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Nepal, Factor 9: Water & Sanitation

Nepal: A Contamination Crisis

“At any one time, close to half of all people in developing countries are suffering from health problems caused by poor water and sanitation.” (UNDESA). Water is vital to the survival of any living organism, and close to sixty percent of the human body is water (Water Science School). Life depends on water—clean water. Without proper sanitation practices, clear, colorless water can carry bacteria and chemicals disastrous to organic systems. In rural Nepal, clean water is limited. Sanitation practices are insufficient. The population is growing, and diseases are spreading. “Together, unclean water and poor sanitation are the world's second biggest killer of children.” (UNDESA). In Nepal, 44,000 children die from water-borne illnesses every year (CIA World Fact Book).

Nepal, a landlocked, predominantly Hindu nation of 147,181 square kilometers between India and China, has severe climate disparity due to elevation difference (CIA). The aridity and extreme cold of Nepal's mountain region force the majority of the population south, towards the almost tropical, lower regions of the South. A mountainous region containing eight of the ten highest peaks on the planet, including Mount Everest, Nepal faces accessibility problems. Many rural families reside on steep, elevated hillsides in central Nepal and in the southern Terai plains along the Ganges River. Distance, hazardous travel, and limited transportation availabilities inhibit rural access to education, medicine, and proper sanitation facilities. Nepal's economy is dominated by agriculture. Over 70% of the population of 31,551,305 depends on agricultural productivity (CIA). Nepal is also one of the poorest nations in the world.

Average rural subsistence hill farm families in Nepal have six members, and live in communities of about thirty families in straw, mud, and brick houses without running water or proper sanitation (FAO). Access to lower, more irrigable farmland depends on the individual family's wealth, and roughly sixty percent of crop yields are for direct consumption. The average diet of 2,100 calories consists mainly of grains, including rice and wheat, while 90% of the family's expenditures go towards other food (FAO). However, due to inefficient sanitation and irrigation practices causing erosion and desertification, Nepal's crop yields have reached an all-time low—leaving 29% of all Nepalese children malnourished (CIA).

The average farm size, per family, is 1.2 acres. Crops take precedence over livestock on many individual farms, some of which are maize and millet on more elevated, drier slopes, and rice and wheat in the basin (FAO). Agricultural practices, such as manual fertilization and water harvesting, are very intensive, and require considerable labor—and water. Children, starting younger than age five, often contribute: 34% of children work to provide for their families (CIA). Also, men tend to work fewer hours than the women of the community (FAO). This may contribute to the disparity in literacy rates, in combination with the severe gender and caste discrimination in Nepal. For men and women, literacy rates across Nepal are 76.4% and 53.1% respectively, adding considerably to the lack of family planning education in rural areas (CIA). Nepalese men can expect to live to 66, and women to 69. In comparison, the average life expectancy in the United States is 80.

As of 2015, about 54% of Nepal's population has unimproved sanitation (CIA). The degree of risk from disease is high, while sustainable rural agricultural productivity is low. Close to a third of all Nepalese children are underweight (CIA). Environmentally speaking, the contamination of water originates from organic waste and agricultural runoff. In addition, the rural poor of Nepal are more challenged than the urban poor due to the inaccessibility to reliable running water, low literacy rates, and inadequate education. Lacking awareness of the risk of consuming unclean water only adds to the transmission of

disease. Women are at an even greater disadvantage, because they have a 23.3% lower literacy rate than men, practically no rights involving self-sufficiency, and are discriminated against based on residuals of the caste system (CIA).

Nepalese sanitation has improved over the last fifteen years, from 21.7% of population access to 45.8%; however, this still leaves over half the population facing inadequate sanitation (World Bank). Water availability has also gradually increased, but not enough to meet the needs of a growing population and prevent a 15% decrease in gross agricultural output (World Bank).

Upgrading sanitation facilities, especially in rural agricultural areas, could drastically increase this output. Proper removal of waste and treatment of arable soil could not only lower the risk of water-borne illness, but also raise crop production in the climactically unfavorable regions of rural Nepal. Desertification issues would subside due to better treatment of soil, and with sustainably higher crop yields, Nepal's rural agricultural economy could develop more rapidly. Smallholder farmers, dependent on their crops for food and income, with better productivity could potentially have better access to medicine and education—for both men and women.

Nepal's varying terrain and elevation affect both the proper irrigation and drainage of useful, clean water, especially in rural areas. The harsh, freezing temperatures of the elevated north often destroy already-deficient crop yields, because farms do not produce enough in warmer temperatures to endure the winters. The tropical Terai plains near the Ganges often flood during monsoon season, also destroying crops. Repeatedly, lower regions flood and higher regions dry out, eroding the soil often to the point of desertification. Much of the clean water available to combat this process becomes contaminated by the current, ecologically harmful methods of sanitation and waste disposal.

The most common method of discarding human waste in Nepal is the pit latrine, which applies the 'drop-and-store' method to add nutrients to the soil (Holmberg). This method, which depends on the environment to transform waste into nutrients, often does not occur fast enough to keep human waste from contaminating nearby water sources. Thus, when attempting to fertilize, soil becomes contaminated by the pathogens present in human waste. Improper sanitation from the lack of proper sewage facilities makes most available groundwater water undrinkable because it carries potentially fatal diseases, such as bacterial diarrhea, hepatitis A and E, and typhoid fever (CIA).

Human waste carries these diseases, called pathogens, which can contaminate water supplies and crop irrigation. Urine is virtually harmless, but fecal matter contains hazardous pathogens requiring sanitation to prevent their spread as disease. Dehydration of human waste can prevent pathogen spread and enable its use as fertilizer for nutrient-deficient soil. In the absence of urine and water, solid excreta decompose faster, killing most harmful organisms within.

Ecological sanitation, a practice applied in many developing nations, is a solution that could limit the spread of disease and improve the conditions of subsistence irrigation. The double-vault toilet is a dehydration technique that includes the rapid reduction of water from fecal matter already separated from urine. Extensively utilized in rural Vietnam, Central America, and Sweden, the double-vault toilet is an above-ground container used to separate urine from excreta. Ash and dry soil coat the bottom of the compartment for feces, absorbing excess moisture as desiccants, and a narrow ventilation system completes the dehydration of the waste. The toilet has a groove for urine, which collects in the other compartment for disposal or gardening. Toilet paper and leaves are burnt and added to the solid waste compartment. To ensure complete destruction of pathogens, the solid compartment is large enough to last several months, before the removal of the desiccated, odorless solid waste to be used as dry, uncontaminated fertilizer (Holmberg).

Double-vault toilets for each family farm could provide a cleaner waste disposal system that, in addition, can produce fertilizer without fear of crop contamination. Local groundwater supplies would be safer from organic contamination, thus reducing the risk of water-borne illness. Double-vault toilets can be built locally, requiring clay or bricks and an ash pit (Holmberg). Educating rural communities of the dangers of contaminated water, and providing the solution of a locally-built waste removal system rather than the prevalent unhygienic wet pit latrines, could drastically reduce the amount of groundwater contamination. This would both decrease disease rates and increase crop yields. Water no longer used for pit latrines could go towards irrigation to prevent soil dehydration in elevated regions, and uncontaminated groundwater in the lower regions could be repurposed and used for drinking, rather than soak into arable soil and leech its nutrients.

The main materials needed for local construction of double vaulted-toilets are clay, bricks, and containers for dry fertilizer transportation. Families can build their own private double-vault latrines and benefit directly through crop yields and improved health. Also, families building the toilets themselves will improve their understanding of how to operate and maintain the latrines to encourage the longevity of the toilet. This also creates sweat equity, helping establish the toilets as necessary and useful from the perspectives of those families. However, certain challenges must be overcome to attain nation-wide distribution and proper use of the toilets.

Nepal's rural population has limited access to medicine, education, and communication with its administrative government. The double-vaulted toilet can only be useful if people know about it, how to use it, and accept the practice. Unfortunately, its application in Vietnam faced opposition from a cultural standpoint due to rejection of the idea of handling one's own waste directly (though due to its practicality the double-vault toilet remains the prevalent waste disposal technique in Vietnam). Similarly, next door in India, where Hinduism is practiced by a majority of the population, sanitation improvement initiatives have been challenged by rejection based in religious and cultural beliefs. A program started in December of 2015, the Swachh Bharat Mission Support Operation funded by the World Bank, was created to improve sanitation practices across India by building toilets and establish proper use of these toilets by rural families (World Bank). However, the long-standing practice of open defecation, often considered by India's rural population to be an important part of social interaction, has been difficult to abandon despite acting as a dangerous incubator for disease and contamination. In addition, the belief that defecating near the household is impure is common across India, contributing to the fact that upon revisiting homes in which toilets were built, the government found many of the toilets in states of decay, or adapted for other purposes (World Bank).

This example of rejection of a new method due to faith and tradition may likewise be an issue in Nepal. As Nepal is a predominantly Hindu nation, like India, the taboo upon defecating near the home could introduce an obstacle against adopting new practices. Further, the social element of open defecation is present in rural Nepal as well.

In addition, as the social aspect of current waste disposal practices remains important in rural communities, steps can be taken to alleviate strain on social habits from building individual toilets for each household. As many of Nepal's rural communities consist of small villages of approximately thirty families, one solution is to build the double-vault toilets all together, concentrated in one area of the village along its outskirts as is the current situation with communal wet pit latrines. Allowing the community to continue to come together as with the latrines could smooth the transition to and encourage acceptance of the new practice.

Not only does this solution help to preserve the social attachment to open defecation that could pose an obstacle to instating the double-vault toilet as an accepted and widely applied method, it also allows for a community buy-in. As aforementioned, families building the toilets themselves is an integral part of the

process. With all, or a majority of, the toilets assembled in one specific location, each entire village can participate in building them together. Transforming the construction of the double-vault toilet into an activity that involves the community as a whole can strengthen the communal relationship with this change. Once village residents complete the project collectively, each will have an improved understanding of how the toilet works, as well as perhaps better appreciate its advantages, to hopefully incorporate the new practice into daily life.

Additionally, this can relieve strain on those providing materials and educating residents on the construction and use of the double-vault toilet. If completed all at once, involving the entire community, the process of installment becomes more energy and time efficient, allowing this aid to reach more villages at a faster rate.

With regard to the materials and education necessary to make the project possible, determining sources of funding and aid raises another challenge; however, there are several options. Nepal's government can apply for aid from the World Bank and, more specifically, the IBRD (International Bank for Reconstruction and Development) to develop a similar loan situation to that currently exercised in India. Though India's approved loan was \$1.5 billion US dollars, Nepal is much smaller both geographically and demographically, with a 97.49% smaller population, and can approach the toilet orientation differently to prompt a more successful outcome (CIA). The nation's government has also been working with UNICEF to promote toilet use rather than open defecation. (UNICEF).

Also, involving corporations and non-profit organizations such as The Water Project, Volunteers Initiative Nepal, Actions Against Hunger, and Operation USA could contribute to a nation-wide awareness in Nepal of issues with water sanitation. Foreign aid can be a sensitive solution, as every nation does have its own domestic problems. Many are of the reasonable opinion that domestic issues should be solved first. However, Americans, for example, can play a part both at home, with participating in projects such as The Water Project (currently based in Sub-Saharan Africa) and in the classroom before tackling specific international issues from a financial standpoint. With the ultimate goal of playing a role in building sustainable futures for developing countries globally, every step carries weight, and in the meantime Americans can help in the realm of education. Nepal is ranked 11th in countries producing international students, and a majority of Nepalese international students study in America, both in high school and college (CFFN). This provides the United States with the opportunity to incorporate education on sustainable sanitation methods in schools and potentially universities, equipping international students from developing nations with knowledge and awareness to take back to their home countries. Younger generations play important roles in making changes, and this understanding would give them the opportunity to do so.

However, the challenging geography of Nepal's rural regions does pose a final problem. As distribution is a critical element of the process to improve sanitation techniques of rural communities, the limited accessibility to secluded areas both in the tropical, flat plains south of the mountains and in the steep, colder region of the Himalayas presents yet another challenge to be overcome. Yet with Nepal's current status as a developing country, more transportation opportunities are becoming available as a result of the government's push to expand road networks across the nation. The availability of semi-paved and paved transportation in rural areas has increased gradually since 2000, and with the Government of Nepal's Three Year Plan from 2007 to 2010 and the Road Transport Policy's 20-year master plan (started in 2001), efficient road management has begun to overcome the challenges of limited accessibility, transit costs, and domestic resource mobilization (World Bank). The country's small size and willing democratic government are crucial to overcoming these geographic obstacles, and the aid of the World Bank and non-governmental organizations as well as an informed and motivated new generation can catalyze the improvements to sanitation in Nepal.

For a developing nation facing a critical water situation and lacking resources to support a rural population, improvements in sanitation are essential. Once the population is aware and educated about the magnitude of and potential solutions to their water crisis, it can begin fixing the problem, starting from a local level and building towards a national, sustainable future.

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