant deterioration of the mental and physical health of the society. It resulted in the destruction of the educational system and a breakdown of morality (Lostal 2015, 589). U.S. bombing earlier in the decade of the 70s facilitated the rise of the Khmer Rouge, allowing the regime to gain support. The victory of the Khmer Rouge in 1975, ultimately resulted in decimating millions of Cambodians through forced labor, expulsion from the country, and mass execution. When the Khmer Rouge was ousted in 1985, Cambodia was left with few intellectuals, government administrators, and adults in general. Most of the population was under the age of 15.

C. Vietnam Invasion

Vietnam launched a full-scale invasion of Cambodia. This was a turning point in the history of Cambodia; it extended the war between the two countries, both of which were oriented toward communism (Sutter 2019, 237). Through this invasion, Pol Pot was forced out. Most commentators agree that this war was a proxy for larger international tensions associated with the Cold War.

2. Effects of the U.S. bombing, Khmer Rouge Purge, and Vietnam Invasion

The U.S. bombing resulted in the loss of lives, displacement of people, contraction of diseases, and starvation. The purge by the Khmer Rouge, which involved a radical plan to restructure Cambodian society and create an “ideal” communist agrarian economy, led not merely to extreme loss of life, but also the destruction of the administrative, professional, and intellectual class.

A. Loss of Intellectuals

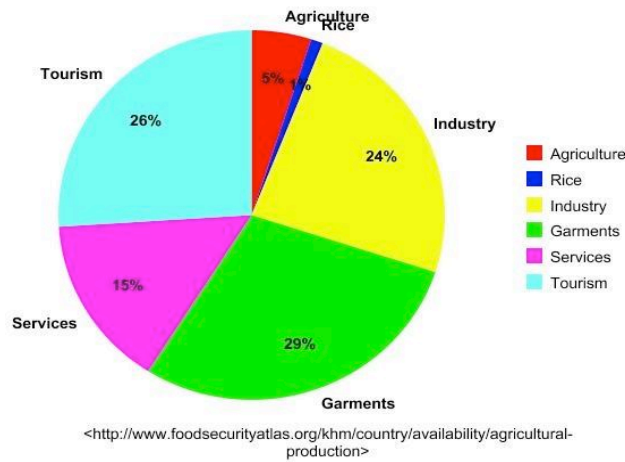
The targets of the purge by the Khmer Rouge and “influences” considered by Pol Pot to detrimental to his ideal society included Buddhists, foreign influences, Muslim Cham, Chinese, and Vietnamese. As a result, intellectuals were expelled or executed. The Vietnam invasion resulted in the establishment of infrastructure, which included agrarian development, political reorganization, restructuring of agriculture, legal and military institutions, and ultimately empowering economic production and consumption (Lostal 2015, 590). After the Khmer Rouge took over, Pol Pot feared that intellectuals would pose threats to the communist. He, therefore, shut hospitals, colleges, and factories. All lawyers, teachers, and doctors were forcefully evacuated from Cambodia while others were killed without mercy. The effect was a massive loss of intellectuals.

As a result of the rule of the Khmer Rouge, Cambodia not only lost its productive adults--the lawyers, university professors, businessmen, and other professionals that a modern society needs to thrive, it also suffered the destruction of its institutions and infrastructure.

3. Infrastructure

Since establishing a constitutional monarchy through the Paris Peace Accords of 1991, Cambodia has made a sharp transition from conflict to peace. The country's progress has paved the way for international recognition, the inflow of cash donations, foreign investment, subsistence economy, and improved economic growth. Infrastructural development achieved by Cambodia includes improvement to transportation, telecommunications, water, and energy.

Diagram 1. Cambodia’s GDP Growth by Sector



Source: <https://sites.google.com/site/cambodiaseasiaproject/home/socio-economic-status>

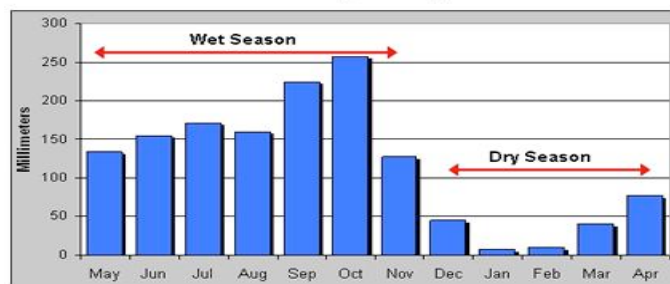
A. Water

Piped treated water Infrastructure is one of the critical areas that the Cambodian government has put more emphasis on. Moreover, the 3i private sector is stimulated via a funding initiative to ensure that piped treated water is accessible to rural areas where water scarcity is experienced. The government is also providing grants alongside technical support to unlicensed piped water private operators as an attempt to improve and expand their piped water infrastructure and coverage in the rural areas and other places with water scarcity (Bréthaut, et al. 2019, 154).

The government has put in place a support program that offers support to the licensing of water facilities to ensure an adequate supply of treated piped water for agricultural purposes. Cambodia has also made significant steps towards helping the communities access to clean water and improved sanitation services. Such measures are more pronounced in urban areas where it is estimated that one-fifth of the population resides. Generally, access to clean water in Cambodia has reached an estimated 71% of the population, an indication that the country is meeting the Millennium Development Goal promulgated by the United Nations. However, a combined analysis regarding access to clean water and sanitation reveals that approximately 4.3 million residents within the country do not have access to an adequate water supply, while 9.4 million people lack access to improved sanitation and other cleanliness services.

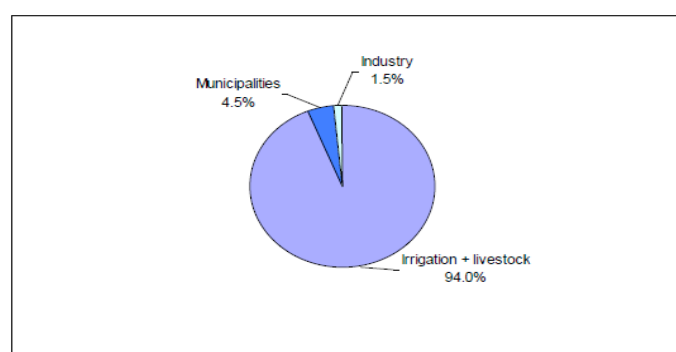
Cambodia's water availability is also affected by the rainfall pattern as indicated by the graph below:

Diagram 2. Cambodia’s Average Monthly Rainfall



Source: <https://ipad.fas.usda.gov/highlights/2010/01/cambodia>

Diagram 3. Water Withdrawal by Sector



Source: http://www.fao.org/nr/water/aquastat/countries_regions/KHM

B. Financial Support

From the time of the Paris Peace Accords, Cambodia has been receiving considerable support from global donors. Such supports have been initiated to aid the development of the country and implement post-conflict rehabilitation programs. The supports include direct aid, development loans, and infrastructural funding from multilateral, bilateral, and private donors. The big donors that have been consistently supporting Cambodia are Japan, the United States of America, and the Asia Development Bank.

C. Current State of Cambodia's Water Infrastructure

Approximately 3 million Cambodians lack access to clean sanitary water; more than 6.5 million Cambodians have no access to improved sanitation. In rural Cambodia, 77% of the population has poor access to safe water and sanitation. Judging from these statistics, the rural population is severely affected by the lack of clean water and poor sanitation (Bréthaut, et al. 2019, 154). Despite Cambodia being one of the fastest-growing economies in Asia, it is still affected by the significant problem of access to water connections and scarcity of affordable water sanitation for families and their homes.

Table 1. Sources of Water in Cambodia

Source	Quantity
Renewable water sources	476.1 cu Km
Freshwater withdrawal	4.08 cu Km where 1% is for domestic, 0%-industrial and 98% agricultural
Per capita freshwater withdrawal	290cu Km
Access to improved water sources	61% of population
Access to improved sanitation	29% of population

Source: http://www.fao.org/nr/water/aquastat/countries_regions/KHM

Clean water is essential to the health of a country. Clean water is necessary for agriculture and food production. Clean water is part of the critical ingredients for the production of food. Clean water is essential for improved sanitation. With clean water, domestic activities such as washing, cooking, and cleaning are essential for good health. Diseases related to contamination are prevented when people use clean water for domestic purposes. Through clean water, hunger within the community can be eliminated or controlled. Clean water promotes food security (Bréthaut, et al. 2019, 160)

Cambodia, a developing country with a recent history of civil unrest, had its water infrastructure severely damaged. However, after the peace deals, the country has focused on re-establishing its physical infrastructure in an attempt to reduce poverty and enhance access to clean water. Unfortunately, the efforts targeted at improving access to clean water are faced with challenges, including corruption, infrastructure development, security, and human capital issues. Yet Cambodia has not prioritized the need for clean water as compared to other sectors of its economy.

Cambodia experienced rapid population growth in urban areas. An exacerbating factor is an increase in its service and tourism sectors, placing pressure on per capita urban water use. Similarly, the rapid population growth puts pressure on the current water supply infrastructure. Estimates are that by 2020, the Phnom Penh Water Supply Authority (PPWSA) will need to supply 500,000 m³ per day to meet the ever-increasing demand for water use within the country. Increased water supply also means increased wastewater. This is a problem because Cambodia lacks a proper system to treat wastewater. Consequently, this has led to contamination of water quality, with attendant adverse effects on human health.

The improvements needed are more investment in the water supply infrastructure. The Japan International Cooperation Agency (JICA) has an office in Cambodia to facilitate the establishment and operation of water infrastructure projects. The project can be useful in the treatment of wastewater. Cambodia also needs the engagement of the private sector to participate in improvements to sanitation and hygiene and to invest in clean water. Proper planning, coordination efforts, and implementation capacity are needed to enhance good governance to ensure that the initiatives are successful. Law enforcement strategies, currently weak, will also have to be beefed up (Dang, Thanh Duc, et al. 2016, 3833).

Foreign donors partnering with government and private interests is essential to plan, implement, monitor, and evaluate infrastructure projects to effectively and efficiently distribute clean water. The public should also be educated about water use and control to minimize waste. The Royal Government of Cambodia will provide financing, while additional funding will come from both governments and NGOs from the USA, Japan, China, India, and others.

4. Plan: Specific Steps and Allocation of Sources

A. Sources of Funding

Governments in Asia are the primary source of funds for investment in water infrastructure in Cambodia. Investors from the private sector have argued that the Royal Government of Cambodia alone cannot provide the required financial and technical resources needed to improve the water infrastructure. Funds will be obtained from donors, who are responsible for the development of the irrigation sector in Cambodia. Most of the donors are from bilateral and multilateral institutions. These sources include:

1. The Mekong Secretariat, as a representative of donors, has prepared an inventory for potential hydropower responsible for emergency rehabilitation of the irrigation infrastructure of rural Cambodia.
2. The Asian Development Bank provides funds for special rehabilitation projects for enhancing access to clean water. Recently, the Bank has financed water projects in the province of Kampong Thom, including the rehabilitation of canals and water delivery systems.
3. Japan's International Cooperation Agency has provided \$10 million for floodplain area establishment and colmatage development.
4. The World Bank assists the Royal Government of Cambodia to improve its water infrastructure. In a recent instance, the World Bank extended technical assistance through a grant of \$2 million towards increasing the capacity of MOWRAM staff.
5. Food and Agricultural Organization (FAO) has funded the initiation of a project designed to control water technologies.

6. The European Union also forms part of the program by providing funds in developing local capacities and strengthening farmers association (Dang, Thanh Duc, et al. 2016, 3827). The funds provided by the European Union have been instrumental in supporting the research and study of small and medium-scale irrigation schemes in both Kampong Thom and Kampot.
7. NGOs offer significant assistance to the water and agricultural sectors, with 20 such organizations currently involved in irrigation (Arias, et al. 2019, 3). They provide financial assistance, technical assistance, materials, and equipment. They put more focus on rehabilitating the existing irrigation and sanitation system, including the repair of water reservoirs, outlets, repair of pumps, and canal networks to increase access to clean water. Since 1991, NGOs have been involved in the organization and promotion of farmers' unions to encourage proper water usage and participation by farmers in the planning and operation of the irrigation systems (Arias, et al. 2019, 5).

B. Allocation of Resources

The Royal Government of Cambodia allocates experts taking part in the improvement of the water infrastructure through various ministries and departments. International bodies also allocate experts through collaboration and consultation with governmental agencies (Dang, Thanh Duc, et al. 2016, 3838), including the ministry of industry; the ministry of mines and energy-- which is responsible for water supply to cities and towns within a province; the ministry of rural development--responsible for water supply, land drainage and sanitation in rural areas; the ministry of finance--which is in charge of water management; the ministry of public works and transport--in charge of water supply and sanitation; the ministry of planning--which oversees the plans for development of water infrastructure programs; the ministry of health--controlling the quality of water consumption for public water supply; the ministry of environment--in charge of water protection, and ministry of agriculture, forest and fisheries--in charge of policy implementation process for irrigation schemes, forests, and fishing areas.

C. Application of Filtration Systems

The most used filtration system in Cambodia is the Ceramic Filtration System, which has been constructed and installed by using locally available materials and sources. The financial aspects have been funded from both external and internal sources. Since the system was installed, pure drinking water has been made available for the neighboring communities. The mechanics of the operation involves the removal of impurities through a ceramic pot placed inside the top of a large water storage vessel. Contaminated water is then poured into the pot; as the water flows through the openings, impurities are removed. Pure drinking water is then collected in a cistern, from which it is available for consumption.

This clean water can then be delivered to farmers, households, and industrial plants. The other method is reverse osmosis and water treatment.

The strategy and mechanisms for delivery will ensure that clean water is accessible to areas where water is scarce or unavailable. The citizenry is educated by various bodies on how to use and control water. The education program is aimed at improving water hygiene and sanitation, as well as ensuring that water waste is effectively minimized.

Conclusion

In order for Cambodia to grow, improvements to its water infrastructure need to be implemented. Programs, funding, and administration are in place to achieve the necessary changes to help Cambodia succeed.

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