The Tropics: A Utopia in Progress

written by Saarani Vengadesen | 29/09/2022

In contemporary times, the tropics have been consistently inundated with climate change's forebodings of extreme weather events and higher temperature deviations. The tropics' vulnerability to climate change is characterised by the Global Climate risk index report, which reveals that all top ten affected countries are tropical nations. Primarily, the threats of climate change's worsening reverberations, like rampant poverty and the threat of infectious diseases, remain omnipresent. However, science and technology (S&T) — which compels society's progression — provide integral research and development that could alleviate the tropics' germane dilemmas. Ergo, this essay will thoroughly investigate such threats as consequential repercussions of one another and advise on how S&Ts could remedy them.

Despite their myriad economic, social and political histories, tropical countries have almost ubiquitously remained underdeveloped. The livelihood of rural and urban communities in the tropics is predicated upon "natural reserves and…ecosystem services." Climate change has spurred macro socioeconomic instability amongst disenfranchised and vulnerable demographics. Nonetheless, S&T remains instrumental in alleviating widespread poverty. Notably, research and development in agriculture could stimulate economic growth in penurious communities. Revolutionary biotechnology and genetic modification (GM) have improved horticulture varieties by "integrating heat, drought, and salinity tolerance traits."

For example, a primary tropical industry, palm oil has suffered dramatically from water deficiency — its predominant agroclimatic limitation — due to climate change. Through novel GM technologies developed by MPOB, oil palm trees have been cultivated to have higher "resistance to water stress and salinity" and greater yields without additional land. Thus, local industries can rely on better yields with less risk and more stability, thus allowing underprivileged communities to rely on such crops for survival. These GM crops also utilise less land, which decreases deforestation and amplifies local flora and fauna's biodiversity. Interestingly, GM crops can also increase "soil carbon sequestration," which reduces overall

carbon dioxide output, thereby minimising its carbon footprint. Although climate change's impacts permeate the tropics through negative socioeconomic impact, S&T utilises GM crops to stimulate local communities' economies whilst combating climate change and systemic poverty.

Technology can also be strategically employed through "crop simulation models", which predict "key crop characteristics over [myriad] climates." This computerised program saves time and resources in the "decision-making process" by "predicting growth, development and yield" of food crops. Furthermore, such technologies assess climate change's future implications as acidification, rising temperatures and unprecedented weather predominantly affect tropical populations. Therefore, farmers can receive more accurate and timely information whilst reaping its cost-effective benefits. However, these simulation technologies would need to be institutionalised at the meso- or macro-level due to high operation, maintenance and purchase costs. Even so, local tropical communities will have access to lower food prices and stable food security, reducing poverty and increasing opportunities. Overall, S&T remains an integral tool in combating climate change-correlated poverty through agricultural improvements in the tropics.

In the tropics, the threats of infectious diseases have exponentially increased due to inadequate infrastructure, insufficient knowledge and low income. Furthermore, climate change's "widespread and rapid changes in the atmosphere" has fostered increasingly ideal conditions for infectious disease transmission. Additionally, climate change will inordinately affect the most disenfranchised vulnerable communities like the poor, ethnic and displaced. Nonetheless, mass advances in innovative technologies like Nanopatch will reduce disease outbreaks and prominent social inequalities. The Nanopatch is a patch covered with vaccine-coated micro projections that perforate into the skin's outer layers to directly deposit the vaccine for an efficient and effective immune response. These needle-free systems are formulated to be safer, less expensive and more accessible as they do not require qualified personnel or cold chain facilities that tropical countries have historically lacked. The Nanopatch is also environmentally sustainable as it utilises fewer resources for transport, less packaging and contains a reusable application apparatus.

Moreover, the Nanopatch is socially responsible due to its significantly lower price, which can be delivered to underdeveloped areas throughout the tropics. However, local scientific communities in the tropics will need to produce local adaptations of such existing technologies that specifically target local endemic strains. If such processes are institutionalised, tropical countries can drastically reduce infection and deaths by producing customised vaccines through extensive S&T research and development. Hence, mass advancements in S&T can engineer increased accessibility to vaccines and prevent diseases throughout the tropics.

Mainstream media has exacerbated vital information during the tumultuous COVID-19 pandemic. Similarly, new artificial intelligence (AI) technologies and algorithms can analyse animal and plant disease data, foreign reports and collected data to advise on infection zones. As big data analytics become more standardised, many tropical countries should invest in national smart thermometers and disease detection technology. These technologies — alongside blockchain and other AI — can ensure easy traceability of contaminated areas, identify high-risk patients and provide "population screening, medical help [and] infection control." Thus, the tropics have a systematic approach to combating possible future outbreaks.

Similarly, the proliferation of social media has spread important governmental guidelines alongside the 'standard of procedures.' As many communities in tropical regions still live in rural areas, mass advances in 5G technology could enable online healthcare services to offer

remote diagnosis and treatments. Furthermore, the science community can create simplified content targeted at indigenous or uneducated demographics to explain diseases and preventative measures, thereby reducing social inequality. This interconnectedness would bolster health officials' efforts in mitigating potential disease outbreaks for all individuals, regardless of location, education or status.

Science and technology can catalyse mass reformations in addressing climate change's worsening impacts by combating infectious diseases and alleviating rampant poverty. Through international discourse and cooperation in S&Ts, the tropics would inevitably rapidly develop through reductions in poverty levels and improved disease prevention. Ergo, S&Ts remain the proverbial 'panacea' and remedy to the tropics' most pertinent problems.

Exploitation. Marginalisation. Demolition.

Cohesion. Salvation. Jubilation.

What awaits the fate of the tropics?

This essay was written by Octavius Ete Tan Zhy Lam who is currently a student at Carnegie Mellon University (previously he studied at the Australian International School Malaysia). His essay was selected as the 1st place winner of English category of the 2022 Science for Youth Global Essay Competition held by the Mahathir Science Award Foundation. In this competition, participants were asked, "How can science and technology remedy the issues faced by tropical regions?".