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Indonesia, Water Shortages and Contamination

Water Shortages and Contamination in Indonesia

Introduction – Indonesian Lifestyle

Indonesia, a country consisting of over 17,000 islands, is home to around 300 million people. (NationsOnline). Indonesia is a nation that consists of many islands, known as the Archipelagos. There are many well-known attractions in Indonesia, from the beaches of Bali to the Gili Islands. Regardless of its many attractions, Indonesia is known to have the worst water treatment facilities in the world. Currently, 10.2% of Indonesia's population is living under the poverty line, and more than 63% of the impoverished population lack access to pure water. (WDB, 2021). As Indonesia continues to modernize, different districts are decreasing their budget to help poverty-stricken families in Indonesia.

Many families across the country live in different villages, or “kampungs”, while other families live in the city. Those who are situated in the villages live in the traditional kampung house, built from bamboo and wood. Fishing and agriculture are two main ways that Indonesians who live in villages earn a living. Since 29% of the Indonesian workforce is based in agriculture and fishing, they need to have a pure water supply. (Thomas 2020). The water supply usually comes from nearby water bodies, but during the dry seasons, the amount of water available decreases for those in the village. Another issue villages face is water contamination due to runoff from chemical plants and factories in Indonesia. If this continues, lower-class families in Indonesia will lose land that would be suitable for crop growth and fishing.

Water Shortages

Indonesia is 84% water and 16% land, the total landmass area being around 750,000 square feet (Notosugondo 298). These calculations prove that there are around 4 million square feet of water in Indonesia., which amounts to 300 billion gallons of water. Despite the vast amount of water surrounding and located in Indonesia, almost 10% of the population – 18 million people – lack access to safe drinking water.

In the past, streams and rivers populated the land areas, resulting in a continuous flow of water for the population. Countless wells and holes were built to collect this water but over time, the population increased. “Rivers and streams were forced to carry higher waste discharges,” leading to poor water sanitation which resulted in the water shortages that we see today (Notosugondo 298). During the 1960s in Indonesia, the population began to grow at staggering rates. However, the water facilities used to clean water were still underdeveloped and the amount of water that could be distributed throughout the population was staggeringly low. At that time in Jakarta, Indonesia, when the population was around 4.5 million, the amount of water that was available for the people was only 52.5 mgd (million gallons per day), or 12 gpcd (gallons per capita per day) (Notosugondo 298). For a population of 4.5 million, 315 to 360 mgd of water would be needed because one person usually uses around 70 to 80 gallons of water per day. These water shortages led to many health problems among the lower class, creating an unstable environment. These water deficits have shown long-term effects, impacting Indonesia's present society.

Regardless of the lower class, many factors contribute to the ever-increasing water scarcity. Three factors that have taken a significant toll on the water supply in Indonesia are natural disasters, climate change, and COVID-19. When a natural disaster occurs, a large number of water transmitter lines that transfer

water to many people throughout the islands of Indonesia get damaged which plays into the water shortage that Indonesia is currently facing (Saimon, 2020). As a consequence of global warming, the number of natural disasters that occur each year is increasing at an alarming rate. The expanding climate crisis decreases the water supply, causing the price per gallon of clean water to increase. These increasing prices make it harder for people to afford natural resources and in turn, create huge water deficits among the Indonesian population. On top of these factors, the COVID-19 pandemic has taken a toll on economies in various third-world countries, including Indonesia, further impacting water facilities in the country. Currently in Jakarta, many people cannot afford to buy water due to the pipeline shortage. They have to go to their neighbor's house and practice "nyelang", the act of buying water from their neighbors who can afford it. Due to this shortage, water prices have skyrocketed in Indonesia. Many people who need to buy water will need to pay "25% of their monthly income on water, adding to further impoverishment." (Sahu, 2020).

Natural disasters can be combated by using more durable materials for the water lines and placing the water lines in a safer area. One of the proposed solutions was to recycle wastewater to decrease the amount of wasted water in Indonesia. The majority of Indonesia's islands are known to have one of the worst waste-water treatment facilities in the world resulting in a shortage of freshwater/drinkable water. Members of the World Water Day movement, an organization dedicated to raising awareness of the 2.2 billion people living without access to safe drinking water (UNHCR), have "urged a new mindset for wastewater treatment" to help cut down on the imported freshwater in the third world nations. The idea of recycling wastewater is highly efficient since there is a vast amount of water in Indonesia and the water price will decrease as the supply increases. The only issue with this solution is the exorbitant cost of recycling water, which is unreasonable due to the poor economy in the developing parts of Indonesia.

On the other hand, using both solar and thermal power to desalinate seawater to produce drinkable water would be more efficient and less expensive. The process of using heat energy to get rid of water of toxins has been used since pre-Columbian times. The main difference between solar power and thermal power is that solar power is used to generate electricity that is collected from solar panels, while thermal energy is used to boil water. Solar radiation from the sun is a natural process that can also be used to decontaminate water. The climate in Indonesia also makes it suitable for both thermal and solar technologies. Typically, the climate in Indonesia is hot and humid, which makes it easier for the water to reach higher temperatures. The idea of boiling water in a pot seems inefficient due to the amount of time it takes for the water to boil, but using both solar and thermal power to rid the water of toxins could be more efficient and cheaper. This technique can be implemented by simply using a box with three sections and a clear dome-shaped cover. The water starts to boil once the temperature of the box reaches 212°F. The vapor will then start to form droplets at the top of the dome once it condenses, clean water will start to gather at the top of the container. The two sections on the opposite edges will collect the clean water and can be used for drinking water. Though this may seem expensive to create, the machine itself can be created with common household materials such as plastics, metal containers, recycled materials, etc. Since there may not be many high-end technologies for the mass population to use in Indonesia, this solution is efficient because anyone can implement it. The limitation of this machine is the fact that it won't produce large amounts of water each time it is used. The machine will create small amounts of clean water, mainly for drinking and for daily activities such as washing hands or making a meal. For the machine to be successful, citizens of Indonesia should actively try to maintain a larger water supply and adhere to the proper regulations regarding water maintenance.

Water Contamination

The most polluted river in the world, the Citarum River, is located in the West Java Province of Indonesia. It is known to contain various types of toxins such as industrial and agricultural waste, high sedimentation that gets trapped on the seafloor increasing the sea level, and common pollutants like plastics and garbage from the Indonesian population. According to the pollution indicator analysis, coliform and E. Coli. are two bacteria that are prominent in the river. Due to the high pollution levels, sea life has been threatened and aquatic habitats have been destroyed. These factors have led to the poor environment that many people are currently living in, which also limits the amount of drinking water they have (Sholeh, 2018). Many rivers in Jakarta, Indonesia have faced high pollution levels. Due to the industrialization period that took place in Jakarta during the 1970s and 1980s pollution levels have increased dramatically since then and the population increased at staggering rates as well. Due to the water contamination, the water supply decreased, leading to a water shortage (Luo). 10% of Indonesia's population is under the poverty line and won't have the ability to pay for pure water. In turn, their ability to pay for water treatment will be even more scarce. There are around 38 million people in Indonesia that cannot afford proper water treatment, resulting in the spread of disease and poor health (Saimon).

To emphasize the effects of natural disasters, in Jakarta, many floods have taken place since 2000. Due to these floods, Jakarta has lost 800 million US dollars and the damage affected not only the real estate but also water waste treatment facilities. Currently, only "[5%] of the city area is covered by sewerage systems, and [85%] of wastewater is directly drained into the water bodies." (Sahu, 2020) Due to the lack of these facilities, most of the population that can't afford clean water must suffice using groundwater, which is extremely contaminated in Indonesia due to the amount of pollution produced by corporations and people. In Indonesia, there are currently only 150 waste treatment facilities but only 10% are functioning and only 4% collect septage that is to be treated at the facilities (Rosario) This means only 0.4% of the waste treatment facilities in Indonesia filter the water so that it can be hygienic and the population can use it for daily purposes. These statistics are drastically different from the United States which has a very good wastewater management system. The United States currently has over 16,000 wastewater treatment facilities and over 30% of those facilities produce water that is deemed usable for the population (USEPA, Sept. 2004).

One of the proposed solutions to this problem is the *Drinkable Book*, a book that contains pages that can be used to rid water of contaminants and toxins. The pages in the book are created with silver and copper nanoparticles, which rids water of 99.9% of harmful toxins. Copper and silver release electrically charged particles called ions which kill any bacteria or virus that comes in contact with the silver or copper particle. (MGS News). The creative use of these particles to filter contaminated water is cheap and efficient, making it a perfect tool for the poverty-stricken population in Indonesia. The book is also able to filter out various diseases such as cholera, E. coli, hepatitis, and typhoid. The only issue with the proposed solution is that it can't filter out pesticides and industrial waste, which is prominent in parts of the Indonesian water supply. Spreading awareness regarding the high use of pesticides and how to manage waste is one way to make this solution preferable.

Dolomite minerals are one of the best natural resources that are both sustainable and efficient in water decontamination. Dolomite is prominently found in rock beds around the world. Dolomite is a sustainable resource because it doesn't create any secondary pollution and it can be used as a natural fertilizer as well. It can be used as a fertilizer because dolomite consists of magnesium, which can be used for magnesium-deficient soil. (Jordan, 2022). This means that fewer fertilizers can be used and the water supply will consist of fewer contaminants. Dolomite also acts as a water filtration system because its surface absorbs toxins and throughout its layers, ion exchanges occur. The low-cost mineral is highly

efficient due to the fact that “it can remove more than 90% boron of wastewater to reach the drinking water standard... and it can also remove metal ions such as iron and manganese in industrial wastewater.” (Jordan, 2022). Using dolomite is one way to improve water quality and provide drinkable water for the impoverished population in Indonesia.

NGOs (non-government organizations) should educate the general population on how to recycle effectively, safely store their waste in a spot that doesn't affect their health or the environment, and reduce the number of materials, such as plastics, they use that can affect the water supply. These three factors can efficiently rid most of the toxins from the water bodies, leading to a healthier environment. Regulations should also be formulated to ensure corporations use proper waste management techniques to reduce the amount of water contamination in Indonesia. There are currently many NGOs around the world working on supporting communities without a pure water supply. For example, the Pacific Institute is an organization that is working on producing research and informational resources for water conservation. In doing so, they can inform the public on how to conserve water. Another organization called Project WET is working on informing the younger generations about the importance of managing and protecting water resources. As more organizations work towards informing the general public, water quality will start to increase. In order for the youth to become more involved with these issues, they have to also take a part in the call for change. To do so, the younger generations should see how their futures will be affected without safe access to drinkable water. If they realize the importance of safe water, they can start to form groups and call for change in their communities.

One of the main factors that led to the high amounts of pollution in Indonesia's water bodies was human waste. Improper waste management is a problem for many developing nations in the world because there are not many facilities that are established to control waste management. Currently, due to the high number of people in Indonesia who don't properly manage their waste, many aquatic species are either dying or getting mutations that affect the whole environment. Another consequence of improper waste management is the diseases that get transmitted to humans. Diseases such as Cholera, Dysentery, and Leptospirosis are spreading rapidly and affecting many poverty-stricken communities. Acid rain is one of the most significant long-term effects of improper waste management on the environment. Acid rain comes from polluted water bodies and harms many different types of habitats, creating an unstable environment.

Human waste is only one factor that affects water contamination in Indonesia and other developing nations. Many other factors affect water contamination, one of them being corporate industries with multiple factories in Indonesia. Most of the toxins in the Citarum River were caused by chemicals that weren't properly managed, leading to a higher contamination rate in the water. People in the Indonesian community can form organizations that can spread awareness about these industries. They can lead activities that can improve the aquatic life which in turn would greatly improve the water quality and reduce water contamination. Local river cleanups can be implemented monthly so that local people and other industries can see the impact they have on the environment. Currently, the Indonesian population is working together to clean up the Citarum river and rid the water body of most of its toxins. Thorough progress has been made and spreading awareness to a larger portion population can decrease the contamination levels dramatically.

Another problem many Indonesian communities face is not being able to access information regarding the water supply. Many communities in Indonesia earn their living from water bodies, so they need to know when the water body is contaminated and how they can work on decontaminating the water supply. A

citizen in the Tengkurak village stated that “... daily income is not available if there is wastewater. If wastewater goes to the pond, everything is off...” (Moses, 2017). Transparency laws have been created by the Indonesian government to make sure that they disclose information regarding the water supply to the public. The problem with these laws is that many districts in Indonesia haven’t been disclosing the information to the public. Over time, Indonesia’s government has created multiple databases to supply information regarding the water supply. One way to support the Indonesian government is through social media.

Social media platforms can be used to educate and influence the youth. 97% of the youth all around the world use different social media platforms such as YouTube, Instagram, or Snapchat. (Mayo Clinic Staff). Using these platforms to educate the next generation on proper waste management is essentially free and efficient. Spreading awareness throughout the next generation is an essential factor in appropriate waste management because it will have the ability to change the toxic levels in Indonesia’s water supply. Currently, many platforms are being used to spread awareness and monitor water quality to maintain public health. According to Dr. Matthew Keifer, “... social media platforms like Facebook, Twitter and Instagram are some of the first places people turn when they want to share and find information on public health topics.” (STAFF, 2015). In 2014, when algae blooms started to show up across the United States, groups on social media started a “do not drink” campaign that warned the public regarding the contaminated water supply. In short, using social media platforms can be used to influence and raise awareness regarding proper water management among Indonesia’s youth.

During the COVID-19 pandemic, corporations were struck by a dramatic decrease in demand for their products. On the opposite end of the corporate spectrum, hospitals were experiencing a higher demand for their services, resulting in higher waste and higher prices for waste management. During the pandemic, “medical waste was predicted to increase five times before the pandemic or around 1,000 tons per day.” This medical waste would be found all across Indonesia, from Banten to East Java. The waste would finally end up in Jakarta Bay. Furthermore, the Director of Environmental Health at the Health Ministry Imran Agus Nuraldi stated that his directory doesn’t have any authority over every waste management company, meaning waste management companies have free range regarding the way they manage their waste. (Renaldi). Imposing stricter regulations on waste management companies will restrict their ability to improperly rid their waste throughout Indonesia. These regulations will further impact the amount of pollution in the water supply in Indonesia.

Impacts of Water Shortages and Contamination on Food Security

In Indonesia, many farmers rely heavily on crops that require pure water to grow. Agriculture in Indonesia is an important sector of the economy because it accounts for 14% of the Indonesian GDP. Around 33.4 million people (12% of the population) in Indonesia are farmers or work in the agricultural sector. The number of farmers is starting to decrease each year because most of the younger generation don’t see any benefits from farming. The major crops that are grown in Indonesia are rice, cassava, coconuts, chilies, and sweet potatoes. (Shean, 2012). Without enough pure water, these crops won’t be able to grow and as harvest decreases, many farmers won’t be able to survive.

One of the main issues that many Indonesian farmers face is drought. During the winter of 2015, the WFP collected data that showed how the drought had impacted families in different provinces in Indonesia. According to the WFP, 60% of households in different districts lost income because of the drought, 20% cut food costs due to drought, and 1.2 million Indonesians required financial aid. (Wadhwa, 2016). Food insecurity is a huge problem for many poverty-stricken districts in Indonesia, and water shortages create more problems for those who are struggling.

Water shortages and droughts also impact farmers all across Indonesia. According to the World Food Programme, in 2015, 40% of farmers lost more than 50% of their crops due to water shortages and droughts, and “The most severe and frequent coping strategies were found in Sumba Tengah and Kupang where 30% and 27% were classified as having reduced the number, frequency or quality of meals.” (Wadhwa, 2016). Many lower-class farmers have faced problems with their harvest due to the rising temperatures each year.

Water contamination also impacts farmers’ harvests in Indonesia each year. Many farmers face the problem of mutilated crops due to the toxins in their water supply. In 2017, Indonesia faced a crisis regarding water contamination when coal mining started to create toxic runoffs into multiple rivers across Indonesia. According to a report from the Mongabay Series, “The study calculated that coal mining already costs the country 1.7 million tons of potential rice production, and another 6 million tons of current production are under threat.” (Satriastanti, 2017).

Water contamination also pollutes the environment in which the crops grow and if the water in the environment has high toxicity levels, the land will become unsuitable for crop growth. In the same study, Satriastanti stated that “... loss of agricultural productivity is due to land-use change and contamination of the water used for irrigation.” (Satriastanti, 2017). As land becomes unsuitable for agriculture, farmers start to lose their income and fewer crops are being grown. This leads to food insecurity for the lower-class population because their food supply comes mainly from crops such as rice and cassava.

Conclusion – The Connection Between Shortages and Contamination

Even though water is an abundant resource throughout the world, many people around the world don’t have access to clean, drinkable water due to contamination or shortage. Access to clean water should be a human right, not a resource that is too expensive to obtain. Throughout the world, we should take steps to make water more accessible to everyone, not just the higher class.

Indonesia’s government and some parts of the population have been taking steps toward creating a more hygienic environment. Despite this, their efforts have made a minimal impact because the majority of the population hasn’t been taking these steps. The population of Indonesia as a whole should take action against both water shortages and contamination to fabricate a healthier environment.

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