L. Knudsen

Kalon Prep Academy

Alexandria, MN, United States

Nepal, Water Access and Sanitation

Nepal: How to Increase Water Access and Sanitation

How can we stop world hunger and poverty? Nepal is one of the poorest countries in the world. One-fourth of the population lives below the poverty line and 10% of Nepalese children are severely hungry. Because Nepal is a mountainous country, poor road quality restricts access to markets. As well as natural disasters and high food costs, a contributing factor to the country's trouble is water access and sanitation. Residents are forced to drink polluted or packaged water, which is often expensive and can lead to disease. We can help this issue by improving water collection and distribution systems, promoting awareness and education, and building more waste sanitation facilities.

Nepal is a South-Asian country between China and India. It is most known for its Himalayan mountains, including Mt. Everest. The population of Nepal is 30.03 million people, as of the 2021 census, 79% of which is rural, though more people move to cities every year. The major crops and exports are rice, corn, carpet and wool. In rural areas, the average farm size is 0.73 hectares per household. This is relatively small compared to India, which is 1.06 ha/household. 75% of the landmass is mountainous, which leads to cool summers and severe winters over the majority of the country.

The average family size is 3.9 members. Even with these relatively small family sizes, it can be difficult to feed the household. The average diet consists of rice, corn and lentils. Most dishes are made from fresh vegetables and meat. Two-thirds of the population works in agriculture, so most of the food they eat is grown locally (*Ying, 2023*).

When bought from supermarkets, food is imported and costs in rural areas are too high for most to afford. In October of 2022, The Kathmandu Post reported that, “Food and beverage inflation in September stood at 8.17 percent.” And that prices overall had more than doubled in a year (*Prasian, 2022*). This increases the need for local farms, but with polluted water and rising climates, small scale farming is becoming less affordable and less reliable.

According to the 2016 Nepal Demographic and Health Survey, 20% of Nepalese households are mildly food-insecure, 22% moderately food-insecure, and 10% severely food-insecure (*USAID*).

According to a 2022 study by the U.S. Department of Health and Human Services, “Adults who are food insecure may be at an increased risk for negative health outcomes and health disparities.” For example, “Higher rates of chronic disease in low-income, food-insecure adults between the ages of 18 years and 65 years” (*Healthy People 2030*). Children who are food-insecure are over twice as likely to get sick and significantly more likely to have asthma or lung problems (*Gundersen, 2015*).

The Nepalese government has mandated provision of free and compulsory education, though it is not enforced. 16% of children do not attend school regularly. Most of these children are young girls, who stay home to gather water and do household chores instead (*UNHCR*).

Over 73% of citizens have access to mobile phones and the internet. However, Nepal relies on the coastal countries surrounding it, primarily India, for cross-border connections to the global network (*Government of Nepal*). Because of this, Nepalese citizens pay higher prices, have weaker signals throughout the country, and experience country-wide poor service. Due to their national internet gateway, Nepal will most likely continue to raise the cost of the internet and put more strain on the people and businesses that rely on it (*Wan, 2024*). This is an integral obstacle in the economic development of Nepal.

Efforts by WaterAid have improved water access conditions, and due to their efforts, 9 out of 10 citizens have access to clean water (*WaterAid).* However, this does not account for water sanitation. 10% of the population does not have access to a decent toilet and diseases are running rampant (*Asian Development Bank*). 80% of the population has access to drinking water, though there is no guarantee that it is safe to consume. Thanks to the interference of Non-Governmental Organizations (NGO) like the Asian Development Bank (ADB) and Wateraid, over 90% of the population have access to toilets, however, most human waste is sent to river-side landfills and open burns. River-side landfills and open burns are also how trash, like plastic water bottles, are disposed of.

Nepal is frequently hit with natural disasters. Avalanches from melting mountain tops and floods from the runwater being the most prominent. During a flood, fast-moving water destroys buildings, washes away entire fields and uproots trees. In the process of doing so, it contaminates wells and springs with safe drinking water. Pollutants are quickly mixed with safe water, contaminating anything in its path (*Vermont Department of Health*). Because of this, time and effort must be spent making sure water storage and well systems are safe to use. If they aren’t, or unable to be checked, disease could run rampant in the wake of natural disasters.

The leading cause of death in Nepal is Chronic Obstructive Pulmonary Disease (COPD) which is caused by smoking and air pollution. It is not curable, but can be prevented and improved by avoiding smoking, less exposure to air pollution and getting vaccinated. COPD weakens your immune system, making you more susceptible to disease (*WHO*).

As Shima Kumar Rai, a microbiologist and member of Nepal's NPR says, “Though the overall burden of [infectious diseases] is decreasing, several newer infectious diseases (emerging infections) namely, dengue fever, scrub typhus, influenza (H5N1 and H1N1), and others are posing a great public health problem.” (*Rai, 2018).* If this fails to improve, approximately 81% of deaths will be caused by noncommunicable diseases (*Pandey, 2020*).

With all the above concerns that face the people of Nepal, there is hope through many solutions. Improving existing wells and the technology in them can keep water sources safe and curb the spread of disease. Raising environmental caution in schools and communities can help raise concern and efforts to protect the environment. Building and improving sanitation facilities can help curb disease and pollution in Nepal.

Improving wells built by Wateraid and building additional water collection and filtering systems will vastly improve the sanitation of the water quality. In 2021, Engineers at the Massachusetts Institute of Technology (MIT) found a way to use trees to purify drinking water, by utilizing natural xylem tubes, which are connected by a sieve-type fiber. They have even recently updated the design to filter out E. Coli and rotavirus. It has been shown-both in lab and real world tests-to remove bacteria from contaminated spring, tap and groundwater (*Chu, 2021).*

By installing this technology into existing wells and water collection systems, drinking water will be significantly safer. The tree-based design cuts down on costs significantly, and it has been shown in real-world tests to work on Southern Asian trees, with some minor changes to the design. “Because the raw materials are widely available and the fabrication processes are simple, one could imagine involving communities in procuring, fabricating, and distributing xylem filters,” says Rohit Karnik, professor of mechanical engineering and associate department head for education at MIT. This solution will need people to install the technology, which will create local jobs (*Chu, 2021*).

The University of Massachusetts Amherst published a study on water quality that says, “Water with high alkalinity can adversely affect the pH of the growing medium, interfering with nutrient uptake and causing nutrient deficiencies which compromise plant health” (*UMA*). Water and soil in frequently flooded areas should be tested for pollutants and to ensure it is safe for crops or ingestion. In addition, wells should be checked for contaminants after floods.

The most common contaminants are heavy metals, nitrate and microorganisms. Checking for contaminants can be done by lab, however, this can take an excess of time and money (*CDC*). By establishing Water and Waste Treatment Centers that offer water testing services, getting water quality checked will be more accessible. Lab tests are the most accurate and extensive type of quality test, and come in two forms. Dedicated testing detects one or a group of heavy metals that commonly occur together. Multi-contaminant testing detects heavy metals and other common contaminants, like nitrate (*Byrd, 2024*).

Diseases like cholera and dysentery are spread by floodwaters, which can easily infect water collection tanks and wells. Polluted waters are often filled with gasoline from flooded cars, trash from dumps and dead animals. When pollutants like these leak into wells and waterways, they are ingested by people and cause mass sickness (*National Geographic*).

To protect existing water collection tanks from this kind of flood contamination, installing a clay or concrete cap to provide a protective barrier on the tanks upper walls will help prevent the amount of contaminated water getting into the wells. This will double as strength for the walls of the collection tank and lower its risk of collapsing (*Climate Technology Centre and Network).* Alternatively, fiberglass casings are versatile to many soil types and are well suited for flexibility and strength. Gravel packing can be used in addition to concrete or fiberglass casings, to offer filtration and support in sandy soils (*Kocher*).

Raising awareness in schools and communities can cheaply and effectively grow caution for water sanitation issues. However, this fails to reach kids who do not attend school often, or at all (*Morgenstern, 2006*). 16% of Nepalese school-aged children do not attend school. Most of those children are girls, due to cultural favoring of boys education. Another obstacle in sending children to school is a language barrier. There are over 90 Sino-Tibetan languages used throughout communities in Nepal, but the official languages are Nepalese and English. With all these barriers, awareness in schools will fall short to reach critical demographics.

Partnering with Wildlife Conservation Nepal (*WCN*) and Community Conservation Nepal (*CCN*), students will be more engaged with conservation and see the direct impact of caring for our environment. WCN has already reached over 1000 schools in Nepal with their Prakriti Pathshala program, successfully raising awareness of Conservation work (*WCN- What We Do).*

Building sanitation facilities, like proper trash disposal and water sanitization plants, will keep diseased or dirty water from affecting the health of the city, and offer lab tests to determine what pollutants need to be taken care of. 25.4% of Nepal's trash goes to unsanitary landfills, and the other 74.6% is unaccounted for (*C40 Knowledge Hub*). Coming into contact with polluted water can cause severe health problems, such as typhoid fever, gastroenteritis and even food poisoning. Building sanitation facilities will create jobs for construction workers, and staff positions to run and maintain the facilities.

In conclusion, water access and sanitation are immediate issues in Nepal that directly affect the health of the people and stunt economic growth throughout the country. Through disasters like landslides and monsoons, recovery efforts take up a significant portion of the country's economy. We can provide support for ordinary people by; improving water access systems with natural filtering systems, spreading awareness of pollution and direct action against it, and building sanitation and waste disposal facilities.

Citations:

“After a Flood: Private Drinking Water Guidance”. Vermont Department of Health. 2024, February 20.

Aid, Water. “Where we work - Nepal”. Wateraid. https://www.wateraid.org/us/where-we-work/nepal

Bank, Asian Development. “Bringing Water and Sanitation to Rural Nepal” Unlocking the Potential of Small Towns. Asian Development Bank. 2024.

https://www.adb.org/where-we-work/nepal/water-sanitation-small-towns

Byrd, Jennifer. “How to Test for Heavy Metals in Water”. Water Filter Guru. 2024.

https://waterfilterguru.com/how-to-test-for-heavy-metals-in-water/

Chu, Jennifer. “MIT Engineers make filters from tree branches to purify drinking water”. MIT News Office. 2021, March 21.

“Concrete Well Casing: Your Ultimate Guide to Durable and Safe Wells”. Kocher’s Water Pumps & Tanks Inc. 2023.

https://kochergeowelldrilling.com/concrete-well-casing

Conservation, Community. “Our Partners”. Community Conservation.

https://communityconservation.org/about-us/our-partners

CTCN. “Flood proof wells”. Climate Change Adaptation Technologies for Water.

https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/flood\_proof\_wells.pdf

“Environmental Education Program”. Wildlife Conservation Nepal. 2024.

https://wcn.org.np/what-we-do/environmental-education-program/1/

“Food Assistance Fact Sheet - Nepal”. Food Assistance. U.S Agency for International Development. 2019.

https://www.usaid.gov/food-assistance/nepal

“Food Insecurity”. Healthy People 2030. U.S Department of Health and Human Services. 2022.

https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/food-insecurity

Gunderson, Craig. “Food Insecurity And Health Outcomes”. Health Affairs. 2015.

https://www.healthaffairs.org/doi/10.1377/hlthaff.2015.0645

Harby, Annie. “What a Waste: Global Good Practices of Urban Waste Management”. City Changers. 2021, December 27.

Hub, C40 Knowledge. “Why every city needs universal waste collection and safe disposal as the foundation for sustainable waste management”. C40 Knowledge. 2019, May.

Liu, Ying. “Does Nepal Have the Agriculture to Feed Its Population with a Sustainable Diet? Evidence from the Perspective of Human-Land Relationship”. National Center for Biotechnology Information. PMC10000846. 2023, March 2. Pg 1.

Morgenstern, Richard D. “How Well Do Voluntary Environmental Programs Really Work?”. Resources. 2006, December 31.

Nepal, Government of. “National Review of Sustainable Development Goals”. National Planning Commission. Ch. 7. 2020. Pg 65-73.

“On World Water Day refugee girls around the world collect water”. USA for The UN Refugee Agency. 2019, March 22.

Organization, World Health. “Chronic obstructive pulmonary disease (COPD)”. World Health Organization. 2023, March 16.

Pandey, Achyut Raj. “Mortality and risk factors of disease in Nepal: Trend and predictions from 1990 to 2040”. Nepal Health Sector. PMC7714223. 2020, December 3.

Post, Kathmandu. “WWF supported eco clubs mark Earth Day 2023 in Nepal”. The Kathmandu Post. 2023, April 23.

Prasain, Krishna. “Nepal’s inflation hit 74-month high in September”. The Kathmandu Post. 2022.

https://kathmandupost.com/money/2022/10/21/nepal-s-inflation-hit-74-month-high-in-september

Rai, SK. “Changing Trend of Infectious Diseases in Nepal”. Advances in experimental medicine and biology. PMC7122567. 2018.

Sharma, Laxmi. “Washing Away Barriers to Social Inclusion through Improved Access to Clean Water”. Development Asia. 32249-013. 2020, March 4. Section 5-6.

“The Many Effects of Flooding”. National Geographic. 2022

https://education.nationalgeographic.org/resource/many-effects-flooding/

Wan, Adrian. “Internet Impact Brief: Nepal’s Proposed National Internet Gateway”. Internet Society. 2024, February 19. Section 4.

“Water Quality for Crop Production”. Center for Agriculture, Food and the Environment. University of Massachusetts Amherst. 2024.

“Well Protection in Flood Prone Areas”. Mississippi Department of Education. 2004.

https://extension.umd.edu/sites/extension.umd.edu

“Well Testing | Wells | Private Water Systems | Drinking Water | Healthy Water | CDC”. U.S Centers for Disease Control and Prevention. 2023, February 23.

https://www.cdc.gov/healthywater/drinking/private/wells/testing.html

“What is flood proofing?” Flood Resilience Portal. 2016.

https://floodresilience.net/what-is-flood-proofing