Seasonal Isolation: The Latest Call for Action Regarding Climate Change

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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

Communities around the world are built upon connection. In their early years, children form connections with their classmates and teachers in school, allowing them to learn and evolve socially. As adults, most people have a connection to a job, or at least some place where they can be paid for their labor. Similarly, people need a place to exchange this payment for goods to provide for themselves and their families. When they get older, people typically encounter health issues, and need a connection to healthcare. If you are from the developed world, it likely never occurred to you that having access to these resources is an immense luxury, one that not everyone globally gets to enjoy.

For over one billion people in the world, the rainy season leads to flooding that makes rivers impassable, isolating communities from schools, healthcare, and markets (O'Neill, 2010). Individuals in these areas sometimes attempt to cross the rivers to access the infrastructure on the other side, resulting in injury or even death. Fortunately, there is an organization that has identified this issue, and their work has led to tangible benefits for roughly 150,000 people in these rural communities.

The Engineers in Action (EIA) Bridge Program works with students from universities across the United States and Canada as well as these seasonally isolated communities to design and build footbridges over rivers to improve access to basic necessities such as hospitals and markets. Among many positive impacts, the footbridges have resulted in a 12% increase in children enrolled in school, an 18% increase in healthcare treatment, a 30% increase in labor market income, and a 75% increase in farm profits for the previously seasonally isolated areas (Why Bridges?). Along with my capstone team, I have been able to work with EIA this year to design and provide relevant construction documents for a footbridge to be built over Rio Coilolo in Zudañez, Bolivia, with hopes of achieving similar success as previous EIA projects.

While my team's effort will hopefully make a sizable difference for the 800 residents of the surrounding Coilolo and Tipa Tipa communities, it also underscores the need for broader solutions to seasonal isolation and its consequences. It took eight months for my capstone group, which consists of eight fourth-year civil engineering students, to design and create the construction plan for our bridge. While this was not our only responsibility at the time, we also had support from our technical advisor, two external civil engineers who served as mentors, and the EIA team. This is also not considering the construction of the bridge, which will require significant planning, coordination, and financial backing from EIA's end. Between all parties, this bridge is a massive endeavor and is still not making a noticeable dent in addressing the effects of seasonal isolation on a global scale.

Ultimately, the only way to truly address seasonal isolation is to attack the issue at its root. Currently, an eighth of the world has limited access to schools, healthcare and markets because of the increased frequency and intensity of 100-year storms (Water Environment Federation, 2019). Considering the effects that climate change will continue to cause, it is expected that the problem of seasonal isolation due to swollen rivers will only be exacerbated in the coming years and decades (Davenport, 2022). Along with a multitude of other reasons, governments and individuals alike need to do their part to mitigate climate change to reduce seasonal isolation rates across the world.

Methodology

While learning that one billion individuals globally have limited access to vital infrastructure may be startling, the full extent and dire nature of the situation does not resonate without further statistics and examples. For that reason, evidence illustrating the scope and severity of the negative impacts of seasonal isolation will be provided for the separation of communities from schools. Similarly, statistics revealing the tragic results that separation from

hospitals and other healthcare options will highlight the severity of the situation. Additionally, data about how extreme flooding has wrecked the economy in some parts of the world will be given to further emphasize the urgency for action. Lastly, information regarding climate change will be provided to contextualize the central claim by highlighting how action against climate change is needed immediately.

Body

Schools

As of 2021, 244 million children and youth between ages 6 and 18 worldwide were not in school (Antoninis & Montoya, 2022). There are several other reasons for this, including families needing children to work and contribute to household income and inadequate school systems, but often areas encompassed in school commutes are simply ill-equipped for flooding and other natural disasters (Ferdman & Kuo, 2013). It is likely difficult for people from the developed world to imagine keeping children home from school, but the reasoning should become clear when realizing some routes to school look like Image 1 below.

Image 1. Students in Indonesia use the remains of a bridge to cross a river and get to school. (Reuters/Beawiharta, from Ferdman & Kuo, 2013)

This picture should be quite alarming. These students, many of whom appear to be under ten years old, are faced with this challenging and unsafe commute each day. This is clearly an example of a community that would greatly benefit from an EIA bridge, but that is not always possible. With over a billion people experiencing seasonal isolation globally, more far-reaching answers are needed.

In some areas, creative solutions have been implemented to improve access to schools. In significant portions of Bangladesh, villages become isolated during the monsoon season, with up to 70 percent of the country ending up under water in heavy rain (Beaubien, 2018). However, a charity in the northwest region of the country has combatted this issue by building 23 boats that function as both school buses and classrooms. The boats pick up students in the morning, lessons are delivered, then the boats return that group of students and repeat the process with an afternoon class. Mohammed Rezwan, the founder of the charity, grew up in the area and explains that the idea was to ensure "all-year round education" and that the organization has expanded to include five floating medical clinics (Beaubien, 2018).

While the floating schools are tremendously impactful on a regional level, they are like EIA's footbridges in the sense that they are impractical for making a meaningful change on the global scale. Instead, hundreds of millions of children are not enrolled in school, and thus may not have the knowledge or ability to improve living conditions for themselves and their children in the future (Humanium, 2018). This creates the potential for a dangerous cycle, one in which generations of families in a community never receive a proper education, with the village never being able to improve its standing. The out-of-school rate has decreased significantly since the start of the century in countries with low and lower middle incomes (Antoninis & Montoya, 2022), but this trend may reverse if physical access to schools continues become more difficult due to climate change.

Healthcare

Beyond schools, swollen rivers are also problematic due to the isolation they cause between communities and hospitals and other healthcare opportunities. For instance, in Cambodia, the rainy season lasts from May to September. In a study focused on three provinces in the nation, it was found that 27% of people would lose all access to hospitals during floods, with an additional 18% of individuals facing an increase of 30 minutes of travel time (Espinet et al., 2020). This limited access can lead to a myriad of issues, the statistics of which are quite startling and further display the need for immediate action against climate change.

One specific example of the negative consequences of seasonal isolation from healthcare is with pregnant women in Mozambique. Flooding in Mozambique is not as bad as it is in many other parts of the world, but there was still a 6% decrease in institutional child deliveries during the rainy season due to limited access (Stone et al., 2020). While this is a seemingly low percentage, it was estimated that there were 74 additional maternal deaths and 726 additional deaths of children under the age of one month because the mothers did not deliver at a hospital or other facility (Stone et al., 2020). This is obviously tragic but becomes even more so when considering that these are just deaths from one cause in a country where seasonal isolation is not extraordinarily frequent.

The isolation from hospitals due to flooded rivers is especially worrisome because there are diseases that are more common during monsoon seasons. For instance, dengue and malaria are more prevalent during these times of year because the standing water serves as a breeding ground for the mosquitos that cause the diseases (Odomos, 2021). People experiencing symptoms from these diseases, such as high fever, swollen lymph nodes, and anemia, may be unable to seek proper medical treatment if their route to the hospital is inaccessible for months at a time. Typhoid is a highly infectious monsoon related disease caused by contaminated food and

water (Odomos, 2021). If the community is isolated due to flooding, typhoid could spread rapidly throughout the village while healthcare opportunities are limited.

While it may be obvious, communities suffer immensely when they are isolated from hospitals and other medical care due to flooded rivers. Access to healthcare is a basic necessity in the modern world, and many lives are put in jeopardy without this access. Statistics such as the one that highlighted the maternal and infant mortality in Mozambique are incredibly alarming. However, across the globe, these effects of seasonal isolation are far more widespread, and partially explain why life expectancy tends to be lower in the countries that experience significant flooding and thus isolation from healthcare.

Markets

While the impacts may not be as easy to see, isolation from markets can also be incredibly detrimental to a community. For example, it is fairly obvious that a lack of access to schools and hospitals would negatively impact children and sick individuals, respectively. However, it may be more surprising to learn that the completion of EIA bridges results in a 30% increase in labor market income, a 56% increase in crop yield, a 59% increase of women in the labor market, and a 75% increase in farm profits for the communities affected (Why Bridges?). When farmers and other community members can get to markets and jobs reliably and on time, women can expand beyond household duties and enter the workforce, farmers have better access to tools and services, and economic opportunities as a whole escalate dramatically (Why Bridges?).

Those statistics are intended to highlight the impact of EIA's work, but they also reveal the plight of most communities that experience seasonal isolation, where assistance from charities is not present. For most areas where swollen rivers and thus seasonal isolation occur, there are significantly lower crop yields and farm profits, making it extraordinarily difficult for

individuals in these areas to ever get ahead financially. As is the case with the other impacts described already, these problems will only increase in magnitude as climate change and severe weather patterns continue to become more frequent and intense.

Beyond specifically locations experiencing seasonal isolation from swollen rivers, there is evidence displaying the devastation that widespread flooding can have on an economy. In September 2022, Pakistan's foreign minister, Bilawal Bhutto Zardari, revealed that over a third of the nation was submerged, with the crisis being "far from over" (Graham, 2022). It was estimated that 80-90% of Pakistan's crops were damaged by the floods, resulting in crop price increases of over 100% in one year (Graham, 2022). These economic losses are tremendous, and that is without considering the damage to key infrastructure and over one million homes that were destroyed. Much like several previous examples, this evidence only speaks to the situation in one country, while immense economic damage from flooding is the reality for many nations across the globe.

Climate Change

The cause of all of the troubling statistics, ranging from the near quarter of a billion children not in school to the 74 additional maternal deaths in Mozambique, can at least partially be traced back to one central issue: climate change. While some deny that it is even occurring, climate change is evident through the ever-increasing presence of severe weather patterns. For example, in the United States, extreme rain events and extreme storms are 85% and 51% more frequent in 2017 compared to 1950, respectively (Water Environment Federation, 2019). While the trends in rainfall extremes have generally not led to increased flood risks in the United States, it is a different story internationally. For instance, in South Sudan, four consecutive years of flooding has left two-thirds of the nation under water (Doctors Without Borders, 2022). The rainy season in the country has been starting earlier, persisting longer, and more intense in recent

years, so much so that the flooding does not recede during the dry season, compounding the issue even further (Doctors Without Borders, 2022).

The information about the current status of climate change is already concerning, but studies about its future trajectory may be even more alarming. Despite more awareness regarding taking care of the environment than ever, greenhouse gas concentrations continue to rise to record highs and fossil fuel emission rates are now above pre-pandemic levels (United Nations Framework Convention on Climate Change [UNFCCC], 2022). In part due to this, scientists believe there is a 48% chance that the annual mean temperature may rise to be 1.5°C higher than the pre-industrial average in the next five years, a level at which some climate changes may become irreversible (UNFCCC, 2022). It does not take much to draw the conclusion that this increase in temperature would in turn lead to more extreme weather events, thus leading to more flooding, as well as more seasonal isolation and the multitude of problems that can be caused.

Although it would not be the best scenario, it would at least seem just if only the countries negligent toward the environment faced the consequences of climate change. However, the opposite is the case, as these negative effects are disproportionately affecting the most vulnerable and marginalized communities around the world (Tollefson, 2022). For example, Pakistan's contributions to global carbon emissions, the largest factor contributing to global warming, is less than 1%, but it is among the 10 most affected countries in the world by climate change (Graham, 2022). On the other hand, the United States produces more carbon emissions per capita than any other nation with over 50 million people but avoids facing much of the catastrophic effects of climate change due to stronger infrastructure and economic power.

Given this imbalance, it is obvious that countries with the most pollution need to step up to address climate change. With the future of the planet hanging in the balance, it stands to reason that all countries should be invested in taking immediate action to halt climate change and

its consequences. However, some nations are in a better position to make a difference than others. Edwin Castellanos, director of the Sustainable Economic Observatory at the University of the Valley of Guatemala, provides a poignant stance on the situation. He hopes that new information regarding climate change "will highlight the need for developed countries to support developing countries, particularly with financial resources to reduce the vulnerability of people, particularly those at higher risk: the poor, the marginalized and Indigenous peoples" (Tollefson, 2022).

Fortunately, some governments have set goals to address climate change in the coming years. For example, President Biden has created the National Climate Task Force, which is hoping to achieve goals such as reducing U.S. greenhouse gas emissions 50-52% below 2005 levels in 2030, reaching 100% carbon pollution-free electricity by 2035, and achieving a net-zero emissions economy by 2050 (The United States Government, 2022). Many other nations have similarly set targets to mitigate climate change as part of the Paris Agreement, but having these objectives is not enough. Meeting, and ideally exceeding, the various targets will be necessary, and progress needs to begin immediately.

Conclusion

As mentioned before, over one billion people globally experience isolation from schools, healthcare, and markets due to swollen rivers during the rainy season (O'Neill, 2010). This inherently creates significant challenges for the individuals in these communities, such as millions of children not attending school, significant mortality quantities due to lack of hospital access, and severe economic hardship. This flooding and the associated negative impacts can be tied back directly to a different, more prevalent issue, climate change.

Climate change has become a common term in recent years, and most people are aware that it refers to the increase in extreme weather events resulting from emissions of greenhouse

gases. However, most people would be surprised to learn that over 40% of the world's population lives in places that are considered "highly vulnerable to climate change" (Tollefson, 2022). This is especially problematic because the nations that are most affected by climate change are generally contributing extraordinarily little to global greenhouse gas emissions. Put simply, wealthier nations are consuming carbon and other greenhouse gases at an alarming rate to power their industries and lifestyles while the developing world faces most of the consequences, with deaths and children out of school due to severe flooding.

This relationship can no longer continue to play out in that manner. More information and awareness about climate change exists than ever before, and most of the world has begun to take action to mitigate their carbon footprint. Despite these efforts, it is still relatively likely that in the next five years the global annual mean temperature will reach a level where the damage will be irreversible (UNFCCC, 2022).

If it was not already clear, immediate action is needed from many of the world's powerful nations, especially the United States. There is only one Earth, and we currently stand at a critical juncture in its environmental future. Many governments have set goals to work toward climate goals in the coming years, but ultimately leadership from political figures and compliance from individuals will be necessary to allow for the effective execution of these goals, which may be necessary to save the planet.

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