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Cambodia's Infrastructure: A Modern-Day Crisis

Cambodia has a population of just over 16.9 million people, ranking as the 73rd most populous country; however, its urbanization ranking is at an all-time low, being the 213th most urbanized country ("2023 World Population by Country (Live)"). This low ranking means that more than 80% of the population lives in rural areas where there might be small towns of under a thousand people. The country is a multiparty constitutional monarchy called the "Kingdom of Cambodia," ruled by King Norodom Sihamoni. The king is hereditary, unlike the prime minister, who is voted on by the 123-member national assembly. The national assembly votes on appointing the members of the senate and the supreme court ("Cambodian Embassy Culture and Religion"). Cambodia's diverse distribution of its population and its alluring government make Cambodia an intriguing country.

Cambodia is a country with beautiful, vast mountainsides and lakes with woodlands stretching across the entirety of the country. Located in Southeast Asia, it is an area known for its long flood months with a warm and humid climate. Cambodia can be associated with having a tropical savanna climate with frequent monsoon rains (Cambodia Climate and Geography: Workingabroad). Southwest monsoons bring flood months from mid-May to mid-September, while Northeast monsoons bring drier and cooler air from November to March. The temperature ranges from 20 degrees Celsius in the coldest months to 32 degrees Celsius in the warmest months (Cambodia Climate and Geography: Workingabroad).

A majority of Cambodia's population, about 80%, lives in rural areas, with citizens' primary income coming from agriculture. Of this population, 95% identify as Buddhist, resulting in farming and everyday life being much different than in the United States (Hays). Besides agriculture, most people work in the textile industry, Cambodia's most rapidly growing industry. Farm size in Cambodia is vastly different from the U.S., with the average farm being around 10 acres. The farm size is closely comparable to 3 city blocks and is about 2% as large as an average American farm. The most abundant commodities farmed are rice, rubber, cassava, and nuts. Meat plays little to no role in Cambodian life since Buddhists do not believe in the killing/or eating of animals. As a result, most families rely on agricultural production to provide for their families.

Similarly, the country depends on low-value agricultural products for export; therefore, they import high-in-value processed foods and goods. Along with farming, many families fish for food because fish is the only acceptable type of meat for Buddhists. Typical meals consist of rice, fish, soups, and fresh fruit, considered a delicacy. Buddhists refrain from drinking alcohol, so tea and coffee are prevalent among Cambodians (Minority Rights Group).

Typically, rural families will not send their children to school because, while school is free, traveling many miles to get there has many downsides. In Cambodia, children stay at home instead of going to school; one of the many reasons for staying home is not having an accessible route to the nearest school. Children will assist their parents on the farm and any other necessary chores. In addition to free education, healthcare is free, and public transportation is low-priced. Inside the few big cities, water and sanitation are in above-average condition. However, only about 40% of the rural population can access clean water (Hays). Access to clean water is another necessity, and without sufficient roadways for rural citizens to gain access to clean water, they will go without it. Overall, families in Cambodia experience a vastly different day-to-day life than Americans.

Reliable infrastructure in Cambodia is scarce; roads and railroads are destroyed and outdated, and disasters caused by flooding lead to many more problems. Transportation in Cambodia during flood months is virtually impossible, with limited railroads and only 65% percent of roads being reliable; many citizens need access to medical and healthcare facilities (Bainbridge and Sokheng). Flooding damages most paved roads, while unpaved roads are destroyed without a trace. Flooding in this region is expected. Southeast Asia has over 1.25 billion people at risk of flooding; these floods make roads impassable, inaccessible, and unreliable (Conte). While Cambodia's healthcare systems have improved in the past decades, these options are only available in large cities miles away from rural citizens (Minority Rights Group). These large cities are some of the only places that have access to healthcare, markets, and other assorted supplies; with 13.5 million Cambodians living outside of the cities, having access to these facilities and commodities is a necessity, and without reliable roads, the big cities are inaccessible for rural citizens (World Bank Group).

Many organizations have attempted to fix this problem but have yet to prove effective. Currently, Cambodia is one of the ten countries with more private investments than public investments; this means the country is still moving toward public infrastructure advancement (Traffic and Road Conditions in Cambodia). For example, the RRIP phase 2 was a 22-million-dollar project managed by the Asian Development Bank and the Cambodian Ministry of Rural Development. The project lasted from 2015-2020, and through those five years, it is estimated that only 1100km of rural roads out of the 43,000km of unpaved roads were paved and made climate resilient. Although this is progress, people in Cambodia need access to these roads as soon as possible, and restoring 2% of the streets every five years could be sufficient and faster (Traffic and Road Conditions in Cambodia). These roads must be fixed and restored quicker and more efficiently while maintaining the lowest budget possible.

Specific measures need to be taken to increase the reliability and stableness of roads. People could fix this problem by paving roads and making the streets weather-resistant. Although this solution is expensive, it is also effective. The benefits stemming from a new road system revolving around pavement significantly outweigh the initial cost to complete the project (Traffic and Road Conditions in Cambodia). Paving and making roads resilient to weather conditions is not a very cost-effective solution, but a solution that has proven to work. Good road conditions are scarce throughout Cambodia, but a small percentage of Cambodia has implemented this solution, which has proven effective. Because this solution was implemented, the Cambodians in these areas now had more access to necessities and emergency services. This solution needs to be applied throughout Cambodia, not just in a few big cities; not some Cambodians need access to reliable roads, all do.

In addition, one of the many possible solutions to this problem is the inclusion of road culverts along with a more efficient drainage system. This solution would eliminate the worry of roads getting destroyed or becoming impassible. Adding a better drainage system would not only prevent flooding, but it would lessen the damage to roads. By decreasing road damage, other solutions could be implemented more easily without repairing the streets. This solution would be one of the beginning phases of a bigger, more expensive fix to this long-lasting problem. Road culverts leading to flowing streams would assist in draining the roads throughout Cambodia's wet and flooding biome. The channels provide a more natural solution while implementing a more effective draining system would speed up the process. Inserting road culverts and drainage systems is one of many practical solutions to Cambodia's infrastructural problems.

Another cost-effective solution would be to form flood barriers or planks. By adding flood barriers during the rainy seasons, roads would be accessible, and Cambodians would have access to reliable and safe routes. There are many practical flood barriers, such as water-filled flood tubes, inflated flood control tubes, oversized sand-filled flood barriers, aluminum flood planks, and water diversion barriers. Using flood barriers offers two paths: an expensive, more effective barrier or a more cost-effective short-term barrier. A long-term, more expensive solution would implement aluminum flood planks, oversized

sand-filled obstacles, or water division barriers. Each blockade would provide a long-lasting, well-built barrier to protect all roads from damage and keep them open for travel year-round. The other boundaries, such as the inflated tubes, would provide a cost-effective, short-term solution to keep roads open and damage-free throughout one rainy season. Any flood barrier would allow roads to stay open and accessible throughout the rainy season.

Action must be taken immediately in Cambodia because families do not have access to healthcare and everyday necessities. Although time-consuming and expensive, many organizations would be willing to fund this project. If the problem is not addressed immediately, the situation for many Cambodian families will worsen. Organizations such as the World Bank, the United States Agency for International Development, the International Finance Corporation, and the United Nations Office for Project Services have assisted in funding and managing similar projects. These organizations could work closely with the Cambodian Ministry of Public Works and Transport, allowing this project to be well organized over a long period.

Properly preparing Cambodia's roads for flooding makes the country safer for citizens, tourists, and wildlife. Implementing these solutions will allow Cambodian families straightforward access to healthcare, education, and everyday necessities. Cambodia needs an effective, long-term, efficient solution as soon as possible so the infrastructural crisis throughout the country can end.

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