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Nepal, Water and Sanitation

Nepal: The Fight Against Unsanitary Water Conditions

Known for its stunning mountains such as Mount Everest, otherwise known as the “Peak of Heaven,” the Federal Democratic Republic of Nepal is a landlocked country between China and India. Nepal, one of the world’s least developed countries, holds a reputation for its water abundance since it has an estimated 6,000 rivers. Despite its profusion of water, Nepal is ranked to have some of the world’s worst drinking water due to the lack of proper sanitation facilities (McPhillips). Over the years, Nepal’s lakes and rivers have been contaminated. The 2015 earthquake destroyed or dried up some 5,000 natural springs and wells (Ng and Xiangyu). Destitute residents used water from any available sources. These free sources of water are not always safe. Neonatal mortality is higher among babies in households without access to proper sanitation facilities and clean water (D. Paudel et al.). If conditions continue to worsen, there will be an increase in the child mortality rate and death toll.

After the abolition of the monarchy in 2008, Nepal became a federal democratic republic with an elected president and three branches of government: the executive branch, the legislative branch, and the judicial branch (Chepkemoi). According to data from the United Nations’ 2018 triennial review, Nepal has an estimated population of around 29 million people. Approximately 80% of the population lives in rural settings (Ritchie and Roser). In 2016, about 29% of Nepal’s land area was considered agricultural land (“Agricultural Land”). Nepal’s major exports are catechu, handicrafts, jute bags, ginger, oil cake, paste, pulses, readymade garments, and traditional hand knotted carpets (“FAO”). It is also the world’s biggest producer of mustard seed and third biggest producer of ginger (“50 Amazing Facts”). Although it has a larger land area compared to South Korea, Nepal has a smaller average farm size. South Korea’s average farm size is 1.5 hectares (1.5 ha), but Nepal’s average farm size is less than 0.7 hectare (0.7 ha) (Kumar et al.).

Eight out of ten of the world’s highest mountains are situated in Nepal, a country that lies along the southern slopes of the Himalayan ranges. Mountains cover up about 75% of the land. The Federal Democratic Republic of Nepal has four main physical belts: the Tarai, the Churia Range, the Mahābhārat Range, and the Great Himalaya Range. Nepal has both freezing and/or tropical weather depending on one’s location. The temperatures of altitudes above 16,000 feet are always below freezing with surfaces being covered in ice and snow. The lowest and highest temperatures in Kāthmāndu Valley were recorded to have been 27 degrees Fahrenheit (27° F) and 99 degrees Fahrenheit (99° F) (Zuberi et al.).

The average household size in Nepal is 4.4 members (“Household Size”). As a traditionally patrilocal and patriarchal country, Nepalese women move into their husband’s place of residence after they marry. Since Nepal is a predominantly Hindu country, one’s caste traditionally determined one’s job. Even though discrimination based on one’s caste became outlawed in 1962, its influence still remains (Evason). A family’s main stable source of income often comes from money sent by family members who work in foreign countries. Nepalis value family and live in multigenerational houses. Most of the population lives in rural villages where houses, made from mud bricks or stone, are typically two stories tall with thatched roofs and raised eaves (“Nepal - Housing”). Some houses contain only a sleeping room and a room for

cooking. A typical Nepali breakfast consists of vegetable and potato soup, roti, fruit salad, and milk tea (Dave). Lunch consists of pulse (legumes), rice, curry, and pickles (Kharel). After lunch, many people prefer to drink tea and eat momo, a South Asian dumpling, for tiffin, a snack between meals. For dinner, people may eat their lunch leftovers. Nepalis either cook their own food or buy food from restaurants.

Nepal faces many barriers that affect employment and food security. With limited access to new technologies and market opportunities, agricultural production has declined while widespread hunger and urban migration increased (“Agriculture and Food Security”). Climate change is another major factor that affects employment and food security. Water hazards have affected the production of rice, a staple crop in the country. Flash floods in 2017 submerged 80% of the southern agricultural belt in water, causing damages that amounted to 57 million United States Dollars of agricultural crops (Pandey). Farmers have started to abandon life in rural Nepal to search for jobs in cities. The lack of education remains a key factor in unemployment. A number of jobless adults faced challenges that prevented them from receiving a proper education. One challenge is the rough terrain of rural Nepal. The fastest route to school in remote areas may involve crossing a rope bridge. To reach their school on the other side of the bank, several students in Dhaing village use a piece of cable to slide across a river. Commuters have suffered injuries such as severed fingers from operating the cables. In 2010, five people died after they plunged into the Trishuli River (Sherwell). Severe weather amplifies the dangers of these commutes; as a result, students often opt to withdraw from school.

Almost all of the people living in rural Nepal are farmers. The local people who live near the Himalayan Mountains are Sherpas (Tibetan mountaineers) who often become experienced climbers, and help foreigners reach the summit of Mount Everest. The minimum wage of domestic laborers is Rs13,450 per month (118.27 U.S. dollars) (Sah). Poor communities often cannot afford healthcare. An estimated 770,000 children aged 5-12 years are still out of school (“Education”). Some children work in order to help provide money for their families. Attendance in early childhood education is at 51%, and the net enrollment rate in primary schools has risen to 97 % of children. Poverty, social exclusion, disability, migration, child labor, social norms, and gender bias remain key barriers to school matriculation. In 2016, almost 91% of the population had access to electricity (“Access to Electricity”); however, only 27% of the population has access to basic sanitation (Suwal). Supplied water is often polluted, leading to water-borne diseases. Many Nepalis fall victim to diarrhea, dysentery, typhoid, gastroenteritis, and cholera. Contaminated water has taken a toll on women from rural communities. Many rural women are not able to receive an education due to the burden of domestic chores. Instead of earning a high school diploma, many girls have to hike miles with their mothers to search for new sources of water.

Polluted water in Nepal has led to a shortage in quality water resources. The main causes of water contamination include open defecation and improper waste disposal. In late 2017, 2.6 million Nepalis still lacked a toilet and only 42 of the 77 districts of Nepal were open defecation free zones (Ojha). In Kāthmāndu Valley, only one public toilet is available for 46,000 people (Ojha). Eighty-five percent of people do not have access to clean drinking water (Chikanbanjar). Every year, roughly 44,000 children die in Nepal from waterborne illnesses (Suwal). The water crisis has forced Nepalis to buy water from private suppliers. Those who cannot afford to buy water turn to publicly accessible sources. In a study, tanker water, well water, and water from a stone spout contained E Coli bacteria, which can cause kidney failure and death (Ng and Xiangyu). The main factor of Nepal’s contaminated water is the sewage system. The two to three century year old system contains broken pipes and leaking sewage. The sewage mixes with water that would have been sanitary to drink. Treated water may get contaminated during transmission. The lack of uncontaminated water has led to a rise in the number of private water sellers. In Kāthmāndu Valley, the over extraction of water from the ground, streams, and rivers has prevented the government from using

these sources to increase city supply (Ng and Xiangyu). The Southeast Asian country is in need of ways to increase its clean water supply. The use of chlorine to kill water-borne diseases in contaminated water is one solution, but water chlorination is not popular in Nepal. The pungent odor of treated water prevents the success of chlorinated water (Ng and Xiangyu). The government of Nepal needs to educate its population, especially the next generation, about the importance of water sanitation. Personal beliefs on hygienic practices can prevent the success of water sanitation education. Now, Nepal must focus on providing safe drinking water to its inhabitants.

The Nepalese government could invest in solar stills for communities to purify dirty water. A solar still is a green energy product that harnesses the sun's energy to purify water (Sherwood). Solar stills are able to supply pure water that is safe for cooking and drinking. One of the first solar stills was used by mine owners in 19th century Chile after they faced the problem of providing safe drinking water to their workers. Mine owners used a sun-operated distilling plant with a large area of glassed-over wooden frames to evaporate contaminated water, recondense it, and make up to 6,000 gallons (22,712 liters) of fresh water daily (Willsey). A modern solar still consists of two water troughs and a piece of glass that runs through the top of the water containers. One places dirty water in one end of the water troughs while the other trough remains empty. The glass is placed across the top at an angle that points down into the empty trough. The bottom of the trough with dirty water is usually painted black to help absorb the sun's energy. A solar still works on evaporation and condensation. The solar still sits in the sun, so water is heated by the sun and liquid water is converted into steam. The steam would evaporate towards the glass ceiling, leaving contaminants and impurities behind. The water droplets roll down into the clean water trough (Sherwood). Solar stills could be a great solution in providing safe, drinkable water to people. Unlike chlorinated water, solar stills do not utilize pungent chemicals in purifying water. The materials needed to build solar stills are not expensive. The country's abundance of sunlight will greatly benefit this project. With more than 300 days of sunshine a year, Nepal is rich in solar power (Bhushal).

To determine the project's sustainability, the government should set up solar stills in two communities that are heavily impacted by unsanitary water. Government agents or volunteers who are trained by experts should hold town meetings in the selected communities to discuss sanitary practices. The workers would educate locals on the construction of solar stills. After the locals understand how to use these solar stills, they could venture out to other communities to share their knowledge. For their efforts, the government can give locals, who decide to expand the use of solar stills, monetary incentives or jobs. The education provided to the government from experts can be funded by nonprofit organizations. In rural regions, large solar stills can be shared amongst each community, but the location of these solar stills should be relatively close to the homes of all the users. The close proximity of the solar stills prevents women from hiking miles to retrieve water. Instead of searching for water sources, many of these women and girls can return to school.

Nepal needs to invest in modern wastewater treatment plants to better treat waste. Several wastewater treatment facilities need to be rebuilt. In Kāthmāndu Valley alone, one wastewater treatment facility is functional but is unable to keep up with the current load while three are non-functional ("Need for Wastewater Treatment Plants"). The majority of Nepal's wastewater facilities cannot properly function. Septic tanks were not designed properly, and broken pipes allow for sludge to mix with clean water. As a result, wastewater is disposed without proper treatment. With proper treatment through filtration systems, the treated wastewater can be released back into the environment. The water should not be drunk but it could be used to cultivate non-edible crops or used as toilet water. Proper wastewater treatment facilities allow for wastewater to be treated and reused in environmentally friendly ways. The long-term effects outweigh the cost of building new facilities. Untreated wastewater can lead to serious health problems when used in farming. Some modern wastewater treatment facilities allow for urine to be transformed into

drinkable water. In Singapore, NEWater plants cater up to 40% of Singapore's current water needs (Hun). NEWater turns urine into drinking water. The Omniprocessor is similar to NEWater. It is part of the Gates Foundation's effort to improve sanitation in poor countries. The Omniprocessor is a safe repository for waste produced by humans. Countries without proper sewage systems dump human waste into the nearest river or ocean. The Omniprocessor burns waste through the use of a steam engine. The facility also produces water and electricity (Gates). Nepal could pay for a facility such as the Omniprocessor by exporting hydropower to nearby Southeast Asian countries. The country has only harnessed 680 megawatts (680 MW) of its potential 40,000 megawatts (40,000 MW) hydropower capacity (Bhushal). With growing hydropower demands, Nepal could improve its economic status.

Along with hydropower, solutions for water sanitation can be funded by the production of industrial crops and tourism expansion into rural areas. Farmers can use wastewater in the production of "non-edible" crops such as cotton. A farmer by the name of Muniragu in Vijayapura, India utilized wastewater to grow mulberry, a crop used to produce silk ("Using Sewage to Make Saris"). Muniragu was a vegetable farmer forced to abandon his farm after his well dried. The harvested mulberry leaves are sold and fed to silkworms. The cocoons the silkworms produce are spun and made into saris. According to Muniragu, fellow farmers who followed his advice have started to make a comfortable living for themselves ("Using Sewage to Make Saris"). One of Nepal's main exports is readymade garments. If farmers turned to cotton farming by using wastewater, the readymade garment industry's potential could grow. The growing readymade garment industry could help invest in plans to clean Nepal's contaminated water. Profits made from tourism can also fund water sanitation projects. Nepal's Department of Tourism should expand the country's tourism potential. As a new marketing strategy, many countries have used social media as a way of increasing the tourism capital. Instead of focusing on one urban destination, Nepal should advertise tourists to visit rural communities. Nepal's tourism market is mostly concentrated within Kāthmāndu, the capital of the country. There are breathtaking regions of Nepal that receive little recognition. Media campaigns should advertise different aspects of Nepal that will appeal to a variety of people such as artists, families, historians, and students. Endorsement deals with companies and celebrities can propel tourism. Local businesses can benefit from tourists. A portion of the proceeds can be used to fund water sanitation.

Water safety has become a growing problem around the world. Humans must find ways to further prevent the contamination of water resources. With more people on the planet, more waste is generated. Water resources are heavily impacted by improper waste disposal. The world must work as one international task force to make sure that the next generation has access to safe water. Each country must do its part to resolve its own problems first. The change in Nepal's water usage, treatment, and purification practices begins now. The involvement of the government of Nepal, the education of its people, and the implementation of change in practices are paramount to greater water quality in the country.

Works Cited

- “Access to Electricity (% of Population).” *The World Bank*, The World Bank Group, data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=NP.
- “Agriculture and Food Security: Nepal.” *U.S. Agency for International Development*, U.S. Agency for International Development, 30 July 2019, www.usaid.gov/nepal/agriculture-and-food-security.
- “Agricultural Land (% of Land Area).” *The World Bank*, The World Bank Group, data.worldbank.org/indicator/AG.LND.AGRI.ZS?locations=NP.
- Bhushal, Ramesh. “Nepal Is Diversifying Its Renewable Energy Mix.” *The Third Pole*, 24 Nov. 2016, www.thethirdpole.net/en/2016/11/24/nepal-is-diversifying-its-renewable-energy-mix/.
- Chepkemoi, Joyce. “What Type Of Government Does Nepal Have?” *World Atlas*, World Atlas, 28 Mar. 2017, www.worldatlas.com/articles/what-type-of-government-does-nepal-have.html.
- Chikanbanjar, Reena. “Right to Safe Drinking Water.” *The Himalayan Times*, The Himalayan Times, 4 Feb. 2018, 5:00 pm, thehimalayantimes.com/perspectives/right-safe-drinking-water.
- Dave. “Photo Favorite: Nepali Breakfast.” *Go Backpacking*, Go Backpacking, 18 May 2011, gobackpacking.com/nepali-breakfast-photo/.
- “Education.” *UNICEF*, UNICEF, www.unicef.org/nepal/education.
- Evason, Nina. “Nepalese Culture.” *Cultural Atlas*, IES, 2017, culturalatlas.sbs.com.au/nepalese-culture/references-c9757708-49b1-4aa2-8fbd-9d4b4c9901d4#references-c9757708-49b1-4aa2-8fbd-9d4b4c9901d4.
- “FAO in Nepal.” *FAO*, FAO, www.fao.org/nepal/fao-in-nepal/nepal-at-a-glance/en/.
- “50 Amazing Facts About Nepal.” *Work The World*, www.worktheworld.com/infographics/50-amazing-facts-about-nepal.
- Gates, Bill. “This Ingenious Machine Turns Feces Into Drinking Water.” *Gatesnotes*, The Gates Notes LLC, 5 Jan. 2015, www.gatesnotes.com/Development/Omniprocessor-From-Poop-to-Potable.
- “Govt Plan Stresses Need for Wastewater Treatment Plants.” *The Himalayan Times*, The Himalayan Times, 13 Mar. 2017, 4:01 am, thehimalayantimes.com/kathmandu/government-plan-stresses-need-wastewater-treatment-plants/.
- Household Size and Composition Around the World 2017*. United Nations, 2017, www.un.org/en/development/desa/population/publications/pdf/ageing/household_size_and_composition_around_the_world_2017_data_booklet.pdf.
- Hun, Boon. “8 Facts About NEWater, The System That Turns Urine to Drinking Water.” *Goody Feed*, Goody Feed Singapore, goodyfeed.com/8-facts-newater-system-turns-urine-drinking-water/.

Kharel, Rupa. "Daily Routine of Meals and Work in Nepal." *OhmyNews International*, OHMYNEWS, 9 Feb. 2006, 11:50 (KST), english.ohmynews.com/articleview/article_view.asp?menu=c10400&no=272504&rel_no=1&back_url=.

Kumar, Anjani, et al. *Impact of Contract Farming on Profits and Yield of Smallholder Farms in Nepal: An Evidence from Lentil Cultivation*. 2016, ageconsearch.umn.edu/record/235848/files/Lentil_Nepal_CF_AAEA_2016.pdf

"Least Developed Country Category: Nepal Profile | Economic Analysis & Policy Division." *United Nations*, United Nations, www.un.org/development/desa/dpad/least-developed-country-category-nepal.html.

McPhillips, Deidre. "10 Countries With the Worst Drinking Water." *U.S. News & World Report*, U.S. News & World Report L.P., 14 July 2017, www.usnews.com/news/best-countries/slideshows/10-countries-with-the-worst-water-supply?slide=7.

"Nepal - Housing." *Encyclopedia of the Nations*, Advameg, Inc, www.nationsencyclopedia.com/Asia-and-Oceania/Nepal-HOUSING.html.

Ng, Desmond, and Say Xiangyu. "In the Land of 6,000 Rivers, a Contamination Crisis: Nepal's Water Nightmare." *Channel NewsAsia*, Mediagroup Pte. Ltd., 10 May 2017, 7:31 PM, www.channelnewsasia.com/news/cnainsider/in-the-land-of-6-000-rivers-a-contamination-crisis-nepal-s-water-8600062.

Ojha, Anup. "2.6 Million Nepalis Still Lack Toilet." *The Kathmandu Post*, The Kathmandu Post, 21 Nov. 2017, 17:06, kathmandupost.com/miscellaneous/2017/11/21/26-million-nepalis-still-lack-toilet.

Pandey, Swikriti. "Climate Change and Nepal's Food Insecurity." *Kathmandu Tribune*, Kathmandu Tribune, 30 Sept. 2017, kathmandutribune.com/climate-change-and-nepals-food-insecurity/.

Paudel, Deepak, et al. *Trends and Determinants of Neonatal Mortality in Nepal*. Mar. 2013, dhsprogram.com/pubs/pdf/FA75/FA75.pdf.

Ritchie, Hannah, and Max Roser. "Urbanization." *Our World in Data*, 13 June 2018, ourworldindata.org/urbanization

Sah, Dev Narayan. "Minimum Wage Raised to Rs13,450 per Month." *The Kathmandu Post*, The Kathmandu Post, 10 July 2018, 08:32, kathmandupost.ekantipur.com/news/2018-07-10/minimum-wage-raised-to-rs13450-per-month.html.

Sherwell, Philip. "Nepalese Children Cross River by Cable in 'World's Most Dangerous School Run'." *The Telegraph*, Telegraph Media Group, 19 Feb. 2016, 11:39 AM, www.telegraph.co.uk/news/worldnews/asia/nepal/12164594/Nepalese-children-cross-river-by-cable-in-worlds-most-dangerous-school-run.html.

Sherwood, Chris. "How Does a Solar Still Work?" *Sciencing.com*, Leaf Group Ltd., 24 Apr. 2017, sciencing.com/solar-still-work-4696783.html.

Suwal, Sahisna. "Water In Crisis - Spotlight Nepal." *The Water Project*, The Water Project, thewaterproject.org/water-crisis/water-in-crisis-nepal.

“The Farmers Using Sewage to Make Saris.” *BBC News*, BBC, 14 Aug. 2018, www.bbc.com/news/video_and_audio/headlines/45133277/the-farmers-using-sewage-to-make-saris.

Willsey, Marie. “Can the Sun's Energy Be Used to Clean Water?” *HowStuffWorks*, HowStuffWorks, 25 Apr. 2011, science.howstuffworks.com/environmental/green-science/sun-clean-water.htm

Zuberi, Matinuzzaman, et al. “Nepal.” *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 26 July 2019, www.britannica.com/place/Nepal#ref23637.