WATER-ALLIES: A COLLABORATIVE APPROACH TO SOLVE WATER & SANITATION CHALLENGES IN INDIA

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INTRODUCTION

India has around 16 per cent of the world's population and four per cent of world's fresh water resources at its disposal. Sizeable water resources is under tremendous pressure due to ever increasing population and unequal distribution of water. The current per capita water availability in India is around 1545 cu m/ person/ year which is below the global standard of 1700 cu thereby resulting in India being a water stressed country. The rural population of India comprises more than 700 million people (roughly 60% of total population) residing in about 1.42 million habitations. The lack of water availability and poor management practices have also manifested in poor sanitation facilities. World Bank estimates that nearly 21% communicable diseases in India are due to the unsafe water. Even though water supply coverage has improved in recent years, water quality continues to be a cause of concern and the health burden of poor water quality is enormous. Waterborne diseases affect nearly 37.7 million Indians annually, with 1.5 million children estimated to die of diarrhea alone and 73 million working days are lost due to waterborne disease each year. The 2011 Annual State of Education Report (ASER) reveals that only 73.5 percent rural government schools have drinking water facility

Poor and unreliable surface water supply has led to unchecked groundwater pumping as an ad-hoc adaptation mechanism. Roughly 92% of India's irrigation needs and 85% of its domestic water supplies comes from groundwater. India possesses about 432 billion cubic meters of groundwater replenished yearly from rain and river drainage, but only 395 bcm are utilizable. In addition these ground water sources are often contaminated with fluoride and arsenic. Fluoride problems exist in groundwater sources in 17 out of 29 states in India. The rivers also have high fluoride content, beyond the permissible limit of 1.5 ppm, which affects 66 million people nationwide. An estimated 5 million people are likely to be drinking water with concentrations of arsenic greater than the national standard of 50µg/l, principally in the state of West Bengal.

The lack of water, sanitation and hygiene has an unprecedented effect on India's economy. In a study undertaken by the Water and Sanitation Program (WSP), a global partnership administered by the World Bank, it was found that inadequate sanitation causes India 'considerable economic losses', equivalent to 6.4 per cent of India's gross domestic product (GDP) in 2006 (US$53.8 billion) (WSP, 2010). The health-related economic impact of inadequate sanitation was also $38.5 billion, which was 72 percent of the total impact. The study also highlighted that 40 percent of Indian water sources suffered bacteriological contamination attributable to poor sanitation (UNICEF, 2008). An important point regarding improved sanitation is that it is not enough to increase access to improved toilets—it is equally important to ensure the safe collection, conveyance, and treatment of sewage so that it can be safely released into the environment.

INTRODUCING WATER –ALLIES

Rising water demands due to population and economic growth are straining the already stressed demand-supply balance. It is estimated that if the current pattern of demand continues, about half of the demand for water will be unmet by 2030 (WRG 2009). Thus in a bid to contribute towards solving the water sanitation issues in India, the ASCE EWRI chapter of Richmond, Virginia instituted a program called "Water-Allies" in 2014. Based on the principle, Connect, Collaborate and Conquer- Water-Allies is an initiative to bring the information of all active non-profits and developmental, international organizations, working on infrastructure, water & sanitation issues, one location (web portal).

The primary objective of water-allies is to build sustainable collaboration between the water sanitation non-profits, institutional supporters, developmental organizations, professional chapters, social business group, and individual volunteers. To achieve this mission, water-allies showcases all the possible opportunities available within each organization. The opportunities can vary from being a case study or literature review on topics of wastewater treatment, groundwater contamination, storm water management to a fund raising opportunity for any current projects.

SUSTAINABLE & INNOVATIVE PRACTICES – AN OVERVIEW

The program also aims to create a resource directory of various economical, sustainable and innovative practices that can be replicated in other parts of the developing world. The EWRI team has studied more than 110 nonprofits and currently more than 30 such organizations are a part of the initiative. In this article, the authors would like to share the wok of few of these organizations in brief and the innovative approaches adopted by them in solving the water and sanitation challenges.

SEHGAL FOUNDATION: In 2015, Sehgal Foundation installed the world's first stainless steel bio-sand filter in Ghaghas village, Haryana, India. In comparison to the traditional concrete filters, which can weigh as heavy as 170 pounds, the stainless steel filter weighs only 10 pounds. These biosand filters

can remove more than 95% of fecal coliforms and 75% percent of iron, manganese and arsenic content. The foundation has also been able to augment groundwater levels with the help of check dams, contour trenches, dug well recharging and pressurized recharge wells.

SUSTAINABLE SOLUTIONS: Sustainable Solutions, a NGO based in Virginia, has developed a sustainable enterprise rainwater harvesting model called Akash Ganga. The program is based on a public utility model, where every homeowner in the community with a roof is asked to lease the rights to harvest their rooftop rainwater. The homes are provided with the gutters, spouts and pipes that are connected to a network of interconnected underground storage reservoirs. Some of the rain water from these houses is channelized to a large reservoir of about 400,000 to 1 million liters to provide drinking water to those who live in houses with thatched rooftops that cannot be used for harvesting.

PROJECT WELL: Meera Hira Smith, a research specialist in the arsenic health effects research group of University of California, Berkeley, founded Project Well in 1996. Project Well is a sustainable community based mission that works in the arsenic affected villages of West Bengal where the drinking water is contaminated with more than 50ug/l of arsenic. In such Villages, the program constructs shallow concrete dug wells. The design of these wells differ from the traditional ones mainly by a layer of coarse sand of one-foot width that envelops the outer wall of the concrete cylinder that also acts as a filter, and by covering the wells and extracting water with hand pumps to reduce potential bacterial contamination. The annual average arsenic content of water from these shallow wells is approximately 11ug/l and the average fecal coliform count reduces from 100 to 26 units.

TOILET FOR PEOPLE (TFP): founded by Jason Kass in Brooklyn, TFP has designed and developed a sustainable, affordable and waterless composting toilet called "The CRAPPER" especially targeted for flood prone areas of the developing countries. The CRAPPER, aka the Compact, Rotating, Aerobic, Pollution-Prevention, Excreta, Reducer, consists of a horizontally mounted rotating drum which sits inside a box. The rotation mechanism maximizes aerobic degradation, eliminating pathogens and foul smell and also reducing the volume of the waste by 80%. In comparison to the traditional composting toilet that costs $1500, CRAPPER costs $200 per unit.

UNITED FOR HOPE: United for Hope is a nonprofit organization founded by Tara MaCartney who left her lucrative job at Microsoft and decided to work for a village in Uttar Pradesh, India. With her clean drinking water project, Tara with her team has succeeded in creating behavior change in the minds of the villagers. Adopting a social enterprise model, the team delivers clean drinking water to households at a very low price (3 cents per gallon).

GRAVIS: This non-profit works in drought affected Thar Desert of India and has succeeded in reviving indigenous rainwater harvesting systems in its last 30 years of existence. The team has designed and developed three major inlet structures that collect surface water from the desert catchment areas: percolation wells, underground tank, and village ponds. These structures have a capacity of storing more than 250,000 liters of water and Gravis has constructed more than 6,000 such structures.

GRAM VIKAS: The organization was founded by Joe Madiath in Orissa, India in the year of 1979. The majority of tribal communities that Gram Vikas works with are un-electrified. To bring 24-hours of piped water supply to un-electrified villages, Gram Vikas uses the principles of induced gravity flow and siphoning. Water from perennial springs are harnessed and diverted through pipelines, from as far as five or six miles. Gravity flow design for water-supply systems requires zero operating energy making the project financially attractive and easy to maintain.

BAREFOOT COLLEGE: The organization was founded by Mr. Bunker Roy in 1972 in Rajasthan, India and since then has successfully implemented various sustainable water solutions addressing the scarcity in rural communities. Solar powered reverse osmosis water desalination plants designed by Barefoot can reduce the total dissolved solids from 4,000- 6,000 ppm to only 450 ppm, making the water safe for drinking.

Water-Allies currently has established collaborations with 30 different WASH organizations and plans to increase this number to more than hundred in near future. To make this idea more impactful, a lot of groundwork, research and discussion are needed. The authors invite volunteers who would like to be a part of this initiative and make a difference in the lives of millions of people. Based on the scalability and success of this program, Water-Allies may be implemented in other under developed and developing regions of Asia and Africa.