INFRASTRUCTURE for the SUSTAINABLE DEVELOPMENT GOALS

POLICY BRIEF | DECEMBER 2018

The infrastructure – climate change nexus: Integrated approaches as a catalyst for transformational change

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BACKGROUND

In 2017, the average temperature on earth had risen by approximately 1.0°C compared to pre-industrial levels. The last 19 years included 18 of the warmest years on record[1] and perpetuating the current business-as-usual (BAU) scenario is likely to cause an additional 0.5°C of global warming between 2030 and 2052.[2] The latest World Meteorological Organization Greenhouse Gas Bulletin[3] provides evidence that the rate of increase in atmospheric CO2 over the past 70 years, which has now risen to 405 ppm (2017), is now at a level not seen on earth for 3-5 million years and was at a time when sea levels were 10-20 m. higher than today.

Visible effects of climate change are manifold: unprecedented mass coral bleaching events have threatened coral reefs worldwide for three consecutive years, the pace of global sea level rise has accelerated significantly over the last few decades and extreme weather conditions as well as other climate-related hazards have led to record losses in 2017.[4] To limit self-reinforcing feedback loops, urgent upscaling of climate action is needed.

In October 2018, the Intergovernmental Panel on Climate Change (IPCC) released a special report on the consequences of global warming of 1.5° in response to a request issued at COP 21 of the United Nations Framework Convention on Climate Change.[5] The report, which will serve as a key scientific input for the Katowice Climate Change Conference 2018, calls upon the international community to ramp up climate action trough "multilevel and cross-sectoral mitigation and by both incremental and transformational adaptation".[6]

The infrastructure – climate change nexus is pivotal in addressing this call for a holistic approach to climate mitigation and adaptation. The diverse systems of infrastructure, including systems for water and sanitation, transport, buildings, energy, food, telecommunications, resource use, and waste management underpin the global economy as well as human well-being. At the same time, infrastructure systems and assets are a major source of anthropogenic greenhouse gas (GHG) emissions.[7] Hence, sustainable and resilient infrastructure (SDG 9) is a core component of all pathways towards a low-carbon economy, and unleashing the potential of purposefully designed infrastructure policies and assets is essential to spur multilevel climate action (SDG 13).

1. The New Climate Economy (2018). Unlocking The Inclusive Growth Story Of The 21st Century: Accelerating Climate Action In Urgent Times. https://newclimateeconomy.report/2018/.
2. IPCC (2018). Global Warming of 1.5°C: A Summary for Policymakers. http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.
3. WMO (2017). Greenhouse Gas Bulletin no. 13. https://library.wmo.int/doc_num.php?explnum_id=4022.
4. Munich RE (2018). Hurricanes cause record losses in 2017—The year in figures. https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/natural-disasters/2017-year-in-figures.html.
5. UNFCCC (2016). Report of the Conference of the Parties on its twenty-first session: Addendum. FCCC/CP/2015/10/Add.1 https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.
6. IPCC (2018). Global Warming of 1.5°C: A Summary for Policymakers. http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.
7. UNOPS (2016). How Infrastructure Defines our Climate. https://www.unops.org/news-and-stories/insights/how-infrastructure-defines-our-climate.

KEY MESSAGES

1. **The scale and longevity of planned infrastructure assets imply both serious challenges and good opportunities to catalyze transformational change for climate action.** The 2030 Agenda for Sustainable Development depends on large investments in infrastructure to increase connectivity, boost economic growth and enhance social welfare. The need for infrastructure investment is overarching: while developed countries face ageing infrastructure assets that are in need of upgrading and replacement, developing countries rely on construction of new infrastructure systems that support sustainable development. Because of the long lifespan of infrastructure assets, the impacts of the infrastructure choices that are made today will have climate impacts – either positive or negative – that will last for generations.

2. **The development of low-carbon infrastructure is key to achieve targets enshrined in the Paris Agreement.** According to the IPCC's special report, restricting global warming to 1.5°C requires a drop in anthropogenic CO2 emissions by about 40% of 2010 levels until 2030, and a reduction of the same emissions to "net zero" by 2050. Infrastructure assets account for a substantial share of GHG emissions, with estimates reaching up to 70% of total emissions.[8] Therefore, reducing emissions from infrastructure can make a significant contribution to closing the total emissions gap. Important sectors for infrastructure emissions reduction include transport, waste, and energy, among others. In the energy sector, optimizing and integrating existing power grids as well as extending renewable energy investment as opposed to the construction of additional fossil fuel plants, can help to reduce GHG emissions. Estimates released by the Inter-American Development Bank (IADB), for example, suggest that the extension of existing power grids and renewable energy investments could save more than $20 billion in Latin America.[9]

3. **Since infrastructure in every sector has climate implications, we need to incorporate a broad array of stakeholders and cross-sectoral linkages throughout the entire infrastructure planning and development cycle.** Institutions and governance mechanisms that support multi-disciplinary cooperation and coordination across various policy levels (sub-national, national, regional, international) are necessary to implement such a "system-of-systems" approach, and multi-stakeholder consultation should be built in at different stages of the process to ensure that infrastructure is delivering the right services in an inclusive manner. Existing tools such as Strategic Environmental Assessment (SEA), Environmental and Social Impact Assessment (ESIA), Cumulative Impact Assessment (CIA), the Capacity Assessment Tool for Infrastructure (CAT-I), the National Infrastructure Systems Model (NISMOD), spatial planning tools, and the various guidelines and sustainability rating schemes (e.g. Envision, SuRe, INVEST), can all be used to support an upstream, integrated approach that results in lower GHG emissions and increasingly resilient infrastructure systems

4. **Climate resilience should be considered for all infrastructure projects in order to limit climate risks to infrastructure systems.** This is to say that roads, bridges, pipelines, power transmission lines and other infrastructure assets should be designed and built to withstand unexpected and unpredictable climatic conditions in future. For example, where possible, avoiding infrastructure development in

8. World Bank (2017). Low-Carbon Infrastructure: Private Participation in Infrastructure (PPI). http://ppi.worldbank.org/~/media/GIAWB/PPI/Documents/Global-Notes/2017_Low_Carbon_Infrastructure_PPI.pdf.
9. IADB (2017). La Red del Futuro: Desarrollo de una red eléctrica limpia y sostenible para América Latina. https://publications.iadb.org/handle/11319/8682

locations that are most exposed to climate-related hazards (e.g. mountain slopes, floodplains, and low-lying coastlines) helps to manage climate threats to infrastructure. Infrastructure planning should also embrace ecological solutions which provide catalytic opportunities to limit and mitigate climate risks and biodiversity loss, while at the same time increasing the resilience of the infrastructure itself and improving service provision. The 2012 Cloudburst Plan in Copenhagen (Denmark), for instance, adopted a mix of green and grey infrastructure to adapt to the increased likelihood of extreme rainfall periods. Tunnels and roads designed to increase drainage capacity and water discharge into the sea were combined with the installation of anti-flooding mechanisms in buildings, and with the restoration of natural waterways and green spaces to enhance stormwater flows.[10]

5. **Adopting an integrated approach to the planning and development of resilient, low-carbon infrastructure can provide environmental, social and economic co-benefits.** By considering the interlinkages between different infrastructure systems, sectors, project phases, locations, and aspects of sustainability (environmental, social, and economic) planners can maximize the synergies between sustainable infrastructure, climate action and other SDGs while minimizing trade-offs. City administrations have high potential to become agile and pragmatic drivers of such multilevel approaches thanks to their proximity to the public and their focus on day-to-day service provision. For example, public investment in the extension of cycling infrastructure within metropolitan areas does not only reduce transport-related GHG emissions, but it also has positive consequences on air pollution levels and traffic congestions, thereby improving community and individual health and quality of life. Furthermore, the accessibility of cycling infrastructure fosters social equity based on the inclusion of vulnerable groups within urban transportation systems, and potentially within urban job markets.[11] Increased social and environmental interactions also contribute to community well-being. Investments in low-carbon infrastructure also have the potential to create enormous economic gains. It has been estimated that more compact, connected, and efficient cities will generate up to US$17 trillion in economic savings by 2050 and will stimulate economic growth by improving access to jobs and housing and reducing poverty.[12]

6. **Research and development of decarbonized construction materials needs to be accelerated to abate climate change.** In particular, efforts to commercialize alternatives to traditional cement should be boosted. According to a Chatham House report, more than 4 billion tonnes of cement are produced each year, accounting for approximately 8% of CO2-emissions worldwide.[13] As cement continues to be a widely used building material, it is vital to explore opportunities to blend in materials other than clinker in order to reduce GHG emissions. A practical example of the use of alternative construction materials is provided by a UNFCCC Lighthouse Activity in Gorakhpur (India) which supported

10. The City of Copenhagen (2014). Cloudburst Management Pays Off: The Economics of cloudburst and stormwater management in Copenhagen. https://climate-adapt.eea.europa.eu/metadata/publications/economics-of-cloudburst-and-stormwater-management-in-copenhagen/11258638.
11. OECD (2018). Financing Climate Futures: Rethinking Infrastructure. http://www.oecd.org/environment/cc/climate-futures/synthesis-financing-climate-futures.pdf
12. New Climate Economy Working Paper: Accelerating Low-Carbon Development in the World's Cities (2015) http://newclimateeconomy.report/2015/wp-content/uploads/sites/3/2015/09/NCE2015_workingpaper_cities_final_web.pdf.
13. Chatham House (2018). Making Concrete Change: Innovation in Low-carbon Cement and Concrete https://reader.chathamhouse.org/making-concrete-change-innovation-low-carbon-cement-and-concrete#

local communities to design and build flood-resilient, low-carbon houses. The application of innovative construction techniques allowed these communities to use 19% less bricks and 54% less cement mortar. Additionally, transport-related emissions were minimized thanks to the use of local building materials.[14] Ultimately, the benefits of using alternative construction materials extend beyond the climate; the production of concrete and bricks also use large amounts of sand, water, gas, wood, and coal, which also impact terrestrial and aquatic habitats and biodiversity. Low-carbon alternatives should therefore be complemented with the application of Nature-based solutions (NbS), including the restoration of forest ecosystems and avoided deforestation. In addition to the protection of biodiversity, these solutions provide a host of infrastructure services such as carbon sequestration and land stabilization, thus maintaining ecosystem service benefits and providing long-term mitigation effects.[15]

7. **Innovative policies are needed to promote the development of new technologies and business models that can spur systemic change for climate change mitigation.** For example, global oil demand could be substantially reduced by replacing fossil fuel subsidies with financial incentives to promote the use of electric vehicles running on electricity from renewable energy sources. Furthermore, public investment in research and development and the integration of sustainable cutting-edge technologies within public procurement policies are powerful tools to nurture innovation. Investing in research on digital manufacturing, for instance, can support the rise of disruptive technologies like 3D printing and address sustainability concerns at the same time (for instance, by supporting the use of sustainable printing materials) On the demand side, sharing economy applications like car-sharing, home-sharing or food-sharing platforms, amongst others, can help to promote inclusive models for sustainable consumption and fossil fuel-related emission reduction. Consequently, policies steering consumer behaviour towards these peer-to-peer models have high potential to boost inclusive and climate-smart growth.[16]

8. **Innovative financing solutions are needed to drive the development of low-carbon sustainable infrastructure.** The SDGs and the Paris Agreement provide a framework of quantifiable sustainable development targets. Meeting these targets will require tens of trillions of dollars of infrastructure investment.[17] Innovative financing solutions are needed to incorporate biodiversity, climate mitigation and adaptation, inclusivity, and other elements of sustainability within infrastructure investments. In this regard, the issuance of sovereign green bonds as well as tax exemptions, credit enhancement and national green bond guidelines can further promote the climate-aligned bond market, which has reached a global value of $1.45 trillion in 2018.[18] The engagement of private sector is also crucial to achieving both climate targets and the SDGs. Low-carbon investments from large global actors in the private sector will spur innovation and growth in low-carbon infrastructure. Investors are increasingly recognizing

14. UNFCC (n.d.). Community-Based Micro-Climate Resilience | India. https://unfccc.int/climate-action/momentum-for-change/urban-poor/community-based-micro-climate-resilience-india.
15 . IUCN (2016). Nature-based solutions to address global societal challenges. https://portals.iucn.org/library/sites/library/files/documents/2016-036.pdf.
16. OECD (2018). Financing Climate Futures: Rethinking Infrastructure. http://www.oecd.org/environment/cc/climate-futures/synthesis-financing-climate-futures.pdf.
17. Global Infrastructure Hub (2018). Global Infrastructure Outlook. https://outlook.gihub.org/.
18. Climate Bonds Initiative (2018). Bonds and Climate Change: The State of the Market 2018. https://www.climatebonds.net/resources/reports/bonds-and-climate-change-state-market-2018.

that low-carbon commitments and in turn investments are key to preparing their businesses for future markets, which will thrive on sustainability principles. Nevertheless, private investments remain small due to the high risks of investing in sustainable infrastructure. Blending public capital and concessional climate finance with private capital can help to reduce risks for private investors.

9. **Robust legal frameworks, regulations and standards should mainstream climate action into national long-term plans for infrastructure.** Such frameworks should incorporate independent assessments spanning the entire life-cycle of infrastructure assets as well as strong monitoring and evaluation mechanisms, which allow for evidence-based feedback and continuous revision processes. Climate-related standards for infrastructure planning should be integrated, inter alia, within "long-term low greenhouse gas emission development strategies" (LTCs) and National Adaptation Plans (NAPs). To support the mainstreaming of climate action within NAPs, in 2013 the Conference of Parties (COP) to the UNFCCC has launched the joint UNDP-UN Environment National Adaptation Plan General Support Programme (NAP-GSP). Funded by the Global Environment Facility (GEF), the Least Developed Countries Fund (LDCF), and the Special Climate Change Fund (SCCF), and in cooperation with other development partners, this programme provides stocktaking, capacity building and multi-level coordination support for NAPs in least developed and developing countries. Regulatory frameworks for infrastructure play a pivotal role in this process due to the cross-cutting importance of infrastructure for sectors presenting a high level of vulnerability to climate change such as water and sanitation, energy, agriculture and food security.[19]

19. UNFCCC (2018). National Adaptation Plans: Synthesis report by the secretariat. https://unfccc.int/sites/default/files/resource/inf01.pdf.

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