

SUSTAINABLE INFRASTRUCTURE IN THE TROPICS



STATE OF THE TROPICS

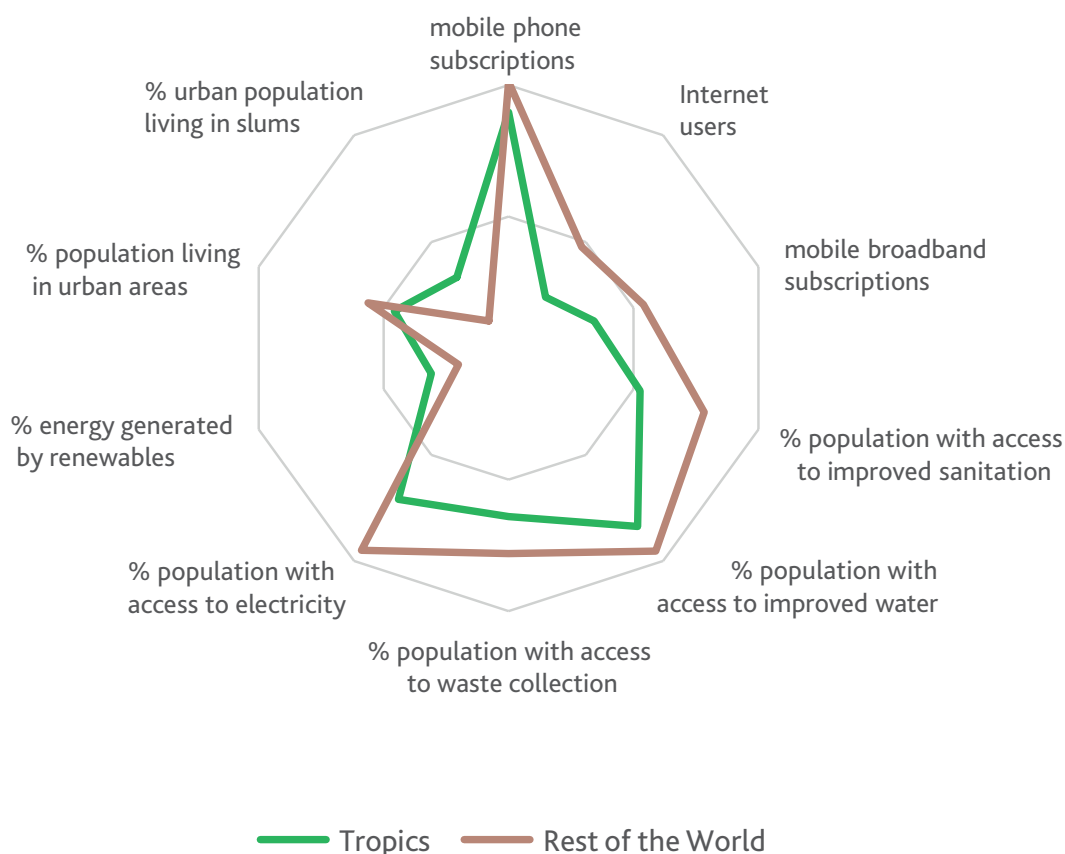
Investment needs to be increased substantially to meet the world's significant infrastructure deficit, most of which is in the Tropics.

Major global trends including growing human populations, increasing affluence, and rapid urbanisation rates, alongside the impacts of global challenges such as climate change, will require massive investment in infrastructure in the next few decades to meet demand and global targets for sustainable development. An estimated US\$3.5 trillion needs to be spent globally each year to 2030 to meet the world's growing requirements for energy, transport, telecommunications, water, and sanitation. Most of the infrastructure needs (almost 70% of the estimated global deficit) are in the world's tropical nations, where an estimated US\$30 trillion will need to be invested by 2030 to bridge the gap. As the adjoining figure shows, nations of the Tropics trail the rest of the world in infrastructure in most sectors.

Tropical nations share infrastructure development challenges and opportunities but in many cases are constrained by limited human and institutional capacity and poor governance. Effective partnerships promoting greater pan-tropical and cross-disciplinary collaborations are required to improve the enabling environment for infrastructure development and management.

The planning, delivery, operation, and maintenance of infrastructure in the Tropics is subject to unique challenges that require focused attention. Tropical climates and environmental conditions, including high heat, humidity, rainfall, and extreme weather events, expose infrastructure to conditions not experienced elsewhere. Many forms of infrastructure such as roads, energy networks and buildings are particularly vulnerable to extreme events, and compared with temperate regions are affected by higher rates of deterioration. Limited technical and institutional capacity in many tropical nations, compounded by ineffective governance (more so than access to resources and financial investment opportunities), constrains development and maintenance of adequate infrastructure in the region. The transfer of infrastructure,

The Tropical Infrastructure Gap in 2015



technology and policies developed in other parts of the world are often inappropriate for tropical conditions. These points underlie the critical need for tropical nations to acquire their own independent capacity to develop and manage sustainable and resilient infrastructure for their own local circumstances. Locally developed solutions and innovations offer considerable potential for sharing across nations and communities in other tropical contexts. Effective multi-stakeholder partnerships between nations, regions, and sectors in the Tropics will help build human and institutional capacity and improve governance, leading to greater potential for capitalising on tropical infrastructure solutions developed for tropical challenges.

Climate change is likely to disproportionately affect the Tropics exacerbating the inherent challenges relating to infrastructure development and management in the region.

With a disproportionate number of the world's poorest and most vulnerable communities, climate change impacts are set to affect tropical nations significantly. Tropical climatic conditions and extreme weather events are set to intensify with even higher rainfall and temperatures predicted, in some cases resulting in novel climates in equatorial regions that have not been recorded in human history. Small Island Developing States, coastal communities and the urban and rural poor are at the frontline of many of these impacts, particularly in relation to sea level rise and natural disaster risks. The need to "climate proof" infrastructure to help tropical countries adapt is an imperative, while the broader need to reduce future warming by investing in infrastructure and technologies that emit fewer greenhouse gases is a global priority.

There is considerable scope for developing renewable energy options in the Tropics, with several tropical nations already world leaders in certain sectors.

More than one billion people worldwide do not have access to any form of modern energy, while for another billion access is intermittent and unreliable. Most of these people live in rural areas of the Tropics. Energy generation lies at the intersection of development, poverty alleviation and climate change. The energy infrastructure deficit in the region is a significant challenge but it also offers an opportunity for tropical nations to develop more efficient, decentralised and renewable forms of energy generation that can 'leap-frog' inefficient and polluting infrastructure. Micro-hydro, solar photo-voltaic and biomass gasification as well as hybrid technologies such as wind-diesel and solar-diesel supported by energy storage technologies are evolving rapidly. Proportionately more of the energy generated in the Tropics is from renewable energy sources than in the rest of the world. Some tropical areas such as parts of South and Central America already rely mostly on renewable energy, while other constituencies such as Singapore and Australia are world leaders in research and development in renewable energy technologies ideally suited to tropical conditions.

Despite recent progress, many people still lack access to basic infrastructure relating to water, sanitation and waste management. The financial investment required to meet these needs is relatively modest compared to other sectors and significantly lower than the costs of addressing the negative outcomes of poor water, sanitation and waste management.

Access to clean water, sanitation facilities and waste management are among the most basic of human needs. Poor water quality, sanitation facilities and waste management practices impact human health and wellbeing, posing particularly acute risks to poor and vulnerable communities. Pollution and greenhouse gas emissions from poor practices also have major impacts on the environment. In 2015, almost half of the population in the Tropics had no access to improved sanitation infrastructure, while a third were not covered by adequate waste disposal services. Waste generation rates are notably lower in low income tropical nations, however, the waste that is generated is mostly disposed of by uncontrolled and unsustainable means. Progress relating to the provision of infrastructure supplying clean water has been comparatively better reflecting the greater attention this sector has had from the international development community. However, at 84% of the population with access, coverage is not universal and still lags behind the rest of the world. In part, the reason for relatively slow progress in these sectors relates to the poor investment returns for the private sector relating to the provision of this type of infrastructure and inadequate public investment. Nevertheless, the estimated total financial investment to provide universal coverage in the Tropics is around \$385 billion – a relatively modest amount compared to the world's investment in other sectors. Significant opportunities also exist in developing and formalising the waste management sector in many tropical nations where a large informal reuse and recycling industry already exists.





Information and communication technology (ICT), including 'smart' infrastructure, offers great potential for innovation and development in the Tropics and is applicable to all other infrastructure sectors. However, digital literacy and equitable access remains a challenge in most tropical nations.

The rapid global growth of ICT infrastructure is mirrored throughout the Tropics with its contribution to improving financial inclusion, health and education outreach and productivity of primary industries particularly notable. Mobile phone uptake in the Tropics has been rapid and is the main source of connectivity for most people in the region. Access to the Internet, however, is highly variable in the Tropics despite a 10 percentage point increase since 2010. High speed, fixed line internet access is rare in the region although there is increasing access to mobile and satellite broadband. The rise of 'smart infrastructure' and its applicability across sectors offers significant potential for the development and scaling up of local innovations and solutions and options for 'leap-frogging' older, less efficient or polluting infrastructure.

Transport infrastructure facilitating the movement of goods and services and people is an important driver of trade, productivity and economic growth. Its sustainable development requires that it be safe, affordable, accessible, efficient and resilient while minimising carbon and other emissions and environmental impacts.

Transport infrastructure has developed significantly throughout the Tropics in the last two decades. The development of roads, air and sea ports and railway networks are an important facilitator of trade and economic growth in the region and investment in these facilities offer a high rate of return for government and private investors. Growth in air and sea traffic and improvements in technology have opened up new industries and export opportunities for many tropical countries, particularly for high value agricultural products. Nevertheless, the volume of air and sea freight and air passenger traffic originating from the Tropics remains a fraction of the global total. Many regions of the Tropics, particularly island nations of South-East Asia, Oceania and the Caribbean are highly reliant on port and sea freight infrastructure but quality remains low requiring significant new investment. A huge increase in road construction is projected over the next few decades in the Tropics. While roads are important for development there is a critical need to ensure planning and building of new roads optimises social and economic benefits while minimising environmental impacts. Tropical wilderness areas are especially vulnerable given that roads into new areas are often associated with increases in land colonisation, habitat disruption and overexploitation of natural resources.

Financing sustainable infrastructure development will require multiple financing sources including public and private, domestic and international.

The large infrastructure gap in the Tropics will require considerable investment from both public and private sources. Insufficient investment in many tropical nations to date is partly due to inadequate infrastructure planning and significant challenges in the enabling environment in terms of institutional capacity, technical knowledge and skills and governance structures which act as impediments to investment and development. New infrastructure initiatives such as the UN's Global Infrastructure Forum led by multi-lateral development banks aims to bring together multiple stakeholders to bridge the infrastructure deficit by identifying and addressing key requirements and highlighting opportunities for investment and cooperation, including through the facilitation of publicprivate partnerships. Currently, most private investment in the Tropics is within the ICT sector, and to a lesser degree in energy infrastructure. Investment in transport, sanitation, water infrastructure is considerably lower, reflecting in part the lower returns in these sectors. Within the transport sector, most private investment is channeled towards roads due largely to a growing dependence on roads for moving freight and increased car ownership across the region.

The rural – urban divide and rapid rates of urbanisation present particular challenges for equitable and inclusive infrastructure development in the Tropics.

Urbanisation is a major global trend that has particular resonance in the Tropics given the region's rapidly growing human populations, rural-urban mobility and young population demographics. Existing urban infrastructure deficits and the high proportion of informal settlements in many cities are magnified as the need for key infrastructure development is outpaced by increasing demand. For the one third of tropical city dwellers who live in a slum, securing tenure and ownership is a key to improving conditions and transforming slums into developed, formal settlements with adequate infrastructure. Despite the many urban development challenges in the Tropics there are many examples of innovative urban developments in the Tropics which offer opportunities for broader leadership in innovation and sustainability. Nevertheless, while urban infrastructure development is a major issue most of the tropical population remains rural. Logistical challenges and the higher economic costs of providing adequate infrastructure to rural communities means much of the world's infrastructure deficit is in tropical rural regions.

Balancing the economic and social benefits of infrastructure development while minimising environmental impacts and respecting cultural considerations is critical to ensuring infrastructure is sustainable, resilient and inclusive.

The tropical zone hosts most of the Earth's cultural and biological diversity including ecosystem services of global importance. Poorly planned, delivered and managed infrastructure has significant environmental impacts including habitat loss and degradation, pollution, and overexploitation of wildlife and natural resources. The lack of effective engagement with local communities, including taking into account local cultural considerations and needs, often results in the development of infrastructure that is not appropriate to local community needs and can be rendered useless and ultimately wasted.

The timely delivery of sustainable and resilient infrastructure in the Tropics is central to achieving the world's goals for sustainable development.

Most of the world's aspirations for a sustainable and equitable future will play out in the world's tropical zone. As this report demonstrates, although the region has made extraordinary progress on a range of infrastructure development indicators in recent decades, significant challenges remain. Enduring poverty, growing inequalities, poor health and education outcomes, and environmental degradation remain major obstacles to sustainable development in many tropical nations. With rapidly growing human populations, changing demographics, many rapidly growing economies, and as a host of most of the world's cultural and biological diversity, the importance of the region is set to increase. The development of sustainable, resilient and inclusive infrastructure is central to addressing the region's challenges and meeting global development goals.

