GSDR Science Brief – 2016 Update

Implications of an expanding and intensifying tropical zone for the sustainable development agenda

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The tropical zone provides ecosystem services of global importance, yet development in the tropics has lagged significantly behind the rest of the world (Sachs 2001). The *State of the Tropics 2014 Report* launched by Nobel Laureate Aung San Suu Kyi demonstrates that while tropical nations have made significant progress across a broad range of development indictors they face a suite of challenges that demand focused attention (State of the Tropics 2014).

A regional perspective, driven from within, that recognises the diversity and dynamism of the tropics, but acknowledges and embraces the shared challenges and opportunities the region faces, is essential for promoting long-term sustainable and socially equitable development relevant to tropical regions. In this brief, we highlight some of the more pressing shared issues facing the nations of the tropics.

Tropical development challenges

While none of the world's regions are immune to the negative impacts of climate change or the need to address poverty alleviation, food security and environmental degradation the tropics evince, nonetheless, a number of acute and unique scientific and social challenges.

Disproportionate impacts of environmental change

The tropical zone is the most biologically diverse region on Earth, hosting about 80% of the planet's terrestrial species and over 95% of its coral species and mangroves. Most of the world's remaining primary forests are tropical and, along with coral reef systems, sustain many millions of people and play important roles in climate regulation. Negative impacts on tropical ecosystems and biodiversity threaten critical ecosystem services that underpin human health, wellbeing and prosperity.

Climate change is likely to disproportionately affect the tropics. Tropical ecosystems and biodiversity are inherently vulnerable to small changes in temperature and rainfall as a consequence of adaptation to a narrow range of environmental conditions (Laurance et al. 2011). Many tropical species are already living close to their upper thermal limits with opportunities for migration constrained by habitat fragmentation and topography. Rising temperatures will change rainfall patterns and introduce additional stressors including pathogens, competitors and predators.

Significantly, nations residing near the equator are expected to experience climatic conditions with no existing analogues (Williams & Jackson 2007; Corlett 2012). Even small temperature increases in the equatorial tropics could create conditions that have not existed on Earth for millions of years and that have never before been experienced by human communities (Corlett 2012). Many of the world's most vulnerable human communities are likely to be most affected.

Climatologically, the tropics and subtropics are expanding poleward (Heffernan 2016). Corresponding shifts in tropical cyclone activity, high temperature extremes, pest and disease prevalence, and biodiversity decline are likely to have far reaching implications. While the causes and rate of poleward expansion remain unclear, a pattern of declining rainfall in regions

bordering the tropics already appears evident (Heffernan 2016).

Profound demographic and economic changes

By mid-century, more than half of the world's people and two out of three of the world's children will live in the Tropics. With tropical economies growing some 20% faster than the rest of the world, infrastructure and cities are expanding rapidly. The sheer scale of demographic growth coupled with increasing affluence will place unprecedented pressures on the natural environment and require significant investment in infrastructure, health, education and other important services. The OECD estimates that 75% of the infrastructure that will be needed by 2050 does not yet exist; much of this need will be in the tropics. Unprecedented levels of road building (Laurance et al. 2014) and dam construction (Winemiller et al. 2016) planned for the tropics will have significant benefits but potentially immense environmental consequences. It is critical that such developments are well planned so as to maximize social and economic benefits, while minimizing environmental impacts.

The tropics also host most of the world's cultural and linguistic diversity, with especially high language diversity in Melanesia, the Amazon, equatorial Africa, South-east Asia and India. The rapid loss of languages and cultural diversity in the tropics mirrors biodiversity loss. Traditional knowledge and wisdom accumulated over millennia relating to unique social and natural environments of the tropics is similarly threatened.

Data for tropical development

The *State of the Tropics 2014 Report* analysed key development indicators for 143 countries with at least some footprint in the tropics. Of these 34 nations (mostly small developing island states) were excluded entirely from analyses due to a lack of data. Some regions had particular issues with data availability; of the 50 development indicators considered only half had adequate coverage in Oceania for example. Among the most significant gaps were in areas of health, education, and science and technology - areas that are critical for development.

Reliable data and statistics are vital for understanding the development status of nations, for designing development programs and for tracking progress against the SDGs (UN SDSN 2015). They also enable decisions that are evidence-based and can help strengthen accountability. Increasing support for data collection and capacity building will be a priority in the post-2015 period (UN SDSN 2015).

Strengthening science and research capacity

Research and development activity and capacity in the tropics is not proportionate to the challenge ahead. In the decade to 2008, tropical nations dedicated approximately 0.5% of GDP to research and development compared with 2% in the rest of the world. Between 2000 and 2010, only 10% of university science and engineering graduates worldwide came from institutions in the tropics. Since 1990, tropical nations have produced only 5% of scientific and technical journal articles (State of the Tropics 2014).

While the tropics do enjoy some spillover benefits from R&D undertaken outside the region, capturing the benefits of such activity requires capacity to understand, adapt and operate novel technology. Critically though, science and technology is not always transferable. The particular climatic, ecological and cultural specificities of the tropics demand dedicated R&D effort from within the region.

Agricultural productivity, for example, lags signfiicantly behind the rest of the world (State of the Tropics 2014). And while tropical populations are rising, climate change is expected both to reduce crop

yields and to accelerate land degradation. If future forest conversion is to be limited and food secutiry improved a step-change in agricultural productivity in the tropics is required. The same is true of fisheries, aquaculture, and other natural resource-based industries.

The need for uniquely tropical R&D is not, however, limited to natural resource-based industries. Infrastructure in the tropics is exposed to environmental conditions not experienced elsewhere. The same environmental conditions combine with food insecurity and poverty to elevate the burden of disease over that experienced elsewhere. More than a billion people worldwide are affected by neglected tropical diseases such as dengue and rabies (WHO 2012).

Uniquely tropical research needs and capacities are largely invisible in the global sustainable development agenda. In one recent study, for example, of key post-2015 development research questions nearly three quarters of submissions came from Europe and North America, no questions were identified specific to the tropics and no questions were identified specific to building research capacity in developing countries (Oldekop et al. 2016). While the authors acknowledge this limitation and recognize the importance of broader representation, citing a range of barriers to effective consultation, engagement by the people most affected by development policies remains difficult.

The future belongs to the tropics

Given the region's extraordinary biological and cultural diversity, abundance of natural resources, and rapidly growing populations and economies, what happens in the tropics in coming decades will have global impact. The nature of that impact will depend on how well governments and other stakeholders address the many threats to sustainable development in the tropics and grasp, instead, the potential and opportunities. At a time of global change, and as the world is redefining the development agenda, it is appropriate to explicitly recognize the unique characteristics, dynamics and capacities of the tropical zone.

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