

The Péligre Dam: An Application of Utilitarianism in Haiti

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

The Péligre Dam exists as a main case study which scholars use to investigate environmental, social, and health inequities. Controversy surrounds the dam as its backing came principally from foreign entities, and the negative repercussions that resulted from dam construction were disproportionately distributed across Haitians. Scholars tend to emphasize the immediate consequences, good and bad, that arose from dam development, which include changes in the agricultural landscape and power generation. Furthermore, discussions concerning the morality of the Péligre Dam focus on immediate impacts. However, scholars tend to neglect the repercussions that arise from the eventual failure of the Péligre Dam due to high silting rates and Haiti's inability to counteract sedimentation. The focus on immediate consequences restricts ethical debate since including repercussions which are prevalent at a later period of time is paramount for assessing the Péligre Dam's full impact on human welfare. Ultimately, the construction of the Péligre Dam in Haiti was an immoral act as Haiti lacks the infrastructure to sustain the installation; the repercussions that arise from dam failure including reduced power generation, decreased agricultural productivity, and induced migration negatively affect human welfare. I will use the conceptual framework of utilitarianism, specifically the freedom principle, to assess the morality of building the Péligre Dam in Haiti. I will rely on scholarly analysis of the current state of the dam to frame my argument.

Background

Planned by United States Army engineers in the early 20th century, the Péligre Dam was completed in the middle of the 20th century during the reign of "Papa Doc" Duvalier. The dam served two purposes: improve irrigation for agriculture downstream and supply electricity to

Haiti's capital Port-Au-Prince (Kidder, 2000). Both purposes benefited American interests at the expense of Haiti's citizens.

As the poorest country in the Western Hemisphere, Haiti is ill-equipped to deal with infrastructural problems, including those of the Péligré Dam. Due to the limited number of resources, the developing country's main priority is addressing the increasing demands for water and energy by providing further resources rather than fixing outdated infrastructure. As such, Haiti will only attend to aging water-work installations when an immediate hazard is present (Palmieri, Shah, & Dinar, 2001). Given the economic status of the country and its approach to addressing infrastructural problems, the failure of the Péligré Dam is predestined.

Literature Review

The available research on the Péligré Dam primarily addresses its failing infrastructure. Several scholars have used the Péligré Dam as a case study for examining the effects of sedimentation on the dam's lifespan. Ultimately, researchers conclude that the dam will be inoperable within the next 40 years due to the high rate of sedimentation. However, while scholars have adequately addressed the effects of sedimentation on the Péligré Dam's infrastructure, they fail to consider to repercussions that complete dam failure has on the welfare of Haitians.

Frenette, Tournier, and Nzakimuena (1982) attributed the shortened lifespan of the Péligré Dam to inaccurate estimates of silting rates. Several decades before the Péligré Dam project, the estimated amount of silting, or accumulation of sediment particles, was 3.45×10^6 m³/year. The silting rate played a critical role in predicting the lifespan of the dam, originally thought to be 180 years. However, several years after the completion of the dam, data indicated a silting rate of 9.6×10^6 m³/year, which was almost three times higher than the initial estimate

(Frenette et al., 1982). Taking into account multiple factors, including degradation of watersheds, deforestation, and agriculture, researchers concluded that the silting rate of the dam most accurately resembled a quadratic or exponential growth curve. Consequently, Frenette et al. (1982) adjusted the lifespan of the dam to 80 years. While the analysis describes the sedimentation occurring in the Péligre Dam in detail, it does not thoroughly address the impact that an increased silting rate has on dam operations nor on human welfare.

Philip Howard mentions the cause of high rates of sedimentation as well as its ultimate effect on dam operations (1997). The main culprit behind the high rates of sedimentation is the increased deforestation that exposed “a significant amount of topsoil to erosion” (Howard, 1997). Engineers failed to predict the high rates of sedimentation due to forests being inaccessible to loggers prior to the dam being built. The high amount of sediment settling at the bottom of the reservoir has adverse implications for dam operations that include restricted water flow, lowered holding capacity, and reduced dam efficiency. Furthermore, the Haitian government is unable to combat the effects of sedimentation due to “dwindling state resources ... [making] comprehensive agriculture development difficult” (Howard, 1997). As a result, the dam’s lifespan was lowered from 180 years to a mere 80 years after its completion. While the author addresses the cause of dam failure and its effect on dam operations, he fails to consider how dam failure impacts the welfare of Haitians. Similarly, no ethical discussion ensues in either article as to the morality of the Péligre Dam being built without the proper infrastructure to maintain it.

Conceptual Framework

My analysis of the Péligre Dam draws on the normative ethical framework of utilitarianism, which enables me to conclude that the construction of the dam in Haiti was unethical.

Utilitarianism is an example of consequentialism in which an action's consequences guides moral judgement, rather than the moral actor or the rules that govern said action (van de Poel & Royakkers, 2011). Developed by Jeremy Bentham during the Enlightenment period, utilitarianism evaluates the consequences of an action against one central value: human pleasure, happiness, or welfare (van de Poel & Royakkers, 2011). One notable feature of utilitarianism is the utility principle, which aims at doing the greatest good for the greatest number. The natural result from the utility principle is the moral balance sheet; the balance sheet weighs the costs and benefits of an action against each other. This translates nicely into the modern-day cost-benefit analysis.

Throughout my analysis, I will consider the consequences that result from dam failure. However, there is a caveat: creating a common metric as well as assigning a weight to each consequence is beyond the scope of this paper. Thus, it is not feasible to carry out a cost-benefit analysis. Luckily, the addition of the freedom principle, introduced by John Mill, to utilitarianism enables moral judgement without necessitating a cost-benefit analysis. In essence, the freedom principle states that human beings may pursue their own happiness "as long as they do not deny or hinder the pleasure of others" (van de Poel & Royakkers, 2011). Hindering the pleasure of others is analogous to causing harm to human welfare. In reference to the Péligre Dam case study, if a consequence that results from dam failure negatively affects human welfare, then utilitarianism does not justify building the dam in a setting that cannot maintain its infrastructure. Throughout my analysis, I will consider three prominent repercussions of dam failure and discuss their respective impact on human welfare.

Analysis

Three prevalent repercussions that result from the failure of the Péligré Dam are reduced power generation, lowered agricultural productivity, and increased migration of individuals relying on the reservoir, either directly or indirectly, for their livelihood. Throughout the analysis, I will first show how each repercussion relates to dam failure, then discuss the effect that each repercussion has on the welfare of Haiti's citizens and its societal institutions (when relevant).

Power Generation

The failure of the Péligré Dam carries serious implications for the energy sector of Haiti, which includes negative outcomes for both citizens and societal institutions; as a result, the construction of the Péligré Dam in an environment that does not have the necessary infrastructure to support the installation is immoral according to the freedom principle.

The buildup of sediment has negatively impacted the power generation of the Péligré Dam. Data (2015) mentions how “despite having a total installed hydroelectric capacity of 62 MW, the operational capacity is only 40 MW due to out-of-service turbines or reduced water flow rates due to accumulation of silt.” Notice the two causes for reduced energy capacity of the reservoir: out-of-service turbines and silt accumulation. Both of the causes relate to failures in Haiti's infrastructure. With adequate resources, Haiti could repair and maintain the turbines as well as fund counteractive measures against sediment buildup. The aforementioned measures would restore the dam to its original hydroelectric capacity. Jachimowicz, Zhang, and Jakubek (2019) also alludes to the Péligré Dam's reduced power generation where the reservoir is “at only 40% of its original capacity.” Jachimowicz et al. (2019) attributes the reduced energy capacity only to silt accumulation. Furthermore, silt accumulation at the bottom of the Péligré Dam is largely an infrastructure failure in which lack of resources prevent the Haitian

government from intervening. Ultimately, the connection between supply of electricity and human welfare is intuitive. Having a reliable energy supply is imperative in ensuring proper economic growth, development, and poverty reduction (Salci, 2017). As such, the lowered energy capacity of the reservoir carries several repercussions with respect to human well-being. However, the citizens of Haiti are not the only individuals, or social entity, affected by the dam failure.

The reduced energy capacity of the Péligre Dam due to high silting rates will place a large strain on the grid and Haiti's energy sector. Haiti predominantly relies on fossil fuels and diesel power plants for energy production, which makes the country particularly vulnerable to the fluctuating costs of fuel imports (Data, 2015). The low efficiency of power plants coupled with the costs of fuel imports has led to extraordinary high prices for electricity, which many Haitians are unwilling to pay. According to Salci (2017), "only about 50% of customers are legally connected to the power grid Many [customers] have decided to disconnect from the grid and independently generate their own electricity at all times." Without customers paying for the electricity, the state-owned utility Electricité d'Haïti (EDH) is unable to generate revenue and experiences a loss. The federal government accepts the financial burden for the loss, impacting the national budget, which in turns limits its ability to invest in other federal programs or developmental projects (US International Business Publications, 2012). Ultimately, there is a direct connection between energy production and the welfare of its supporting entities. The energy landscape in Haiti will continue to deteriorate along with the Péligre Dam as "the Péligre Hydroelectric Plant (PHP) ... is the most reliable source of energy supply in Haiti" (Salci, 2017). Noticeably, the Péligre Dam plays a critical role in Haiti's energy production. Lacking the proper infrastructure to counteract sedimentation, the energy capacity of the dam will continue to

decline until it eventually reaches zero, exacerbating its impact on Haitians and the federal government.

The repercussions that the failing dam has on the energy sector violates the freedom principle as both the welfare of Haitians and its societal institutions are negatively impacted. Since the country lacks the infrastructure to prevent the reservoir's ultimate demise, it was immoral to build the Péligré Dam from a utilitarianism standpoint.

Agriculture

The failure of the Péligré Dam adversely impacts the irrigational systems that sustain agriculture, increasing both food insecurity and reliance on food imports; thus, it was immoral to construct the installation in an environment that cannot counteract the effects of sedimentation from a utilitarianism perspective.

The Artibonite District, one of the most fertile and agriculturally productive regions in Haiti, depends heavily on the Péligré Dam. The Artibonite river provides irrigation to the Artibonite District (Jachimowicz et al., 2019). Importantly, the Artibonite river extends from Lake Péligré. As such, the water contained in the reservoir is necessary for maintaining domestic agriculture. One crop that depends on irrigation from Lake Péligré is rice. In 2016, Cochrane, Childs, and Rosen estimated that the Artibonite district produced 70% of the rice grown domestically in Haiti. The statistic highlights the significant contribution from the Artibonite district to local agriculture. However, the irrigation canals that originate from Lake Péligré are in impending danger. As sediment continues to collect at the bottom of the reservoir, the dam will have a lower capacity to hold and use water. A good analogy that illustrates the relationship between sedimentation and available water in the reservoir is sand in a glass. As the sand in the glass increases, the amount of “free” water in the glass diminishes as the sand “absorbs” it. Thus,

there is less available water to pour or, applying the analogy to the Péligré Dam, service irrigation canals. In result, the agricultural production in the Artibonite District will decline as crops are highly dependent on water for proper growth. The lower productivity upon sustained dam failure will leave Haiti largely dependent on food imports and increase food insecurity in that region of the country. Thus, the failure of Haiti to address the sedimentation of the Péligré Dam comes at the expense of Haitian welfare, making the reservoir's construction unethical according to the utilitarianism framework.

The reduced holding capacity of the Péligré Dam, a consequence of sediment accumulation, diminishes its irrigational capabilities and increases Haiti's reliance on foreign countries for food imports. Still, some scholars argue that Haiti imports most of its crops anyways. Haiti imported roughly around 80% of its rice, primarily from the United States, in 2018 (Alami, 2018). Therefore, the impact that the failure of the reservoir has on agriculture is not as severe as it seems. However, the dependence of Haiti on US rice exports is the consequence of dam failure playing out in real time. Soon after the completion of the dam, "Haiti was self-sufficient in rice It even grew enough to export" (Alami, 2018). As such, agricultural benefits were reaped from a fully operational dam. As decades progressed, Haiti transitioned from being self-sufficient to being reliant on US exports. One of the main causes for this shift was that the irrigation canals were "of poor quality and in need of repair and cleaning" (Cochrane et al., 2016). The need for cleaning is likely in result to the sediment being carried with the water from the reservoir that travels through the canals; the sediment collects in the canals similarly to the reservoir, which lowers overall waterflow and capacity. Both reduction of available water and sediment collection in the canals affect irrigation. The impact of

sedimentation in the Péligré Dam on irrigation is one of the main contributors to the shift in Haiti's rice exports.

Migration

The failure of the Péligré Dam will induce migration of individuals living in the Artibonite District, disrupting the happiness of both farmers and urban inhabitants; as such, building the dam in a setting that cannot sustain it is immoral from a utilitarianism standpoint.

Domestic agriculture in the Artibonite District heavily relies on the irrigation canals from Lake Péligré. As the dam “dries” up due to sediment accumulation, individuals who farm in that region will be unable to make a living, ultimately forcing families to relocate to urban areas. Shortly after the completion of the dam, urban areas including Haiti's capital Port-Au-Prince experienced a large influx of migrant workers (Howard, 1997). This was largely attributed to the decimation to local agriculture caused by the dam's construction. Not only were farmers flooded out of the central plateau in which the dam resides, but increased deforestation, enabled by the network of roads built to service the dam, deteriorated the land upstream from the reservoir as well (Howard, 1997). Kidder (2000) illustrates the situation in Haiti nicely where “the dam had drowned the peasants' farms and driven them into the hills, where farming meant erosion.” While it is important to consider the immediate impact that the dam had on peasants' well-being, it is more critical to understand how disruptions in agriculture contribute to individual movement and migration.

To evaluate the connection between dam failure and migration, it is essential to understand the population distribution in the Artibonite region. Howard (1997) captures the changes in population throughout the Artibonite region in the following statistic: “In 1956 there were roughly five people for every hectare of forest in the region. Twenty years later there were

fifteen people living off every hectare of forest in the region.” Although the statistic is outdated, it further illustrates the relationship between agricultural disruptions and migration patterns where people moved to more productive regions as well as to urban areas in search of job opportunities. The population in the Artibonite District has only grown as recent data estimates 1,727,524 Haitians living in that region (“Artibonite”, n.d.). Ultimately, as the rate of silting increases, the reservoir’s holding capacity decreases, impacting waterflow through the irrigation canals. As agriculture productivity in the region declines, local farmers will be unable to sustain themselves and forced to emigrate elsewhere. Unfortunately, their options for relocation are limited given the destitute status of land upstream from the reservoir. Individuals will likely move to already overcrowded urban areas, thus affecting both the welfare of the farmers themselves and urban inhabitants.

Haiti’s infrastructure cannot support efforts that counteract sedimentation and the disruption to domestic agriculture that subsequently follows. According to utilitarianism, building the Péligre Dam was immoral as reservoir failure adversely affects the welfare of farmers and individuals living in urban areas.

Conclusion

The repercussions associated with the failure of the Péligre Dam include but are not limited to reduced power generation from the hydroelectric plant, lower productivity for domestic agriculture, and mass migration. To a large extent, the aforementioned repercussions negatively affect the welfare of Haitians and societal institutions. Having a reliable source of electricity is essential for proper economic development and lowering poverty rates. A decreased agricultural output increases both food insecurity and the country’s reliance on foreign countries via imports. Furthermore, disturbances in agriculture affects the livelihood of farmers and forces

them to move to urban areas in search of opportunities; mass migration disrupts the lives of those migrating as well as urban inhabitants. The failure of the Péligré Dam is in large part due to the high rates of silting. Efforts exist that counteract silting, such as manually removing sediment and replenishing forests; however, Haiti lacks the resources to support aforementioned efforts. Building the Péligré Dam in an environment that cannot sustain the installation was immoral from a utilitarianism perspective due to the impact that dam failure has on human welfare.

The significance behind analyzing the Péligré Dam is the link between sustainability and human welfare. Oftentimes, developed countries exploit developing ones, building installations with short lifetimes. In result, developing countries are left with a crumbling infrastructure in which they do not have the means to attend to or replace. Haiti is simply a case study for the rest of the world. If the United States orchestrates an engineering project in another country, there is a moral obligation to consider both its own interests as well as the country in which the project is taking place. One way of keeping the country's interests in mind is developing projects that are sustainable or those that will last until the country is in a position to provide suitable alternatives.

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