

Future-proofing Infrastructure to address the climate, biodiversity and pollution crises



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Cover design: Joseph Shmidt-Klingenberg and Sebastian Obermeyer

Graphic Design: Joseph Shmidt-Klingenberg and Sebastian Obermeyer

Layout: Jinita Dodhia/ UNON, Publishing Services Section/Nairobi

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Future-proofing Infrastructure to Address the Climate, Biodiversity and Pollution Crises

Coordinating lead authors: Jessica Thorn (University of York, University of Cape Town), Christopher Mangieri (FullCycle Climate Partners)

Contributing authors: Daniel Olago (University of Nairobi), Julia Baker (Balfour Beatty), Maria Buhigas (Urban Facts)

GEO for Business fellow: Mochamad Septiono (Indiana University Bloomington)

A full list of acknowledgments can be found [here](#).

About GEO for Business

The United Nations Environment Programme [UNEP] and its global partners are proud to offer this series of stimulating briefs about the environmental challenges and business opportunities that demand transformational change at a global scale. These business briefs are meant to communicate the science of the environment to a broad business audience and provide possible pathways and roadmaps that business can follow to address these environmental challenges. The audiences these briefs hope to reach include companies in the supply chains of major multinationals, multinationals themselves as well as small to medium-sized enterprises. The themes of the first 5 briefs include:

- how to transform in a time of uncertainty,
- how to transform business models towards a fully circular model,
- how to transform global food systems,
- how to build environmentally sustainable and resilient infrastructure,
- and the role finance needs to take in a transforming world.

Key Messages

Infrastructure is both impacted by and impacts the environment in various feedback loops.

Between 1998 and 2017, climate-related disasters accounted for 91 per cent of all recorded disasters, with floods being 43 per cent of these events, affecting 2 billion people, mostly in Asia and Africa. In the future, extreme events are expected to have more severe impacts on infrastructure, such as:

- sea level rise, caused by ocean warming and sea ice melt, which will damage protective walls, create more flooding and saltwater intrusions, and inundate low-lying coastal cities
- temperature increases on land, which will accelerate the ageing of infrastructure through heatwaves and changes in freeze-thaw patterns resulting in further infrastructure degradation
- wildfires, which will increase in frequency and intensity, damaging infrastructure in their wake, and
- hurricanes and cyclones, which will increase in frequency and intensity, damaging or destroying infrastructure with the financial cost borne by national economies and the insurance industry.

Building conventional "grey" infrastructure tends to "lock in" carbon, biodiversity loss and pollution impacts.

This happens through the building and use of fossil fuel-based assets (for example, coal-fired power plants and roadways), which lead to more greenhouse gas emissions, degrade local air quality and fragment habitats that are critical for the movement of biodiversity. The production of steel and cement, which are manufactured using significant amounts of coal and energy from fossil fuels, means that traditional infrastructure has embodied emissions that cannot be eliminated by efficiency measures alone.

The public and private sectors can work better together to transform the design, refurbishment and building of infrastructure by:

- bringing relevant private sector actors into public planning and policy design dialogues, which not only ensures adherence to public procurement rules but drives innovation
- coordinating in areas such as strategy setting, mapping stakeholders' interests and influence, data gathering, prioritizing and planning, policy and project development, pre-tender consultations, and permitting
- tendering in ways that help innovations penetrate markets faster
- developing performance-based legislation incentives that remunerate companies that are active agents of change
- removing investment barriers in ways that, for example, accredit or reimburse adaptation-ready infrastructure investments or adapt price control mechanisms to reflect longer asset lifespans, and
- recruiting in ways that provide full and productive employment and decent work for all, including women and young people.

Businesses, both public and private, can benefit from this transformation through reduced risks, fewer stranded assets and new market opportunities.

Both private companies that are contracted by government through procurement processes and those that build infrastructure for their own needs can reduce risks, lower costs, end up with fewer stranded assets and open new markets by designing and building climate-proof nature-positive infrastructure. The key steps needed to achieve this transformation are:

- Integrate planning and design so that infrastructure is viewed as a system of systems, considering interconnections across sectors, between governance levels, across space and time and across all phases of an infrastructure's life cycle.
- Consider the multiple co-benefits of incorporating nature-based solutions, including hybridized blue-green-grey infrastructure, to help regulate water flows, reduce the heat island effect, treat wastewater, reduce stormwater run-off and improve water supplies.
- Add new metrics to infrastructure design and monitoring, such as biodiversity net gain, where infrastructure development leaves biodiversity in a measurably better state than before.
- Decarbonize and detoxify energy systems by considering renewable energy in new or existing infrastructure designs.
- Upgrade and expand zero-emission vehicle infrastructure so that electrification or zero-emission fuels become the new standard.
- Prioritize smart mobility, transit-oriented bicycle and walking infrastructure in new or refurbished designs.
- Focus on resource-efficient, compact and mixed-use urbanization as well as net-zero carbon building designs.
- Integrate water resource use efficiency in the design of infrastructure as well as a circular economy for waste.

Finally, public and private sector actors should focus on socially inclusive, people-centred infrastructure design to avoid effects like green gentrification or displacement of people living in poverty or informal settlements. Meaningful participatory engagement with all stakeholders is essential at all stages of an asset's lifespan, but especially in the planning and design stages. Strategic foresight and scenario planning are useful for identifying, mitigating or avoiding potential risks and improving coordination. Business is a critical partner in designing and building environmentally sustainable, inclusive and just infrastructure to help transform our world, as called for in the 2030 Agenda and Sustainable Development Goals (SDGs).

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1. Why do we need to build climate-proof nature-positive infrastructure?

Businesses can benefit substantially from climate-proofing infrastructure through reduced risks, lower costs, fewer stranded assets and new market opportunities, such as enabling diverse local industries. Upscaling resilient, accessible, low carbon, and quality infrastructure is a prerequisite for achieving the 2030 Agenda for Sustainable Development and the Paris Agreement. Climate-proof nature-positive infrastructure further enhances environmental quality and systems' capacity to bounce back after shocks and helps achieve broader societal goals, such as social inclusion, health, knowledge-sharing and gender equality.

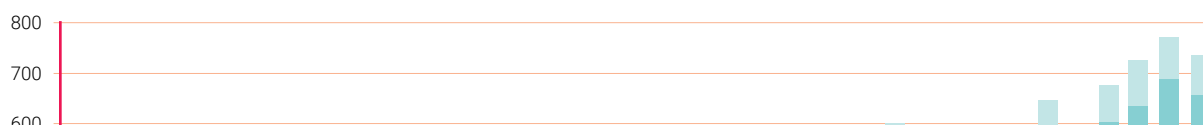
Despite increased recognition of the short- and long-term value generated by these transformations, significant movement away from fossil fuel-based and nature-negative infrastructure assets has yet to happen.^[1] Meanwhile, many conventional infrastructure developments continue to cause irreparable environmental damage, economies face significant infrastructure gaps (about \$15 trillion between 2016 and 2040),^[2] and government policies

do not sufficiently promote, and at times even hinder, innovation (see GEO for Cities Report).^[3]

Infrastructure is both impacted by and impacts the environment in various feedback loops. Global average temperatures have risen more than 1°C since pre-industrial times with the building of fossil fuel-based infrastructure, resulting in more extreme weather events that then directly impact infrastructure. Between 1998 and 2017, climate-related disasters accounted for 91 per cent of all recorded disasters, with floods being 43 per cent of these events, affecting 2 billion people, mostly in Asia and Africa.^[4] In the future, we can expect impacts such as:

- sea level rise, caused by ocean warming and sea ice melt, which will damage protective walls, create more flooding and saltwater intrusions, and inundate low-lying coastal cities
- temperature increases on land, which will accelerate the ageing of infrastructure through heatwaves and changes in freeze-thaw patterns
- wildfires, which will increase in frequency and

Figure 1: Analysis by Munich RE, a reinsurer, of the increase in the frequency of loss-relevant extreme weather events. Note: These events are already estimated to have resulted in the loss of 400,000 lives and have cost the global economy \$1.2 trillion annually, wiping 1.6 per cent from global GDP.^[7]



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