

Infrastructure for climate action



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Foreword



Grete Faremo, Executive Director UNOPS

Infrastructure offers a unique chance to help countries get back on track to meet the Sustainable Development Goals (SDGs), mitigate and adapt to climate change and equally accelerate recovery from the ongoing COVID-19 pandemic.

Sustainable infrastructure is fundamental to addressing climate change- and urgently so. We have once again received a warning on the severity of the climate crisis facing our planet. The latest report from the Intergovernmental Panel on Climate Change (IPCC) is a "code red for humanity", to quote the UN's Secretary-General António Guterres. It calls on all of us to urgently step up our efforts to tackle this crisis.

Against this background, the findings of the Infrastructure for Climate Action Report 2021 published jointly by UNOPS, the University of Oxford and the United Nations Environment Programme- are particularly important: Infrastructure plays a key role in supporting the achievement of the SDGs and the Paris Agreement.

Infrastructure is responsible for 79 per cent of total greenhouse gas emissions and 88 per cent of all adaptation costs, finds the report, after looking in detail at the influence of infrastructure on climate action across a range of sectors.

The sheer scale of this influence calls for a radical change in how decisions on infrastructure are made. Now more than ever we need decisions that are evidence-based, and that create mutual benefits on climate action and sustainable development. Despite this importance, infrastructure investments often fail to promote climate action. Too often, decision-makers solve one infrastructure issue at a time, without thinking about how it impacts on and is impacted by others. This needs to end: decisions on infrastructure need to fully account for its role in sustainable development and climate action, they need to aim for long-term impact for people and the planet, and consider that infrastructure systems are interrelated.

Promoting climate-friendly infrastructure requires coordinated action from practitioners across all stages of the infrastructure lifecycle, from planning and implementing, to delivery, management and decommissioning. This report highlights some of the key steps that practitioners can take to ensure infrastructure projects incorporate climate adaptation and mitigation measures, while still aiming for long term sustainability. It presents practical examples of infrastructure projects that have contributed to the achievement of national climate and development targets. It also illustrates UNOPS work to support our partners in developing infrastructure that works for our climate.

Our world's infrastructure needs are immense and unprecedented. We face an uncertain future and far reaching consequences of a climate emergency. This report is a contribution towards ensuring that the infrastructure decisions of today can meet the development and climate needs of tomorrow.



Inger Andersen, Executive Director UNEP

Infrastructure is key to addressing the triple planetary crisis of climate, biodiversity loss and pollution. Even as the world seeks to bridge the massive infrastructure gap, we know that infrastructure is responsible for over 75 per cent of total greenhouse gas emissions worldwide. Today, more than ever, there is a clear urgency for action to combat climate change; the alarm bells are deafening.

As this report demonstrates, infrastructure holds tremendous potential to drive climate compatible development through evidence-based investments that can mitigate greenhouse gas emissions while also helping us adapt to the impacts of climate change. Low and middle-income countries alone could benefit from a 4 USD return on every 1 USD spent on infrastructure that prioritizes future-focused resilience.

The choice is clear: we cannot continue building "business-as-usual" infrastructure, which contributes to the destruction of ecosystems and undermines nature's ability to regulate the climate. It is critical that we invest in sustainable infrastructure that adapts to future uncertain climate conditions; contributes to the decarbonization of the economy; protects biodiversity and minimizes pollution.

Tackling the transboundary, interconnected impacts of climate change requires integrated approaches. This report provides valuable insights through detailed life cycle analyses of built infrastructure, and by illustrating the interlinkages of different sectors, governance structures and aspects of sustainability. The focus on evidence-based planning aligns with UNEP's International Good Practice Principles for Sustainable Infrastructure, including Principle 10: Evidence-based decision making.

To overcome the triple planetary crisis, we urgently need to conceptualize innovative, circular and sustainable infrastructure systems. This report illustrates the powerful opportunities across six critical infrastructure sectors. It offers a roadmap for building climate compatible, resilient infrastructure that addresses challenges linked with existing infrastructure, as well as rapidly emerging sectors like digital communications.



Professor Jim Hall, Professor of Climate and Environmental Risk University of Oxford

Infrastructure systems are central to reaching a future in which all people have reliable access to the services that they need, whilst halting greenhouse gas emissions that are driving global warming. A transformation of infrastructure is under way to provide clean energy services, green transportation and energy-efficient buildings. This transformation has to also be resilient to the inevitable impacts of climate change, which means that damaging extreme climatic events are becoming more frequent with the potential to disrupt the infrastructure services upon which we all depend.

Yet we also recognize that the infrastructure systems that have been built in the past have become part of the problem. Operating today's infrastructure for the most part depends upon burning fossil fuels. Millions of tons of greenhouse gasses have been emitted during the production of the cement and steel in our built infrastructure. Infrastructure construction has devastated natural habitats and opened them up to even greater exploitation. Too often it has involved the appropriation of land and has excluded the poorest from the essential services that they need, whilst adding to unsustainable levels of public debt.

The central question is not whether we need infrastructure, but how it can be provided in ways that are sustainable, resilient and compatible with a net zero future. There is no simple answer to the question of how to provide climate-compatible infrastructure. It requires a myriad of choices, from the moment an infrastructure project is first conceived, to the end of its life when it is decommissioned or repurposed. Making the right choices is not easy – it depends upon in-depth knowledge of the systems that are to be provided, and the context in which they will operate.

For the last decade, my research group at the University of Oxford has been working with UNOPS and other partners to provide evidence, tools and insights that can help navigate towards climate compatible infrastructure development. This report further contributes to that goal. In this crucial year for climate action, it is absolutely right that our most recent collaboration should focus upon this important topic. There is much still to learn, so I look forward to further collaboration on the pathway to climate compatible infrastructure.





Executive summary

Globally, we continue to witness the increasingly destructive impacts of climate change. The increased frequency and intensity of events such as wildfires, floods and droughts are costing lives, disrupting economies and setting back development progress that has taken years to establish. Compounded by the COVID-19 pandemic, the world is facing unprecedented challenges that affect all societies.

In the buildup to COP 26, countries are re-affirming their commitments to climate action, including through submission of their revised Nationally-Determined Contributions (NDCs) under the Paris Climate Agreement. Such action not only advances mitigation and adaptation objectives set out in the agreement but can also protect and enhance progress towards many related targets of the Sustainable Development Goals (SDGs).

This report highlights the key role that infrastructure plays in delivering climate action and sustainable development. Developed through collaboration between UNOPS, the United Nations Environment Programme (UNEP) and the University of Oxford, it finds that infrastructure is responsible for 79 per cent of all greenhouse gas emissions, and accounts for 88 per cent of all adaptation costs. Despite recognition of the need for action, policy makers face challenges in understanding where resources should be allocated, and which practical actions should be prioritized, to maximize progress. Through a systematic assessment of global research, this report offers new insights to help address this challenge. Infrastructure's central importance to climate action and sustainable development can be understood across three main dimensions.

The largest sources of **greenhouse gas emissions** are associated with the energy, transport and buildings sectors (the last of which include homes, offices and schools). In an increasingly connected world, and with the COVID-19 pandemic transforming the way we work, learn and socialize, emissions from the digital communication sector are expected to rise. However, to the extent that digital systems decrease our reliance on the transport and building sectors (e.g. through reduced commuting and remote working), they have the potential to offset emissions and reduce total greenhouse gas emissions overall.

54 per cent of all future **adaptation costs** will need to be spent on the water sector, more than all other sectors combined. These costs originate from hazard protection provided by this sector that can reduce risks from floods, sea level rise, storm surge events, and other climate impacts. Whilst traditional built protective infrastructure (e.g. sea walls) will play an important role in risk reduction, nature-based solutions (such as reforestation, mangroves and wetlands) represent an effective and resource-efficient alternative that can offer a multitude of co-benefits including carbon sequestration and the enhancement of habitats. Policies that protect those exposed to hazards, in particular those most vulnerable within society, will also play a critical role in managing overall climate risk.

Due to the multiple services provided by buildings, the sector is found to have the single largest influence of infrastructure on the targets of the **SDGs**. The importance of buildings for the SDGs, as well as for greenhouse gas emissions and adaptation costs, highlights the need to transform the way we plan, manage and operate buildings in the future - for example, by integrating nature-based solutions and sustainable building materials, and improving energy efficiency. This can have positive knock-on effects across other sectors required to run buildings, such as energy and water supply. The forecast growth of global infrastructure development, including in buildings, highlights the potential for this transformational change to be driven at scale.

An integrated approach requires an understanding of the synergies and trade-offs between sectoral actions so that negative side effects can be minimized, while opportunities to create positive and wider sustainable development benefits can be enhanced. The concept of climate compatible development sits at the intersection of climate mitigation, climate adaptation and sustainable development, which are equally important in realizing the commitments of the SDGs and the Paris Agreement. Balancing these outcomes will require that the right infrastructure is done well so as to provide maximum benefits within each dimension.

In addition to built physical assets, both the natural environment and an enabling environment of appropriate policy, regulatory and governance frameworks, technical capacity and resources are key components of the overall infrastructure system. Policies and investments that protect and enhance nature will be key to ensuring the provision of essential services that include hazard protection, carbon sequestration and wastewater treatment, whilst also offering an array of co-benefits. Strengthening the enabling environment can be a costeffective route to ensuring efficient service delivery and that infrastructure is inclusive and works for all people. Action in the built environment should also not be overlooked. Policies that introduce and enforce standards can be effective tools to ensure that built assets work with nature, do not leave unsustainable burdens of debt for future generations, and support the necessary shift towards a circular economy.

The integrated pursuit of climate action with other sustainable development objectives will require the coordination of multiple practitioners across the infrastructure lifecycle to establish, monitor, evaluate and, as necessary, adapt key objectives. Raising awareness of important issues, and defining concrete actions that different stakeholders can undertake to reach these objectives, are critical first steps to making progress.

Creating and embedding climate action and other sustainable development targets across the infrastructure lifecycle will be central to ensuring that the actions of many different actors can come together to ensure that national and international commitments are met. This will require the coordination and support of government and other key actors during the "upstream" phases of the life cycle, as part of strategic planning, project prioritization and preparation processes.

As highlighted by the analysis in this publication, action is required across all sectors. While prioritizing actions that represent 'low hanging fruit' can help to build momentum, it is essential that policy makers take a more holistic, systematic, and integrated approach to infrastructure to create impact at scale. Such integration should be driven by national governments, who have the responsibility to deliver on development objectives. The establishment of infrastructure-specific coordination units, as have been developed in the UK, Canada and Saint Lucia, amongst others, can be effective in harmonizing action across sectors. Communities of practice that develop and share knowledge and experience through case studies are essential for showing how progress can be achieved in different national contexts.

As we rapidly approach the 2030 milestone for the achievement of the Paris Agreement and SDG targets, and in the face of a climate emergency, action is desperately required to reduce climate change and its harmful impacts, as well as ensure that development is sustainable, resilient and inclusive. The research synthesized within this publication highlights the transformative role that infrastructure investments can have, including which sectors have the greatest potential to drive sustainable development, and opportunities to work in a holistic and integrated way to maximize positive impacts. Practical actions and case studies highlight tangible routes to action, while policy priorities show where efforts can be targeted to take this transformation to scale.

Background

Responding to global challenges

In 2017, less than half of the global population had access to essential healthcare services. 2.2 billion people lacked safely managed drinking water, while 4.2 billion lacked safely managed sanitation.¹ By 2018, 24 per cent of the world's population was living in slums, and 789 million people worldwide lacked electricity.¹ Those in vulnerable situations are disproportionately affected by such access gaps. For example, by 2017, only 17 per cent of mothers and children in the poorest fifth of households in low- and lower-middle income countries received at least six of seven basic maternal and child health interventions, compared to 74 per cent for the wealthiest fifth of households.²

The COVID-19 pandemic continues to severely aggravate these challenges, causing a 3.5 per cent contraction in the global economy, pushing over 71 million people to extreme poverty and causing disruptions in the provision of essential services such as education and healthcare.^{1,3} The pandemic has affected girls and boys, and women and men, differently, with children's education interrupted and families placed under stress by health and economic burdens. Disease outbreaks have increased caring duties for elderly and ill family members, which are often borne by girls and young women, as well as for siblings who are out of school. Girls, particularly from vulnerable communities, are likely to be affected by secondary impacts of the outbreak, such as greater risk of exploitation, child labour and gender-based violence.

Whilst progress has been made over the past decades to provide the global population with the essential services that they need, much of this development has come at a cost to people and the planet. As of 2016, investment in fossil fuels (\$781 billion) was almost 15 per cent higher than investment in climate activities (\$681 billion), and fossil fuel subsidies witnessed an increase of 34 per cent from 2015 to 2018.¹ As a result of deforestation, unsustainable agricultural practices, urbanization and other human activities, one fifth of the Earth's land area was reportedly degraded by 2020, threatening biodiversity and ecosystems, driving species into extinction and aggravating climate change. This compounds growing pressure from drivers such as population growth, the depletion of natural resources and the effects of climate change, such as more frequent flash floods, droughts, hurricanes, wildfires, storm surges, heat and cold waves, sea-level rise and coastal erosion, among others.

Climate-related shocks and stressors have undermined the stability of infrastructure systems and their ability to operate and provide essential services for communities, especially the most vulnerable. Countries have witnessed increasing economic, social and environmental losses during the 21st century, a direct result of climate-related disasters, which deepen access gaps and set back efforts to promote sustainable development. From 2000 to 2019, a 74.5 per cent increase in disaster events was recorded over the previous 20-year period.⁴ These extreme events have affected over 4 billion people worldwide, claimed approximately 1.23 million lives and resulted in approximately \$2.97 trillion in economic losses (an increase of over 82 per cent over the previous period).⁴

Such events have hit the poorest countries hardest, as communities and individuals already struggle with strained resources and acute vulnerability. In 2020, over 1,770 recorded weather-related events led to about 30 million new displacements, the highest number since 2010.⁵ Displacement rates were almost five times higher in countries with the lowest incomes when compared to those in high-income countries.

In the decades to come, climate change has the potential to push more than 100 million people back into poverty by 2030, particularly in Sub-Saharan Africa and South Asia.⁶ It is also in those fragile contexts that access gaps to public services such as safe drinking water, sanitation and electricity are most acute, where resource competition and perspectives of inequality are likely to drive instability and conflict.⁷

In response to the global challenges faced by countries and societies worldwide, governments have committed to a series of global agendas that aim to support low-carbon and sustainable development that is resilient to the harmful impacts of climate change. These include, among others, the Sendai Framework for Disaster Risk Reduction, the **Paris Agreement on Climate Change**, and the **Sustainable Development Goals (SDGs)**, the latter two of which are the focus of this report.

The Paris Agreement on climate change

The Paris Agreement was adopted by 196 countries at the 21st Conference of the Parties (COP) in 2015. This treaty aimed to limit the rise in global temperature to below 2 degrees Celsius, and preferably 1.5 degrees Celsius, compared to pre-industrial levels, and to achieve a net-zero world by 2050. It also established a common goal of enhancing the adaptive capacity of parties, fostering their resilience and reducing vulnerabilities to climate shocks.⁸ The signing of the Paris Agreement represented a landmark moment in the fight against climate change, being the first legally binding international treaty to address the need for countries to undertake ambitious efforts to combat climate change and adapt to its effects, as described by the United Nations Framework Convention on Climate Change Executive Secretary:

"It was a remarkable achievement, a milestone for multilateralism—a declaration that humanity could and would stand united and address the most significant threat to its collective future."⁹

In the lead up to the COP in 2015, countries developed Nationally Determined Contributions (NDCs) which set out their specific targets, objectives and actions to reduce their greenhouse gas (GHG) emissions, build resilience and adapt to the impacts of climate change. Following the signature and ratification of the Paris Agreement, 191 parties have continued to increase the ambition of their NDCs and improve their alignment with national plans and strategies.

The Sustainable Development Goals

The 2030 Agenda for Sustainable Development was unanimously adopted in 2015 by all 193 United Nations Member States. Together, the 17 development goals, its 169 targets and 247 indicators provide a blueprint to stimulate action in areas of critical importance for humanity and



the planet. In practice, achieving the SDGs requires a dramatic shift in the way that countries pursue economic, social development and inclusive growth, as highlighted by the United Nations Secretary-General:

"The 17 Sustainable Development Goals (SDGs) demand nothing short of a transformation of the financial, economic and political systems that govern our societies today to guarantee the human rights of all."¹

Through their commitment to the 2030 Agenda, countries have recognized that the greatest global challenges such as poverty and deprivation can only be addressed through sustained efforts to reduce inequalities, foster sustainable economic growth and protect the planet. At the national level, many countries have established national development plans that reflect their commitment to the SDGs. National plans outline priority areas and key actions to promote sustainable development within their territories.

The Paris Agreement and the SDGs set a framework and direction for countries, the private sector and

civil society to promote sustainable development and climate action. However, six years after these commitments were established, progress remains uneven, and intensified efforts by all stakeholders are more critical than ever. The Decade of Action to deliver these climate and development agendas, alongside the recovery needs of the COVID-19 pandemic, provides an opportunity to support development that is sustainable, resilient and inclusive.

While the Paris Agreement and the SDGs each lay out a different set of commitments, achieving development across both agendas requires an integrated approach that accounts for the societal, economic and environmental impacts of human activity. The 193 Member States of the United Nations recognized this need for integrated approaches to sustainable infrastructure development in a resolution at the 4th Environment Assembly in 2019¹⁰, and since then UNOPS, the University of Oxford, and UNEP and have been working together under the Sustainable Infrastructure Partnership to raise awareness about the role of infrastructure in delivering the SDGs, develop normative guidance on the application of integrated approaches, and provide technical support and capacity building to countries.

This report represents a milestone in the partnership between UNOPS, the University of Oxford and UNEP in contributing to the discussion on the role of infrastructure in achieving global agendas. To avoid making the mistakes of the past and exploit opportunities for co-benefits, it is essential that we take an integrated approach to our future - one that fosters climate compatible development as the norm.

Towards climate compatible

It is therefore important that governments and practitioners avoid contradictory approaches that create negative side effects to sustainable development or climate action. Rather, they should prioritize solutions that exploit their synergies and manage trade-offs where they are unavoidable. Investments that create mutual benefits on climate action and sustainable development will advance climate compatible development, defined as:

"Development that minimizes the harm caused by climate impacts, while maximizing the many human development opportunities presented by a low emission, more resilient, future."12

Climate compatible development is rooted in the recognition that our planet has finite resources and that human activity must respect environmental boundaries to avoid producing consequences that will endanger human life. In practical terms, actions to achieve interdependent SDG targets (i.e., reducing poverty, gender equality, education, clean energy, improving sanitation or increasing healthcare capacity) must not aggravate climate change or create vulnerabilities to it.

Climate compatible development lies at the intersection of climate mitigation, climate adaptation and sustainable development, making it a central framework to assessing the achievement of both of these agendas (Figure 1).

At the heart of all societies are infrastructure systems

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Figure 1: Climate compatible development and the global agendas.