

2019

STATEWIDE GLOBAL HEALTH CASE COMPETITION



**Deforestation of Amazon Rainforest
and impact on children health
outcomes of indigenous populations of
Madre de Dios Province, Peru**

Connecting students from diverse fields to
address a global health challenge



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All characters and plots described within the case are considered fictional and bear no direct reflection of existing organizations or individuals. The case topic, however, is a true representation of circumstances in the Amazon region of Peru. The case scenario is complex and does not necessarily have an ideal solution, thus encouraging a discerning balance of creativity and knowledge. Provided are informative facts and figures within the case and appendices to help teams create a proposal. The data provided are derived from independent sources, may have been adapted for use in this case, and are clearly cited allowing teams to verify or contest them within their recommendations, if necessary. Teams are responsible for justifying the accuracy and validity of all data and calculations that are used in their presentations, as well as defending their assertions during judging.

Opening Scenario

The sun, beaming radiantly on a humid July day in Iñapari, Peru, shined down on the already sunburnt neck of Eduardo as he sat at the riverbank of the Acre River patiently waiting for his first catch of the day. Eduardo is the oldest of 3 boys who were born and raised in Iñapari, a small village in the Madre de Dios region on the border of Peru, Brazil and Bolivia. Eduardo's father, who was a widely loved fisherman in the village, passed away when Eduardo was 15 years old, and ever since, Eduardo has had to work as a fisherman to support his family. Though he works very hard, he loves long days on the riverbank – times when he can bask in the calm flow and serenity of the water, but more importantly, times that provide an escape from the chaos of his home. The recreation and work that the river brings gives Eduardo and so many other villagers not only a livelihood, but a sense of peace and calm in the midst of non-ideal living conditions.

But this would all change when the Peruvian government decides to build a major road from Cuzco to Brazil through Iñapari. This road would allow for expedited travel during the 2032 Summer Olympics which might be jointly hosted by Brazil, Peru and Bolivia. The building of this road would require the deforestation of the rainforest surrounding the riverbank as well as the blocking off of all access to the river, spanning the length of Iñapari, for a 2-year period. Eduardo has heard talk around town about the plans for the road and he doesn't know what to think. What will happen to the river that is his livelihood? Will there be jobs related to road construction that might make him more money than fishing?

The implications of this project are far more reaching than Eduardo and his family – the deforestation process often causes significant ecological and environmental issues that can then have negative health effects on the surrounding communities.



Case Background



Republic of Peru

Peru is located in the western part of Latin America. The country is bordered by Ecuador, Colombia, Brazil, Bolivia, Chile, and the Pacific Ocean (see Attachment A). Peru ranks among the 20 largest countries in the world with an area of over 1.3 million square kilometers (~500,000 square miles). Peru was home to numerous ancient Andean civilizations, specifically the Incas, and today indigenous people comprise 45% of the country's population. Peru gained independence from the Spanish monarchy in 1821 and changed from military rule to a democracy in 1980. In 2001, the newly elected President was the first to be of indigenous ethnicity. As of July 2018, Peru has a population of over 31.3 million people. Although majority of population speaks Spanish, Quechua and Aymara are also official Peruvian languages. About 75% of Peruvians identify as Christians, particularly Roman Catholics (60%). The country has struggled with financial hardships and violent uprisings. Over the past decade, Peru has gained political stability and relative economic prosperity. Between 2002 and 2013, Peru attained one of the fastest GDP growth (6.1% annually) in Latin America attributed in big part to investment in mining industry (particularly gold mining). Rapid economic growth has been reflected in increased employment levels and reduced poverty. The poverty rate decreased from 52.2% in 2005 to 26.1% in 2013 and extreme poverty during the same period declined from 30.9% to 11.4% (World Bank, 2018). However, poverty remains high in rural areas (55%) and among Afro-Peruvian, indigenous, and poor populations of the Amazon and mountain regions. Children living in poverty often drop out of school to help support their families. It is estimated that about 25% of children ages 6-14 work often for long hours in hazardous conditions at mining and construction sites (CIA, 2019). Disparity is also apparent in access to clean water and sanitation facilities. While 91% of urban population has access to clean water and 83% to improved sanitation facilities, only 53% of Peruvians living in rural areas have access to clean water and 47% to improved sanitation facilities (CIA, 2019; WHO, 2015).

Peru has been described as one of the ten most biodiverse countries in the world due to diversity of species and ecosystems (Chevesich, 2017). Approximately 53% of Peru is forest, while another 18.8% is agricultural land. However, Peru struggles with numerous environmental issues such as deforestation, pollution, and overfishing (CIA, 2019). According to the World Health Organization (WHO), Lima, the capital of Peru, is experiencing the worst air pollution in the city's history (WHO, 2015). Furthermore, rivers and coastal waters are also polluted from municipal and mining waste (CIA, 2019). Deforestation in Peru is mainly from illegal logging, road construction, and commercial mining. According to the World Wildlife Fund (WWF), every year about 1,100 square miles of the forests in Peru are cut down and an estimated 80% is deforested illegally (WWF, 2015).

Madre de Dios

The Madre de Dios region is one of the 25 Peruvian regions. Madre de Dios is known as “the edge of the edge” area that spreads over 85,000 square kilometers (~33,000 square miles), roughly the size of Kansas. As per 2017 census, The Madre de Dios had a population of 141,070 and the population size has increased by 29% over the past decade. Over 80% of the population lives in urban areas. Males represent 52% of people living in this region. Life expectancy is about 73 years and only 3% of the population are people older than 65 years. The majority age range is from 15 to 64 years old (66%) and children ages 0-14 represent 31% of the population. Nearly half of people (49%) in Madre de Dios are Mestizo (mixed Amerindian and White) and 37% are Quechua. Other ethnicities residing in this area include Afro-Peruvian, Aymara, White, and other groups. The majority of individuals speak Spanish or Quechua and are literate (89%). The poverty rate is a staggering 32% (City Populations, 2017).

There are 22 indigenous tribes in the Madre de Dios region, including the Eje Esa, Harakbut, the Matsigenka, the Yine, the Kichwa Runa, and others. In the 1970s, the government officially recognized the native communities of the indigenous peoples and they received “specific geographic areas.” The Native Federation of the Madre de Dios River and its Tributaries (FENAMAD) is an organization created in 1982 that focuses on representing indigenous peoples in Peru (FENAMAD, n.d.).

In 2006, Integration Bridge was built across the Acre River. In 2011, Peru completed the Interoceanic Highway, a 1600 miles paved road that cost \$2.8 billion, and connected the Peruvian Coast with Brazil. This road crosses the Madre de Dios region and makes once isolated rainforest area easily accessible to mining and tourism. It also enables many trading opportunities and further investments. The construction triggered other development (Connectas, n.d.). Many people moved to the region to find employment and myriad of temporary settlements are spread across the region. Some sources suggest that working in construction or gold mining pays five times more than traditional fishing or farming (WWF, 2015). Child labor and human trafficking are on rise (Connectas, n.d., Universidad del Pacifico, 2018). The Madres de Dios region partnered with the United Nations to create a new program based on an existing program called “Reducing Emissions from Deforestation and Forest Degradation (REDD+)”. The goal is to measure changes in carbon emissions, climate, and biodiversity. The national government owns much of the forestland, which contributes to conflict with indigenous communities wanting to own the land that they live on (UN-REDD+, n.d.).

Deforestation Impacts

The Amazon is the largest rainforest and river basin on the planet spanning over 670 million hectares. Amazonia is known for its biodiversity, housing almost 10% of known species (WWF, n.d.). Along with the different species living here, the Amazon is also home to more than 34 million people. However, the Amazon is also known for being the “biggest deforestation front in the world”, having lost 20% of its original biome. If the current deforestation rate continues, WWF estimates that more than a quarter of the Amazon biome will be without trees by the year 2030 (WWF, n.d.). While deforestation has declined, it is still continuing at a high rate, with 1.4 million hectares being lost every year. Brazil contributes to half of the deforestation in the Amazon, and Bolivia and Peru are increasing their contribution. Many of the areas facing deforestation are located along major infrastructure development routes. One of the reasons for deforestation is agriculture, such as cattle ranching and plantations, along with mining, as well as other investment purposes (WWF, n.d.).

Environmental impact

Deforestation causes many consequences, both on the environment and health. One of the largest impacts of deforestation, especially in the Amazon, is the loss of habitat for millions of species, many of which are unique to that area (National Geographic, n.d.). The habitat loss does not only affect the ecosystem, but also those dependent on that environment. For example, the indigenous populations are dependent on the species of plants and animals found in the Amazon. The depletion of the habitat will eliminate vital resources for those groups of population. Many of the species lost contribute to medical and herbal remedies both for the indigenous population and around the world.

Deforestation can have disastrous effects including causing soil erosion and flooding. The combination of soil erosion and flooding can lead to mudslides, which can have detrimental effects on the surrounding areas. Deforestation is believed to increase the spread of life-threatening diseases such as malaria and dengue fever. The forest is home to many of the insects that inflict disease, and the removal of their environment causes them to move, often leading to human contact (Robbins, 2016).

Deforestation can also impact water sources and climate changes. The soil in the forest are typically moist, due to the canopy blocking the sun; however, the removal of these trees leads to these lands becoming dried out and can affect the water vapor returning to the atmosphere (National Geographic, n.d.). These effects can impact the water supplies to many cities and neighborhoods surrounding the forest, and larger levels of deforestation may even impact water supplies globally

(National Geographic, 2018). Some suggest that even 20 to 25% of forest lost could tip the Amazon into a drier, savanna like ecosystem, with drought-tolerant plants already appearing. Currently, the dry season is lengthening and the rainfall season has shortened; however, when it does rain, it is more intense and has led to massive flooding (National Geographic, 2018). The canopy also helps block the sun during the day, and hold heat at night, which means the elimination of these trees could cause temperature swings (National Geographic, n.d.).

Nutritional and Respiratory Issues

Research has shown deforestation to be associated with an increased incidence of diarrhea and acute respiratory infection (Pienkowski, et al., 2017). Diarrheal disease is a leading cause of childhood mortality and a significant contributor to undernutrition. Respiratory diseases and undernutrition are among the leading causes of childhood mortality worldwide. Forest ecosystems are essential to the health of populations living within them because they provide food, water, flood protection, crop pollination, and they reduce the risk of disease through natural waste absorption (Johnson, Jacob, & Brown, 2013).

According to UNICEF, almost half of all deaths of children under 5 are due to undernutrition. That translates to approximately 3 million young lives lost every year globally (UNICEF, 2018). In Peru, the under-five mortality rate is 15 per 1,000 live births. This rate is higher in rural areas of Peru; reported to be 33 per 1,000 live births in 2010 (PAHO, 2012). Poor nutrition during pregnancy and in the first three years of life can lead to stunted growth and reduced cognitive ability resulting in underperformance at school and later in life. In Peru, 13% of children suffer from moderate to severe stunting due to inadequate nutrition (UNICEF, 2018). Researchers have shown an association between deforestation and an up to 30% increase in diarrheal disease among children (Johnson et al., 2013, Ostfeld, 2017). This is hypothesized because disrupted forests have the reduced ability to regulate microbial contamination of surface and groundwater; thus, contaminating water supplies (Ostfeld, 2017). Data show that children living in areas of forest cover-loss had significantly less diverse diets and were about 30% less likely to consume vitamin A-rich foods than children living in undisturbed forests (Johnson et al., 2013). Vitamin A is essential for proper growth, development, and maintenance of a vital immune system.

Part of the process in deforestation is the controlled burning of the disrupted biomass. The resulting smoke from biomass burning discharges fine particulate matter into the atmosphere which is associated with reduced lung function and increased risk of obstructive lung diseases such as asthma (Guo et al., 2018). During dry periods, microbes and soil particles in deforested areas become airborne which causes and aggravates respiratory illnesses and triggers allergies (Smith et al., 2014). Acute respiratory infections such as pneumonia are among the leading causes of childhood mortality. An increase in the

incidence, severity, and mortality rate of acute respiratory infection is associated with malnutrition and zinc deficiency (Sazawal et al., 1998). There is a demonstrated synergistic effect between pneumonia and air pollution, wherein the occurrence of both produces a larger negative impact than the combined negative impact of each occurring individually (Williams et al., 2002).

The environmental impact of deforestation disproportionately affects children because of their rapid growth rate, increased proportional air intake, ongoing lung development, and narrower airways. Conservation efforts to protect the biodiversity of the Amazon have been shown to significantly improve the health outcomes of populations living there (Simon, C. et al., 2015). Policies to protect the Amazon should be promoted because healthy, thriving forests and their ecosystems are essential for the growth, development, and health of children.

Human rights issues and guidelines/policies with deforestation of the Amazon rainforest

There are significant human rights violations occurring with the continued deforestation of the Amazon rainforest. Deforestation affects the most vulnerable group in the region, the indigenous people. The expansion of large-scale development projects affects two very important rights: 1) land, territories, and resources and 2) lack of communication with the indigenous people. Building roads, petroleum exploration, gold mining, and the hydroelectric plant are just a few of the large-scale projects that are causing problems for the indigenous people. The lack of recognition of these territories as indigenous territories for these people is problematic, and currently there are over 1,000 indigenous land claims that have not been processed which is in direct violation of the indigenous rights according to both ILO Convention No. 169 (International Labour Organization, 1989) and the decisions of the Inter-American Court of Human Rights. Secondly, by law, the indigenous people are supposed to be consulted before any development projects are approved, however, there are many documented cases where projects were started before the indigenous people were notified or consulted, in some cases for many years (Regnskogfondet, 2014).

Summary of 2019 Case Competition Team Assignment

Your team has been hired by the Environmental Council to submit a proposal for the development and implementation of a program which would address the health concerns in indigenous children raised by deforestation and the construction of a road along the Acre River in the Madre de Dios Region, Peru. The intervention should be effective, culturally appropriate, and feasible. It may include interventions incorporating educational, policy, social, and/or other strategies that involve important stakeholders from local government, the community, non-governmental organizations, universities, and other partners.

The time frame allotted by the Environmental Council to develop and implement effective supports for indigenous children living in the Madre de Dios Region is over a period of five years. The maximum amount you are permitted to request is \$2,000,000 USD for the duration of the program. Your team must present your plan to a panel of 9 local and global experts on March 2, 2019. You will need to justify your decisions concerning the development of your final strategies and be prepared to explain the details of your plans.

Important Considerations

- Choice of Target Population: Who is the target population and why did the team choose to target them?
- Who will you develop partnerships with to leverage resources and expertise?
- Who are the stakeholders and decision makers?
- How will you monitor and evaluate your project?
- Are the proposed strategies feasible, effective and culturally appropriate?
- For your intervention program, what are the:
 - Objectives?
 - Strategies?
 - Settings?
 - Budget?
 - Timeline?
 - Sustainability?

Below are some guiding topics related to health of indigenous children in the Madre de Dios Region. We strongly suggest that you do not attempt to address all of these issues, but focus your attention to a selected area. Remember, that this is a Global HEALTH Case Competition. What are your specific plans to address the following topics?

- Access to health care & health disparities
 - Environmental impacts of deforestation
 - Water, sanitation and hygiene (WASH)
 - Proper nutrition
 - Respiratory issues
 - Infectious diseases
 - Social support for children and caretakers
 - Human rights
 - Other
- What impact will this implementation have at the individual, family, community, and national level?
 - Are there any long-term or short-term economic consequences?
 - Can a socio-ecologic framework be used in assessing this problem and how will this be accomplished?
(Centers for Disease Control and Prevention, n.d.)

Important Aspects of Proposed Strategy

🌐 Social Benefit/Social Return on Investment: Impact on health outcomes, economic improvement, and productivity at the personal, family, and community levels

🌐 Feasibility: How well do the proposed strategies utilize and/or improve capacity of current health systems, training/education required to implement plan, what provisions for education, product, or service delivery?

🌐 Economic Impact: Direct costs associated with proposed strategies; transportation and/or opportunity costs to stakeholders

🌐 Cultural Acceptability: Cultural perceptions of the proposed strategies and the extent to which they have taken in local cultural context and technologies

🌐 Legal and Ethical Issues: Strategies for how these will be addressed, if applicable

🌐 Scalability: Application of recommendation to other communities or more extensive coverage beyond Madre de Dios, Peru, provided there is evidence of success

- 🌐 Sustainability: Plans for how the program will proceed once funding ends
- 🌐 Monitoring and Evaluation: Comparison of baseline data, to data collected during and after proposed intervention(s) and how this information will be used to inform program improvements and demonstrate impact
- 🌐 Risk Identification & Mitigation Strategies: Potential challenges/risks associated with recommendation(s) and how those will be addressed
- 🌐 Innovation: Are there aspects of the proposal which could be considered particularly innovative or creative; novel application of existing technologies or new products/services proposed

Attachments

Attachment A. Map of Peru and Amazonia



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