

# The Challenge of Access to Sustainable Water for the Rural Poor in Cambodia:

Socio-economic Impact Study of a Water Supply System for  
Village Residents in Kampong Speu Province

Lowell John Gretebeck

## INTRODUCTION

### **Impending Water Crisis**

Today, more than 1.2 billion people globally do not have access to clean drinking water, and 2.4 billion lack proper sanitation facilities. Further, about two-thirds of the world's population — or 4 billion people — are confronted with severe water scarcity at least one month out of the year. The journal, *Science Advances*, cautions that the “global water shortage risk is worse than scientists thought” (WWC, 2017). Reflecting these same concerns, the World Economic Forum now includes water scarcity among the top three global problems, along with terrorism and climate change. Supporting this perspective, a writer for the *Huffington Post* asserts:

The consequences of water scarcity can result in economic losses due to crop failure, limited food availability and poor business viability, and can threaten environmental biodiversity. When faced with scarcity, areas in need of water often resort to pumping groundwater, which can permanently deplete the supply. Water shortages have also precipitated or heightened the potential for global conflicts in places like the Middle East and Africa (Bellware, 2016, para. 9).

What is the underlying reason for this growing water crisis? Simply put, the problem is not necessarily about the availability of water, per se, but proper management of existing water resources. The World Water Council declares, “There is a water crisis today. It is a crisis of managing water so badly that billions of people — and the environment — suffer badly” (WWC, 2017, para. 1). Despite the approaching crisis, however, scientists conclude that the water scarcity dilemma can be solved if governments, corporations and individual citizens urgently begin to cooperate and effectively share all water sources that are currently available.

## **Importance of Water**

Scholars confirm that water is critical to national economies, especially since one-half of the global workforce is now engaged in eight water-dependent industries — inclusive of agriculture, forestry, fisheries, energy, manufacturing, recycling, building and transport. It is estimated that 1.4 billion jobs, representing 42% of the global workforce, are largely water-dependent. According to the United Nations, access to a safe and affordable supply of water, combined with adequate sanitation services, can improve living standards, expand local economies, and result in more decent jobs. The UN further affirms, “...sustainable water management is also an essential driver of green growth and sustainable development” (WWDR, 2016, p. 1).

## **Global Context of Increasing Demand for Water**

The world’s population has tripled in the 20th century; however, our thirst for renewable water resources has increased a shocking 600% (The Water Project, 2017). The future trend of increased population growth, together with industrialization and urbanization, will result in serious economic, human and environmental costs if immediate steps are not taken to mitigate the growing water crisis.

While the level of water withdrawals have stabilized in economically developed countries, the same cannot be said for poorer nations. Statistics bring to light the fact that less developed countries have been largely responsible for the overall increase of water withdrawals — which now stands at 1% per year since the 1980s. The UN Water Development Report forewarns, “By 2050, agriculture will need to produce 60% more food globally, and 100% more in developing countries”(Strait Times, October, 2016, p.1). This is particularly problematic for Asia because 70% of water is used for agriculture purposes. Experts in water system development further estimate that “water demand for manufacturing is expected to increase by 400% between now and 2050 globally” (Straits Times, October 2016, p. 1).

Despite rapid global economic growth in recent years, it is likely that future growth in some countries may be impeded unless immediate steps are taken to develop an adequate water system infrastructure to meet increased demand. In addition to water quantity, the quality of the water supply that is available is an equal concern. Government leaders and environmental experts report that the quality of water available is now declining, and the high cost that is required to treat unclean water will place a disproportionate economic burden on many poorer countries — including parts of Africa, Asia, Latin America and the Middle East. Moreover, global warming is yet another factor that threatens the availability of quality water resources. As climate change generates more severe and intense weather, the accessibility of clean water will be affected.

Finally, the global water crisis has accelerated the spread of communicable diseases throughout poorer nations and resulted in increased poverty. More specifically, it is estimated that over 1 million deaths annually are caused by poor quality and an inadequate water supply, and the loss of life is expected to worsen as water shortages become more serious. The large number of deaths underscores the need for governments, international NGOs and local community organizations to work together to secure water for these marginalized communities (WWDR, 2016). Clearly, access to a safe water supply, accompanied with proper hygiene, is imperative when safeguarding a healthy society.

Governments throughout the world, in addition to quasi-government organizations and NGOs, are now taking the lead to ensure that the quantity and quality of water is sustained for future generations. Recognizing this imminent crisis, the international community of nations in 2015 adopted the Sustainable Development Goals (SDGs): Goal 6 is to “ensure the availability and sustainable management of water and sanitation for all” (WWDR, 2016).

### **Cambodia Context**

According to UNICEF, about 6.3 million Cambodians, comprising 40% of the population, do not have access to clean drinking water. This mirrors a global crisis in which one in nine people do not have access to clean water, and one in three lack proper sanitation. While the rapid pace of development has improved the livelihood of Cambodians, the availability of new sources of clean water has clearly not kept pace (WWDR, 2016). The Straits Times (October, 2016, p. 1) reported that “the demand for water is spiraling. Rapid population growth is fuelling more demand for food and goods, meaning agriculture and industry are using ever greater amounts of water.”

Nationwide, only 24% of the Cambodian people currently have access to clean water, with the capital of Phnom Penh at a comparatively favorable level of 69%. There is also great disparity among the provinces: The residents of Prey Veng Province report that 54% of the residents have access to safe drinking water, compared to a dismal level of less than 2% in Oddar Meanchey Province. Nationally, 43% of the people rely on access to dug wells, while only 2.5% have access to piped water. Furthermore, only 30% of rural Cambodians have access to water through tube wells, water wells, treadle pumps and nearby ponds (WEPA, 2016).

In the near term of three to five years, it is generally acknowledged that rural Cambodia will continue to be seriously challenged by a lack of water access. As a result, the livelihood of the most vulnerable people, comprising mostly of the rural poor, will be negatively impacted by poor health, a lack of food, and limited income generation — thus keeping millions in the grip of poverty. Despite the Cambodia government’s stated policy to provide water access throughout the nation, full water access is not expected until 2025 or later.

## **Response to the Cambodia Water Crisis**

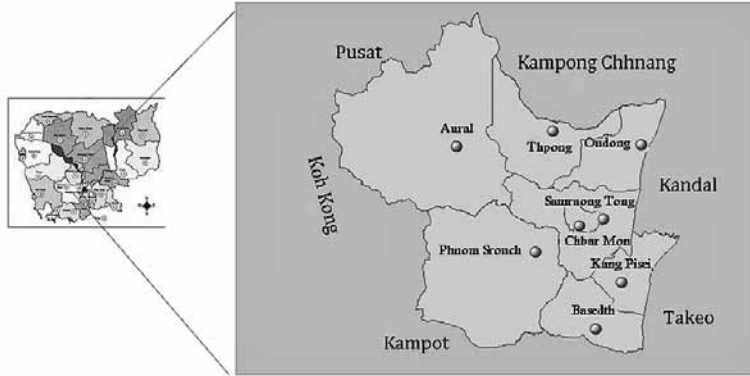
In response to the lack of adequate water supply in rural Cambodia, international nongovernmental organizations (INGOs), national NGOs and grassroots organizations have come together to provide a variety of water systems to help those in need. These cooperative interventions typically include piped water from a nearby reservoir, tube wells, or various forms of water harvesting during the rainy season. This seems to suggest that while groundwater may be readily available in many areas, water supply systems have not yet been adequately developed — perhaps due to a lack of knowledge as well as financial resources.

### **CAMBODIA NGO TAKES LEAD IN WSS DEVELOPMENT**

Realizing that having an adequate water supply is essential to the well-being of rural households, a national NGO in Cambodia, Life with Dignity (a.k.a., LWD), began a strategic planning process in 2008 to identify rural communities with potentially available water sources, yet lacked a water system infrastructure to allow access to individual households. During the two-year period that followed from 2010 to 2012, LWD was successful in constructing water systems in six rural villages in the district of Phnom Srouch by piping water from the mountains, natural streams and lakes.

#### **Launch of Water Supply System Project in Kampong Speu Province**

In early 2014, LWD identified another area in Phnom Srouch district of Kampong Speu province to be a likely candidate of a new water system project (the subject of this impact study). In this particular area, three rural villages of Teuk Tla, Mean Serey, and Dambok Rong, were determined to be in close proximity to a large, eight hectare, freshwater lake. In consultation with water system engineers, LWD thereafter confirmed that this water source was sufficient to provide sustainable water to the more than 260 households in the surrounding area. At the time, the local residents were typically collecting water daily from the lake to provide for minimal needs. However, the small amount of water carried each day was not sufficient enough to provide for sanitation, washing clothes and farming. In short, village residents remained in a “cycle of poverty”, which was the direct result of not having a sufficient supply water to support farming and household needs. Due to this clearly defined need for improved access to water, combined with an identified freshwater source in the area, LWD concluded that the development of a WSS project in this rural community was a priority.



**Figure 1**  
 Project Site Location: Kampong Speu Province  
 Source: Cambodia Parliament Seat Distribution, 2013

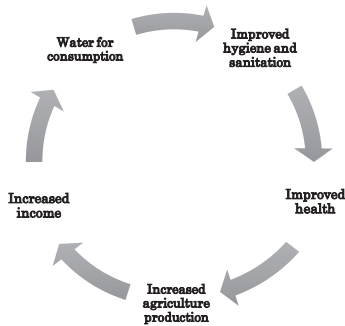
**Local Participatory Approach and Gender Empowerment**

The next step in the planning process included that of consulting with government authorities to clarify land right issues, after which time LWD staff held numerous consultative meetings with local residents — including the village leadership — to collectively participate in planning for the new Water Supply System. At the outset of the consultation, LWD clarified its management role, and also reached consensus among the villagers regarding the local community’s role and responsibilities. As proposed, LWD would assume a lead management role to promote the project’s success, by orientating the project to the local community, organizing local stakeholders, facilitating the establishment of a Water Supply System Committee, monitoring day-to-day construction and training in the areas of water system management. Furthermore, LWD agreed to raise funds through its international partner organizations to cover approximately 80% of construction costs. At the same time, local village residents — through the Water System Committee — would be expected to assume responsibility for the day-to-day planning, implementation, monitoring, maintenance and long-term financial sustainability.

As a supplementary note, gender empowerment would be promoted by requiring that 50% of the local management committee comprise of women from the village communities. This decision on the part of LWD and the local planning committee recognized that women in many countries — including Cambodia — continue to face discrimination and inequality in the workplace. The inclusion of women also supports a finding in a WWDR (2016) report that states, “qualitative analyses show that women’s involvement in management of water resources and water infrastructure can improve efficiency and increase outputs”.

## Key Project Objectives and Desired Outcomes

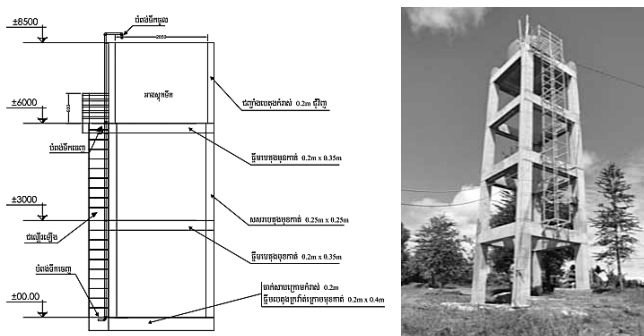
During the planning consultations, the local beneficiaries agreed that the overall objectives of the WSS would be to improve community access to water for daily consumption, improved hygiene and sanitation practices and increased agriculture production. The corollary expected outcomes of the project includes improved health, enhanced household income, and increased agriculture production due to improved access to water. Long-term success of the project would be measured against these expected project outcomes, as shown in Figure 2 below.



**Figure 2**  
Expected Project Outcomes

## Water Supply System Construction Plans

Drawing upon outside technical expertise from government institutions and private industry, LWD proposed that the project be carried out in two phases. As illustrated in Figure 3, during the first phase, a large, 10-meter-high concrete water reservoir would be constructed that holds water pumped from a nearby lake. The size and height of the water reservoir would ensure enough pressure to effectively pipe water to all households in the three surrounding villages for current needs, and still provide a buffer for future anticipated growth.

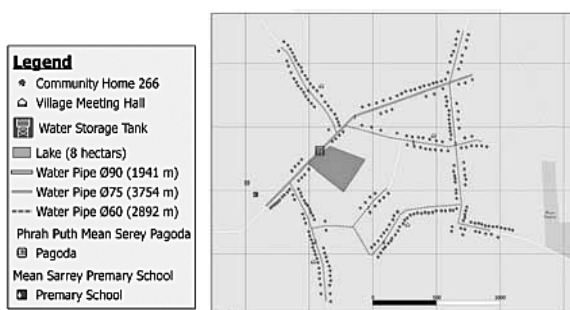


**Figure 3**  
Water Supply System Reservoir

The second phase of the project would involve the construction of piped water lines from the concrete water reservoir to each individual household, as shown in Figure 4. Related, LWD would arrange for the procurement and delivery of all needed piping supplies to each community. It would thereafter be the role of the local Water Management Committee, in cooperation with individual households, to coordinate the digging of soil and connecting PVC pipe from the reservoir to each household. Due to a limited budget and a desire to support the local economy, men in the households would volunteer much of the labor — in addition to locally hired labor — to complete construction of the piped distribution system.

### Targeted Beneficiaries

Figure 4 below illustrates the 266 targeted household beneficiaries of the Water Supply System, comprising 1,181 inhabitants, in the villages of Teuk Tla, Mean Serey, and Dambok ROUNG. Of this total, 36.4% or 430 are children and 17 people are considered disabled. Fourteen percent or 37 of the households are headed by a female.



**Figure 4**  
Water Supply System Project Map

### WSS Project Financing

The \$60,000 total budget included \$16,000 for construction of the reservoir tank, \$38,000 for the installation of the piping distribution system, and \$6,000 for administration, orientation and awareness-building activities. Naturally, local residents were initially concerned about a lack of financial resources to cover upfront construction costs. To ease the burden on the local community, LWD accepted responsibility to seek international funding from partner organizations to cover approximately 83% or \$50,000 of total project costs. Then, in an effort to promote “local ownership and control”, local village residents would be expected to cover approximately 17% or \$10,000 of the costs, which takes into consideration local income levels and payment capacity. Additionally, it was further agreed that local households should pay a nominal fee for water usage; this amount would be designated to cover ongoing maintenance.

## **Structures to Promote Long-term Sustainability**

A precondition to Life with Dignity and international partner involvement in this project was the establishment of sound structures that would promote long-term project sustainability. To reach this stated objective, LWD first agreed to provide grassroots training in the areas of water management and financial accounting. Furthermore, LWD accepted a role in establishing a Local Governing Board, which would ensure proper oversight, transparency and long-term sustainability. From a financial standpoint, sustainability would be further enhanced when recipient households pay a monthly fee, based on the amount of water use. All fees collected would then be used to provide for ongoing maintenance and supplementary training in future years, when deemed necessary.

## **ASSESSMENT METHODOLOGY**

The underlying purpose of this research is to assess key socio-economic changes after the installation of a new Water Supply System to support approximately 260 families living in three rural villages of Teuk Tla, Mean Serey, and Dambok Rong in 2014. The working hypothesis of this research is that the WSS will have a direct, positive impact on the socio-economic variables of health, agriculture production, and family income.

This study used a “mixed” quantitative and qualitative methodological approach. The quantitative component consisted of a 25-question written survey that was translated into Khmer, the official language of Cambodia. In terms of content, the survey was divided into three sections: information about household characteristics and demographics, data related to household water use before and after project implementation, and identification of benefits of the newly installed Water Supply System. Drawing upon internationally-accepted Sphere Project Guidelines, local NGO staff and project beneficiaries were directly involved in monitoring project implementation and gathering data to assess project impact.

Soon after the written survey was completed and analyzed, I traveled to Cambodia on three separate occasions between 2015 and 2017 to meet village residents to confirm the accuracy of the quantitative data collection, and further to conduct qualitative interviews with both individuals and focus groups. This method of “research triangulation” provided more detailed information about water use patterns and helped to understand the changes that occurred as a result of newly installed Water Supply System. The interview sessions with focus groups were homogeneous in terms of gender, occupation and social backgrounds, thus encouraging open discussion about water use and key challenges facing their village community.



## **SOCIO-ECONOMIC IMPACT RESULTS**

### **Demographics of Kampong Speu Province**

The target area is located in Kampong Speu Province, which is located approximately 50 kilometers west of the capital city of Phnom Penh. The area is home to more than 15 garment and footwear enterprises, which employ 13,000 inhabitants. In addition, the area has 16 agriculture-focused businesses with 12,000 employees. Rice, sugar cane, palm tree, cassava, and mango fruit are the main agriculture products of the province (Tourism Cambodia, 2017).

### **Household Characteristics**

The field survey sampling of 70 respondents (42 percent response rate) indicated that 93% of the household beneficiaries are actively engaged in agriculture, compared to 7% of the families who work in the construction sector or are involved in other day-labor activities. The participant households commonly report that children help with agriculture work as time permits. The area remains comparatively poor when compared to other parts of Cambodia; Kampong Speu province has a poverty rating of 23 out of 24 provinces (Gretebeck, 2017).

The majority of the 216 household beneficiaries of the Water Supply System reside in the villages of Teuk Tla and Mean Serey. These households are often composed of extended families, which may include nieces, nephews, distant relatives or grandparents. Also, it is important to note that the average size of the households in the study was 5.7 members, whereas the average number of children in these families was 2.5. The field survey also revealed that a primary education level was achieved by 75% of the residents, as compared to 17% who reported secondary school as their highest level of achievement. Six percent of the residents reported having no formal school education.

### **Family Asset Ownership**

Of the 70 household respondents, only 4% reported automobile ownership, while 80% possess a motorbike and 44% own a bicycle. This data indicates that rural mobility is limited and that residents are highly dependent on limited public transportation to get around. Furthermore, we can conclude that information access is moderate with only 56% of respondents reporting television ownership and a level of 17% for radio. In comparison, cellular phone ownership is high at 92%, and is considered the main source of news and information. Seventy percent of the households reported ownership of a cow, while 86% had chickens to support their livelihood.

Another socio-economic characteristic is that of the quality of home construction, whereby only 6% of respondents indicate living in dwellings constructed of cement, followed by 28% who built primarily with thatch and 26% with mud, respectively. A majority or 68% of the residents reported living in homes that are constructed with a combination of mud, thatch, and cement. Follow-up site visits confirmed that many of the residents reside in basic housing structures, which confirmed comparatively poor socio-economic conditions.

### **Family Income and Expenditures**

Seventy households reported their monthly income and expenditures on food, healthcare, education, clothing and lighting. On average, monthly income for the residents in this study equaled 458,000 Cambodia riel, equivalent to approximately \$112 dollars or JPY 11,500, with some families reporting income of less than \$50 a month. Moreover, families reported that food expense comprised the greatest portion of the family budget, with 25 of the 70 families spending more than 50% on food supplies. This high percentage of income allocated to basic food supplies is characteristic of people living in poverty. Still another major expense allocation included child education, with 16% of family income allocated to this budget category.

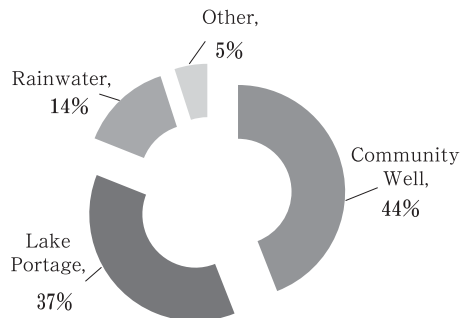
### **Identification of Major Socio-Economic Problems**

To gain a better understanding of the socio-economic challenges facing the target households, individuals were asked to identify two significant problems facing their family. Forty-four households or 63% of the survey respondents said that inadequate healthcare was the most serious problem. This was followed by no access to clean drinking water at 54% and a lack of food at 50%. It is not surprising that families living in poverty identified these basic life survival items of food, water, and healthcare to be most lacking. A cross-reference question focused on the level of dissatisfaction in six areas: home quality, sanitation, healthcare, water and electric. In response to this triangulation inquiry, dissatisfaction was reported in the quality of housing, with 65% of the respondents reporting dissatisfaction. This was followed by dissatisfaction with toilet facilities at 51%, inadequate healthcare at 56%, and a lack of clean drinking water at 36%, respectively. In sharp contrast, a lesser percentage of 20% of the respondents were not satisfied with the quality of education that was provided to children.

### **Baseline Water Use Prior to Installation of Water Supply System**

Next, the survey instrument helped us to more fully understand household water use prior to the installation of the WSS. Forty four percent of the people cited dependence on a community well as the major source of household water, followed by portage from a nearby lake at 37%. With respect to those who relied on the nearby

lake for water, residents reported that water portage of two to three hours each day put a serious burden on family time and energy, thus negatively impacting the amount of time that could have been spent on income-generation activities and farming. Finally, an additional 14% of the residents stated that natural rainfall was the main source of household water prior to the WSS. At the same time, others reported they were not able to fully take advantage of rainfall due to a lack of proper storage facilities.



**Figure 5**  
Water Source Prior to Water Supply System Installation N=70

With respect to the main source of clean drinking water, the study further revealed that village residents similarly used the same household water sources as noted above; however, 49% or 34 households also purchased bottled water — at an average monthly cost of \$7.50. Calculated, this means that some of the poorest families were spending as much as 15% of their disposable income on bottled drinking water.

Despite the fact that households generally had rudimentary access to some type of water source prior to the installation of the WSS, 64% of the respondents reported serious health concerns due a lack of a community-based WSS. In follow-up field interviews, residents reported that water-borne diseases and diarrhea was common due to unclean drinking and household water. Individuals also stated that it was prohibitive to purchase filtered or bottled drinking water due to low income levels of less than \$100 per month. The written survey triangulated this finding as 51% of the residents chose not to purchase bottled water for drinking, citing high cost as the main reason.

**Key Benefits of the Water Supply System**

In an open-ended question, the written survey identified the greatest use and benefits associated with the Water Supply System, after one year in operation. The results showed that 70% of the residents identified laundry, cooking and agriculture as the most significant areas of use. Most positive impacts were reported in increased income at 37%, convenience at 33% and improved health at 30%. A lesser percentage of 22% reported clean bathing to be a major benefit.



**Figure 6**  
Key Benefits of the Water Supply System N=70

Follow-up field interviews confirmed key benefits of improved health and an increase in agriculture production as a result of the newly installed WSS. A high percentage of the women said they now had more time to cook, care for children and engage in micro-financing activities — which was previously committed to daily water portage. In terms of financial impact, the average monthly household expense reduction after the installation of the WSS equaled 15,671 Riel, equivalent to \$3.88. Moreover, it is significant to point out that a majority or 70% of the households projected a future increase in income earned as a result of the WSS, while many others reported that the newly installed water system will allow for the growing of more vegetables for family consumption.

A final linked impact as a result of Water Supply System is anticipated in the areas of education and improved quality of housing. As explained by members of the Water Management Committee and village residents, the use of water for agriculture purposes will enable village farmers to increase their level of income which will thereafter allow for more money to be spent on child education and improving the quality of their homes. During the most recent site visit in August 2017, it was noticeable that a majority of the people still lived in homes constructed of mud and thatch; yet, it was evident that the construction of new homes had already started, with residents now transitioning into better constructed homes of brick and cement materials.

### **Household Recommendations for Enhanced Benefits**

The field interviews with local residents also provided very useful feedback regarding ways in which the benefits of the Water Supply System could be enhanced. First, village residents frequently commented that it is essential for each family to improve one’s water storage capacity. This would permit homes to access and save more water during the rainy season — that could later be used during the dry season or periods of drought. A second recommendation that came from community

discussions was the need to install suitable water filters, thus improving the quality of the drinking water. The survey indicated that only 37% of residents currently make use of water filters, while 63% simply boil water for drinking. In fact, health officials actually recommend a combination of using a filter and boiling to ensure the cleanest drinking water possible.

## **FINAL RECOMMENDATIONS**

- **EFFECTIVE USE OF AVAILABLE WATER RESOURCES:** In an effort to further improve the livelihood of rural village residents, local and international NGOs — in cooperation with local governments and CBOs — should be proactive in educating and promoting the effective use of available water resources. When upfront capital resources are limited on the part of the local community, these stakeholders should also work together to help rural communities to access both government and non-government funding.
- **DIVERSIFICATION OF WATER SOURCES:** The increased demand for water will require a concerted effort on the part of all stakeholders to diversify water resources, including springs, wells, rainwater and wastewater recycling.
- **VOCATIONAL TRAINING PROGRAMS:** The technical competencies of government agencies, NGOs and community-based-organizations in the areas of water resource management and water infrastructure development must be strengthened through vocational training programs.
- **IMPROVE MONITORING AND ASSESSMENT STRUCTURES:** Improvement in the monitoring, assessment and reporting of current water conditions in terms of both quantity and quality is needed on the part of governments, local communities and NGOs. Water monitoring systems are inadequately funded, thus requiring more resources to be allocated.
- **FUNDS FOR RESEARCH AND INNOVATION:** NGOs, community-based organizations, local governments and corporate stakeholders should continue to lobby national government officials to provide needed resources to support research that is focused on the innovation of low-cost water systems that are effective in improving the lives of rural residents.

## **CLOSING COMMENTS**

The implementation of the Water Supply System has significantly improved the livelihood of the village residents in Phnom Srouch. Since the launch of the Water Supply System, improvement in the area of family health was clearly evident. This research confirmed that clean drinking water has resulted in lower incidents of waterborne diseases and diarrhea. In addition, the availability of water has clearly

been an essential prerequisite to increased income as crop yields improve. We can further conclude that the WSS has resulted in other related socio-economic improvements, particularly as increased income is used to support child education, improvement of home quality and the start of new micro-business enterprises.

The long-term sustainability of the Water Supply System has been enhanced through the establishment of a WSS Executive Committee that meets regularly to review the current status of the WSS, identify potential problems, plan for long-term maintenance and update the fee schedule for water usage. While local control is respected, long-term sustainability is further enhanced as the national NGO, Life with Dignity, continues to collaborate with local leaders in providing project oversight, and ongoing training in the area of water system management.

### ACKNOWLEDGEMENT

This research was possible due to the cooperation and support of Life with Dignity (Cambodia) and the Japan Evangelical Lutheran Association (Japan). It has been a privilege to walk together on this journey to better understand the impact of the Water Supply System and how we can continue to improve the livelihood of the “poorest of the poor” in Cambodia and other parts of Asia.

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In response to the global water crisis, international NGOs — working in close collaboration with community-based-organizations — have introduced new, innovative and low-cost water systems that use available local water resources that meet basic water needs. Since 2008, a national NGO in Cambodia, Life with Dignity (formerly Lutheran World Development Cambodia) has taken the lead by providing Water Supply Systems (WSS) to more than 10 village communities in the province of Kampong Speu, located 50 kilometers from the capital city of Phnom Penh. LWD has assumed an important leadership role by orientating water projects to local communities, organizing community-level stakeholders, facilitating the establishment of Water Supply System Committees, monitoring day-to-day construction and training in the areas of water system management. Furthermore, LWD works through it's international partner organizations to raise funds to cover basic construction costs, while at the same time working with local residents to assume responsibility for the day-to-day planning, implementation, monitoring, maintenance and long-term financial sustainability. The underlying objectives of LWD's mission is to provide access to water for daily consumption, better hygiene and sanitation practices and increased agriculture production. The corollary outcomes of these water projects includes improved health, increased household income, and enhanced educational achievement. Long-term success of this water project will be measured against these aforementioned objectives.

The purpose of this empirical research is to assess key socio-economic changes after LWD implemented a new Water Supply System to approximately 260 families living in the three rural villages of Teuk Tla, Mean Serey, and Dambok Rong in 2014. The working hypothesis of this research is that the Water Supply System will have a direct, positive impact on the socio-economic variables of family finances, as well as health and sanitation.

In cooperation with LWD and community stakeholders, Dr. Lowell Gretebeck developed an assessment methodology that evaluated various socio-economic changes, measured against key baseline data. Using a quantitative survey, data from 70 households was received, compiled, coded and analyzed in accordance with SPHERE International Guidelines. Following this quantitative data collection, qualitative field



interviews were conducted with local focus-groups and individuals on three separate visits to Cambodia which confirmed quantitative survey results and provided relevant insight into research findings.

Through this study, the researcher sought to answer the following key questions: 1) What problems are associated with current water use among the “poorest of the poor” in rural Cambodia? 2) What are the most significant socio-economic impacts of a newly installed WSS at the household level? 3) In what ways has the WSS enabled families to improve their financial status through increased agriculture production — as well as the reallocation of increased savings to other budget areas — including child education, nutrition, healthcare and micro-business initiatives.

The results of this academic inquiry show that two of the primary benefits of a Water Supply System are that of improved health and income. This research also confirmed that clean drinking water has resulted in lower incidents of water-borne diseases and diarrhea. In addition, the availability of water has clearly been an essential prerequisite to increased income as crop yields improve. We can further conclude that the WSS has resulted in other related socio-economic changes, particularly as increased income is used to support child education, improvement of home quality and the start of new micro-business enterprises.

**Keywords:** water supply systems, poverty alleviation, Life with Dignity, Cambodia