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South Sudan, 5, Climate Volatility

South Sudan is a nation ravaged by floods, reeling from violence, and suffering from exploitation. The country is a paradox; the White Nile which enriches the country's farms has also destroyed them, its vast wealth of oil has brought violence and poverty. Situated in eastern central Africa, South Sudan's tropical climate is well-suited for agriculture, but limited infrastructure and government planning have prevented commercial farms from flourishing. Eighty-seven percent of South Sudan's eleven million citizens live in rural areas as subsistence farmers or pastoralists, which makes food security critical to the economy and livelihood of the nation (*Agriculture and Food*, 2021). Despite all of the challenges burdening the nation, South Sudan holds a great asset–its youth. South Sudan can build a climate-resilient future by putting its young adults to work with solutions built domestically.

South Sudan's family structure and demographics demonstrate a potential for a future economic boom or humanitarian crisis. The average family has three generations under one roof, and the average couple has five children (*South Sudan,* 2022). South Sudan's culture tightly defines gender roles, where women serve as the homemaker and men serve as the breadwinner. Relevant to agriculture, tending to crops is a women's role, while tending to animals is seen as a man's role (Evason, 2018). For this reason, it is critical that relief programs carry an understanding of the gender dynamics involved in farming. Due to South Sudan's recent war, many husbands left to serve in combat, which forced some women to step up to traditionally male roles (Evason, 2018). Young people in wartime also step up to fill the gap, defying South Sudan's paternal traditions. Approximately 60% of the country's population is less than 24 years old, with an overwhelming 40% of the country being under 14 years of age (*South Sudan*, 2022). The country can expect a large working-age population over the next ten years, which can drive future economic stability and infrastructure improvement. Over the last fifty years, many countries such as China and India have successfully exploited this demographic dividend to industrialize.The nation is diverse culturally, and citizens practice Christianity, Islam, and indigenous religions (*South Sudan*, 2022). Dietary restrictions have not caused hunger historically and should not cause new problems so long as investment builds upon current South Sudanese farming practices rather than replacing them. The country has good fortune for the next generation's economy given that it provides the basic education necessary for semi-skilled labor. However, lack of progress within the next few years will yield a large number of unemployed citizens who will be more likely to perpetuate the violence already occurring. South Sudan's current unemployment rate sits at an enormous 38%, which makes joining a militia appealing for many youth, especially if they can guarantee the next meal (*South Sudan*, 2022).

A typical South Sudanese farm is family-owned, consisting of staple crops like sorghum, maize and cassava (Martinez, 2021). Ranching also plays a large role in South Sudan's livelihood, with the country boasting at least ten million heads of cattle (*South Sudan*, 2022). All in all, 87% of South Sudan's population relies on agriculture in some form to earn a living (*Agriculture & Food,* 2021). Due to high prices and unstable supply, farmers largely lack access to modern farming tools such as pesticide, chemical fertilizer, and farm vehicles, preventing the growth of large-scale farms. The lack of large-scale agriculture and the number of farmers in the country raises the dependency on a good harvest. When harvests fail nationwide, as with the flooding in 2021, farmers have few other options apart from foreign assistance or foraging, which became a brutal reality for many during the last major flood (Martinez, 2021). Ranchers have not been exempt from flooding damage as cattle starve without dry land to graze upon (Martinez, 2021).

South Sudan faces challenges from a weak economy and continued violence. While the nation has become less hostile following the 2018 peace agreement, regional skirmishes still prevent the flow of humanitarian aid (*'Unimaginable'*, 2021). The UN reports that 130 aid workers have been killed while

serving in the country since 2013 (*South Sudan: violence*, 2022). Fighting in Unity, a region in central South Sudan, has shut down recent humanitarian efforts and displaced tens of thousands of South Sudanese civilians (*South Sudan: violence*, 2022). Ambushes of imported material suggest that South Sudan should supply relief domestically as much as possible–which is good news for the country's currently struggling economy. South Sudan ranked first as the most oil-dependent country in the world, with oil accounting for almost all exports (U.N. UN Environment Programme, 2018, p. 35). During its civil war, South Sudan's inflation rate was consistently over 100%, which hurt the stability of the already weak agricultural economy (*South Sudan*, 2022). The nation desperately needs to diversify. Scientists predict that South Sudan's oil reserves will dry up by 2035, suggesting that oil export cannot continue as a sustainable revenue source (U.N. UN Environment Programme, 2018, p. 35). Almost nine in ten people farm for their next meal, and yet oil makes up the country's only significant export (*Agriculture and Food*, 2021). The vast mismatch between where South Sudan's money comes from and where almost all its people actually work leads to an enormous level of wealth inequality, ranked worse than the United States (*South Sudan,* 2022). The barriers to progress have a small benefit by showing the path forward. To best weather violence and an economic downturn, aid must provide solutions built in-country and give job opportunities to locals.

South Sudan's problems with climate volatility lead to severe flooding. Recent flooding has left an estimated 1.7 million people displaced from their homes (Martinez, 2021). USAID listed over two-thirds of the population requiring humanitarian assistance, at a ten-year high (*The United*, 2022). The International Panel on Climate Change has also concluded that this factor will worsen with rising temperatures (Martinez, 2021). Since South Sudan itself contributes little to the world's carbon footprint, only 1.73 megatons a year, it is wiser to invest in severe weather defense rather than target the small industrial sector (*South Sudan*, 2022). Flooding is not only detrimental to harvests, but also nutrition and access to potable water. For example, cattle that graze in standing water can become infected, which can be carried to humans upon consumption. A family might risk infection, however, because staying safe means letting the meat go to waste (Martinez, 2021). Deforestation also exacerbates the issue. Over the past decades, farmers and pastoralists have removed trees which absorbed water and trapped soil at a rapid rate, ranking among the highest rate of deforestation worldwide (U.N. UN Environment Programme, 2018, p. 126). The UN Environment Programme noted that deforestation directly contributed to soil erosion and even the dramatic rerouting of regular water flows (U.N. UN Environment Programme, 2018, p. 123). This environmental transformation has brought the threat of flooding not only to new farmers but also to those most inexperienced and unprepared for its most devastating effects. To prevent damage to additional forests and property, any solution will need to include an alternate means of energy, as charcoal provides 80% of the country's fuel (U.N. UN Environment Programme, 2018, p. 17). Notably, South Sudan's culture considers charcoal collecting a women's chore (Evason, 2018). The time-consuming process leaves women little time to do more than provide for the family, which limits their opportunities outside of the house. For this reason, a switch away from charcoal and unsustainable practices serves gender equity as well as climate justice.

Investment needs to act consciously of its international context and downstream consequences. Ethiopia's flood management provides a counterexample of when planners ignore these consequences. The Grand Ethiopian Renaissance Dam (GERD) has effectively trapped and regulated rainwater, so South Sudan could similarly build a large dam located along the White Nile to regulate the amount of water flow and provide electricity for nearby residents. The mountains just South of the capital city, Juba, would be ideal both for the topology necessary to hold the water and the nearby community to use the electricity. Despite the advantages, there are multiple reasons that South Sudan should pursue other options. First, the budget alone of a similar dam would pose a significant barrier. For comparison, the GERD cost approximately 4.8 billion dollars (Ighobor & Bafana, 2014). For a country with a fraction of Ethiopia's GDP, such a budget would be almost entirely dependent on outside investment (*South Sudan*, 2022). Additionally, total regulation of a worldwide need by a national power poses ethical questions. Sudan and

Egypt also rely on the Nile's water for survival. Across the border, GERD caused controversy for keeping water that would have otherwise gone downstream (Zane, 2021). South Sudan itself lies at the mercy of Uganda and the water released by its own dam (*Flooding in South,* 2022). As a result of the financial and ethical barriers, South Sudan should not emulate Ethiopia's style of flood management.

The shortcomings of Ethiopia's Renaissance Dam suggests that the most equitable and effective solution will not arise from man-made infrastructure. To address flooding, South Sudan will need to implement a recovery plan that addresses why flooding occurs rather than continuing relief that only gives defense against the immediate problem. In order to reverse worsening flooding, South Sudan will first need to reverse deforestation. Tree cover, especially in preserves such as the Dongotana Hills, can be restored with the help of nurseries, which can rebuild the native biodiversity in the area.The UN Environment Programme would make a suitable funder, as they already engage in forest protection efforts on the continent. To staff the project, the Environment Programme can hire and train unemployed locals. Women's role as crop-tenders makes the program an ideal environment to give women opportunities to bring a stable paycheck home to their families while remaining respectful of local tradition. This method will ensure a solution made by locals for locals, building upon the community's knowledge of their own forests. This plan additionally avoids the common problem of "helicopter activism" where scientists work in isolation of the larger community.

To combat the deforestation at its source, any aid package will additionally need to provide an alternate method of energy. Due to economic isolation and poor infrastructure, the ideal solution requires no utilities hookup, low cost, and little maintenance. Solar cookers, or solar ovens, respond to South Sudan's unique situation by providing a low-tech, renewable source of power. A solar oven prepares a hot meal or sterilized water without the need for an electrical connection by trapping or focusing heat through the greenhouse effect. Food enters a closed chamber and then is simply left in the sun to heat until it is ready to be consumed. Some of the most efficient models focus light onto a thin metal tube, but a larger model provided by the United Nations Development Programme (UNDP) in neighboring Sudan is large enough to fit multiple cooking pots at once (*Improving Energy,* 2021). Costing between fifty and five hundred dollars per unit on the market, the solution solves the energy needs of one family, and is ideal for rural populations. While the cooker's affordability and energy independence fit South Sudan's crisis well, the transport of the devices will serve the largest challenge. Since the cookers rely on a reflective surface like aluminum to focus light, and with little aluminum produced domestically, the finished product will need to be imported. Violence and looting at the border currently perpetuates economic isolation, discouraging the country's citizens from purchasing in large quantities. Still, most aid arrives via truck. Drivers will need to stay alert for violence and should enter in the southeast, where the least violence has been reported (*South Sudan: violence*, 2022). If violence remains a problem, transport planes can bypass the border; however, the carbon and economic footprint relegates planes to a fallback option. Humanitarian workers with the UNDP have repeatedly brought solar cookers to those in need despite local violence, including refugee camps in bordering Sudan (*Improving Energy,* 2021). Though the UNDP did not explain the cookers' transportation and manufacturing in detail, collaboration with the agency could help identify a logistical solution effective for South Sudan as well. In addition to the UNDP, the Bill and Melinda Gates Foundation could sponsor this plan, as it aligns with their mission to alleviate poverty and their physical area of operation–the organization funds missions in neighboring Ethiopia and Kenya (*Our Work,* 2022). Moreover, such a mission allows for a variable budget depending on the size of the endowment. Distributing one oven costing one hundred dollars to each family (about seven people) comprising the two million needing nutrition assistance would cost roughly $29 million dollars, based on figures from the World Factbook and USAID (*South Sudan,* 2022; *Food Assistance, 2020*). Should the foundation offer a smaller check, however, the organization can simply offer a smaller amount of ovens without waiting for further funds. Conversely, should the Bill and Melinda Gates Foundation offer a larger budget, relief agents could widen distribution to the six million who are food insecure.

Furthermore, the mission to South Sudan needs to pledge that the country's people never go homeless or hungry again. USAID gave $195 million in food assistance to South Sudan this year, but it did not invest in tools for the South Sudanese people to feed themselves (*The United,* 2022). Flood relief likewise falls into the same pattern. Speaking to his experience, Michiel Smet reported, "After the floods in 2018, young people mobilized to fill sandbags, but the area still flooded again a year later, despite the dikes. Livestock had destroyed the sandbags in some areas, or dikes had been affected by erosion" (*Flooding in South,* 2022). Clearly, the current resources at South Sudan's intend to buy time rather than provide an exit. The World Bank specializes in long-term projects and already funds multiple projects in the country, making it an ideal funder for flood resilience. A budget of $200 million dollars would match the World Bank's investment in South Sudan's COVID-19 resilience and give ample funding for both agriculture and flood prevention (*Projects,* 2022). With the money, the World Bank can employ community members to prevent erosion through tree planting efforts along riversides, reroute portions of rivers away from fragile communities, and relocate buildings at risk of damage. Revitalization will focus not on fighting rivers but working with them by encouraging wetlands and areas which can safely absorb water. Instead of dikes, workers can use trees to prevent riverside erosion and flood damage. The fund additionally will give farmers modern tools like tractors and fertilizer to create the food surplus needed to fight hunger. By emphasizing a domestic, nature-based approach, aid will create a diverse and healthy economy rather than one that relies on oil and imported material.

Economists call the basic factors of production, land, labor, and capital, the ingredients that determine if a project flies or never leaves the runway. Land causes no barrier. Of the 95% of all land in South Sudan suitable for agriculture, only 4.5% is currently used (U.N. UN Environment Programme, 2018, p. 36). With unemployment at nearly 40%, projects should find no shortage of willing workers either (*South Sudan,* 2022). South Sudan is ready for its check. The proposed plan offers a holistic solution to climate volatility and food insecurity which will leave a lasting impact on the people of South Sudan. For this reason, the tough work ahead of the country should be embraced rather than avoided, bought and not rented.

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