

G20 Actions for Deepening the Sustainability of Infrastructure Systems

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Abstract: The forthcoming wave of infrastructure investment is critical for responding to contemporary global crises. A deeper focus on sustainability is required to address the complex web of infrastructure service needs, underlying vulnerabilities and multiple policy objectives. Infrastructure and sustainability considerations have gradually gathered momentum in the G20 while, in 2023, the impact of infrastructure on lifestyles has garnered increased attention. This paper examines the International Good Practice Principles for Sustainable Infrastructure as a complement to the G20 Principles for Quality Infrastructure Investment. It sets out a rationale for integrating the natural environment as an intrinsic component of infrastructure systems that support sustainable lifestyles.

Introduction

Infrastructure underpins the world's economies and societies, providing essential services for day-to-day living like water and sanitation, food, energy, mobility, healthcare and education, *inter alia*. Indeed, infrastructure influences all of the United Nations Sustainable Development Goals (UN SDGs), including 92 per cent of the individual SDG targets (Thacker *et al.*, 2018). Infrastructure is also vital since it

shapes and influences the way societies organise everyday life and their systems of accessing services, production and consumption.

In the organisation of G20 meetings and present global context, infrastructure represents a cross-cutting theme in the context of development and a dedicated G20 Working Group on infrastructure deals with those issues. As G20 members face overlapping planetary, political, economic and health crises,

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responsive and resilient infrastructure systems are needed as the backbone of socio-economic functionality. Enabling infrastructure assets and the services they provide are required to unlock sustainable lifestyles, as highlighted in Lifestyle for Environment (LiFE) movement, now reflected in the G20 Lifestyles for Sustainable Development Approach (G20, 2023a). Yet, the world's stock of infrastructure is currently responsible for an estimated 79 per cent of global greenhouse gas emissions (UN Office for Project Services [UNOPS], UN Environment Programme [UNEP] and University of Oxford, 2021), while contributing to pollution and nature loss (Seiler, 2003). To build more resilient communities and support environment-friendly lifestyles, the G20's actions on infrastructure require a deeper focus on sustainability.

Sustainable infrastructure systems can be considered those that are “planned, designed, constructed, operated and decommissioned in a manner that ensures economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire infrastructure life cycle” (UNEP, 2022a). As such, this understanding of sustainable infrastructure is not restricted to certain types of infrastructure or specific sectors, but rather focuses on outcomes, based on a holistic understanding of sustainability. Amid the recent context of overlapping crises including climate change, biodiversity loss, conflict, pandemics and the cost of living, there is a need for an integrated approach that recognise infrastructure systems comprise interlinked components of the built, natural and enabling environments. Public budgets are increasingly constrained following the COVID-19 pandemic, meaning infrastructure policies and

investment must be carefully targeted to deliver critical services and promote resilience and sustainable lifestyles. By conceptualising a deeper environmental perspective for sustainable infrastructure systems through integrating nature and circularity - as explained later, the G20, under India's presidency in 2023, can drive Lifestyles for Sustainable Development and simultaneously address the priorities and risks stemming from the current global circumstances.

At the Fifth Session of the UN Environment Assembly (UNEA) in 2022, UN member states adopted a resolution on sustainable and resilient infrastructure (UNEP/EA.5/Res.9). This encourages all UN member states to promote investment in natural infrastructure and nature-based solutions as key components of systems-level strategic approaches to infrastructure planning and development. The UNEA resolution also recognises the 10 *International Good Practice Principles for Sustainable Infrastructure* (“SI Principles”) that were endorsed across the UN system (UNEP, 2022a). Building on the *G20 Principles for Quality Infrastructure Investment* (“QII Principles”), the holistic environmental considerations reflected in the SI Principles provide a complement to the QII Principles and a rationale for more effective environmental action among G20 members.

Infrastructure and the G20

Infrastructure appeared as a topic in the initial G20 Washington Declaration in 2008, and later grew in prominence in 2014 at the Brisbane Summit. This heralded the “G20 Global Infrastructure Initiative”, as a multi-year programme to support public and private investment in quality infrastructure. The Global Infrastructure Hub was then created to provide dedicated resources to help implement

the programme. Thematically, the early focus was on improving domestic investment and financing environments, with the Global Infrastructure Hub charged with working collaboratively with governments, the private sector, national, regional and multilateral development banks, international organisations and other stakeholders.

Efforts continued to focus on scaling up investment, and the *Roadmap to Infrastructure as an Asset Class* sought to help mobilise more capital for infrastructure (Global Infrastructure Hub, 2018). In 2019, the Japanese G20 Presidency recognised infrastructure as a driver of economic growth and prosperity and endorsed the QII Principles to emphasise quality. The six QII Principles provide a high-level strategic direction, covering: 1) Maximising the positive impact of infrastructure to achieve sustainable growth and development; 2) Raising economic efficiency in view of life-cycle cost; 3) Integrating environmental considerations in infrastructure investments; 4) Building resilience against natural disasters and other risks; 5) Integrating social considerations in infrastructure investment and 6) Strengthening infrastructure governance (G20, 2019). Importantly, these principles started to articulate a more holistic view of infrastructure and its impacts and benefits, focusing on the project-level.

In 2021, the Italian Presidency reiterated the role of the QII Principles and emphasised the importance of a more systematic analysis of macroeconomic risks including those stemming from climate change. This brought consideration of the costs and benefits of different transitions, as well as macroeconomic and distributional impacts of risk prevention strategies and climate mitigation and adaptation policies. A growing recognition of

climate and environmental dimensions was therefore observable moving into the Indonesian Presidency in 2022. Sustainability considerations were incorporated into additional finance-focused work completed, while a *Compendium of Quality Infrastructure Investment Indicators* was produced in line with the QII Principles (G20, 2022b). In November 2022, the G20 Bali Leaders' Declaration included a commitment to promote investment in sustainable infrastructure and industry, and highlighted key environmental issues that are closely related to infrastructure (G20, 2022a). These included nature-based solutions, resource efficiency and circular economy, implementation actions to support Nationally Determined Contributions and net-zero commitments, as well as sustainable finance.

Through the Indian G20 Presidency of 2023, and the 18th G20 Leaders' Summit, there is a critical opportunity to further connect environmental considerations with infrastructure and deepen G20 members' conception of sustainable infrastructure. The Indian Presidency is expected to produce a new report on infrastructure taxonomies, while the Disaster Risk Reduction Working Group is covering priority areas, such as increased commitment towards making infrastructure systems disaster and climate resilient (G20, 2023b). The Indian Presidency is also expected to highlight the Sustainable Infrastructure Principles, while Lifestyles for Sustainable Development represents an approach to promote sustainability at the individual and community level including through appropriate supporting infrastructure. Indeed, Principle 5.6 of the G20 High Level Principles on Lifestyles for Sustainable Development states, "Encourage markets to leverage the potential created by sustainable consumer choices and create

the necessary sustainable, resilient, inclusive and quality infrastructure and policies to support sustainable lifestyles” (G20, 2023a).

Parameters of Deepening Sustainable Infrastructure Systems

Stronger action on sustainable infrastructure should begin with recognition of the role of the natural environment as a key component of infrastructure systems. A holistic infrastructure system comprises not only the built environment, but also the enabling environment and natural environment (UNOPS, UNEP and University of Oxford, 2021).

Viewing infrastructure provision in terms of service delivery, the natural environment provides many ecosystem services that can complement or replace the delivery of services by built infrastructure (Pearlmutter *et al.*, 2021). Here, the term “natural infrastructure” refers to a “strategically planned and managed networks of natural lands, water and soil, such as forests and wetlands, working landscapes and other open spaces that conserve or enhance ecosystem values and functions and provide associated benefits to human populations” (UNEP, 2022). Infrastructure services provided through natural infrastructure include carbon sequestration, hazard protection and water management, among many others. Natural infrastructure and nature-based infrastructure solutions (a subset of nature-based solutions that includes natural infrastructure, as well as hybrid infrastructure that combines elements of natural and built assets) can be cost-effective and is also associated with numerous co-benefits, from job creation

to improved wellbeing (Lieuw-Kie-Song and Pérez-Cirera, 2020; Sturm and Cohen, 2014). In any case, the enabling environment of policy, regulatory and governance frameworks, technical capacity and resources are key to incentivising and delivering both built and natural infrastructure services in line with national and global priorities, and for better integrating the built and natural environments for effective infrastructure service provision.

Following this logic, the Sustainable Infrastructure Principles set out 10 guiding principles for building an enabling environment for sustainable infrastructure through integrated, systems-level approaches (UNEP, 2022a). Complementing the QII Principles, the Sustainable Infrastructure Principles focus “upstream” of the individual project level, and cover a deeper examination of environmental dimensions alongside important economic and social dimensions. In this sense, they do not seek to replace the QII Principles, but delve further into the topic of *sustainable* infrastructure explicitly, based on priorities and experiences in countries worldwide, and in alignment with the SDGs and the Paris Agreement. For instance, “Avoiding Environmental Impacts and Investing in Nature” (Principle 4) is addressed as an individual principle, as is “Resource Efficiency and Circularity” (Principle 5). Each contain considerations across the built, natural and enabling environments. Integrating circularity into infrastructure systems is key, since the construction, maintenance and demolition of buildings, for example, is responsible for 40 per cent of the solid waste produced in developed countries (Bringezu *et al.*, 2017). This calls for actions to minimise resource use and close material loops. There is a clear economic

Case Study: Gurugram's Nature-based Infrastructure Solutions, India

Owing to its geographical location and increasing economic activities, the city of Gurugram is highly vulnerable to earthquakes, severe air pollution, floods and droughts. Compounded by gaps in critical infrastructure, its drainage system became overstressed, and the natural drainage system was threatened by large-scale development of real estate.

Recently, the Gurugram Metropolitan Development Authority (GMDA) started working on the Geospatial Mapping of the Natural Ecosystem (GeoSM-Nate) framework with the support of professional organisations. Neighborhood and city-level resilience mapping are proposed. As part of the initiative, the city plans to work on a "nature-based blue-green infrastructure network" (Mukherjee *et al.* 2022).

One example already implemented is the restoration and rejuvenation of the Wazirabad Lake in Gurugram, carried out by the organisation "SEEDS" (SEEDS India, 2023). The lake had become very polluted due to the inflow of raw sewage from its inlets and greywater from the nearby housing areas. The outflow of this water was blocked due to the construction of buildings and new roads on the eastern and northern sides of the lake. The waterbody restoration activities helped to revive the biodiversity and recover the green spaces within the area. Thus, the lake was able to contain the excess water flowing from the Aravalli hills abutting it. The area around the lake was also developed into recreational and learning spaces for children. Not only did the interventions increase the green areas of the city, but they also improved the natural absorption of rainwater and the water quality of the water channels around the area (SEEDS India, 2023).

Sources: Mukherjee *et al.*, 2022 and SEEDS India, 2023

rationale to do so, as the potential savings are significant: the cost of raw materials can account for 40 - 60 per cent of the overall cost of construction of a given infrastructure asset (UNEP, 2022a).

Relatedly, the availability and design of infrastructure systems directly and indirectly shapes day-to-day lifestyles worldwide (UNEP, 2022b). Due to the long lifespan of infrastructure assets, their influence on behaviour patterns and broader impacts are long-term. Depending on the form, siting and materials or resources used (as per Principle 5 of the Sustainable Infrastructure Principles), infrastructure can support or prevent sustainable lifestyles. For example, green designs of buildings like university or health facilities can encourage citizens to recycle, minimise waste and energy

use and reduce overall environmental footprints. Conversely, a lack of bike lines, for instance, can prevent low-carbon mobility. As illustrated in the LiFE movement and subsequent Lifestyles for Sustainable Development Approach, there is considerable potential to "nudge" individuals and communities to practise more environmentally sustainable lifestyles, with appropriate infrastructure needed to support this (India, Ministry of Environment, Forest and Climate Change and NITI Aayog, 2022; G20, 2023a). These initiatives therefore present a vehicle to further enhance the long-term environmental impacts of infrastructure, given that decisions on infrastructure will have cascading impacts on daily social and economic activity for many decades. Overall, as guided by the Sustainable

Case Studies: Infrastructure Enabling Sustainable Lifestyles in Latin America

Infrastructure for a Bike-friendly City, Mexico

In 2007, the Mexico City government launched an open streets programme called “Muévete en Bici”, banning car traffic every Sunday on several streets to promote sustainable mobility and improve air quality. A bike network was later introduced in 2019, integrated with the city’s existing transit infrastructure, and the city continued to construct safe cycle lanes in different areas.

As a result, the “EcoBici” system - a bike-sharing concept launched in 2010 - has become popular among the residents. The provision of high-quality infrastructure, with smart integration of different systems, enables people in Mexico City to use multi-modal mobility systems.

Green roofs to improve well-being in local communities, Brazil

In Rio de Janeiro, Brazil, 19 per cent of the population lives in informal settlements, or *favelas*. These areas are densely populated, often built without adequate thermal insulation and lacking green spaces for thermal control. To make efficient use of limited space and mitigate the heat island effect in the Arará *favela*, green roofs have been established and planted with succulents, herbs and small shrubs.

The incorporation of green roofs has successfully improved the health and well-being in the local communities. The green roofs reduce the temperature by around 20°C, potentially lowering the mortality risks from extreme heat. They increase social interaction in the communities, engaging the local population to plant together. Establishing green roofs also helps to improve the general urban environment in informal settlements.

Sources: Herbert (2023) and Institute for Transportation and Development Policy (2021)

Infrastructure Principles, deepening the sustainability of infrastructure systems requires a vision that goes beyond only minimising harm to the environment, to one that actively harnesses ecosystem services and promotes sustainable lifestyles in communities long-term.

Way Forward

The G20 has a critical role to play in deepening the environmental sustainability of infrastructure, and better integrating it with economic and social considerations. Based on current trends, the Global Infrastructure Hub (2023) has estimated \$ 79 trillion of investment up to 2040, meaning there is a window of

opportunity to lock-in positive impacts in the years ahead.

Domestically, the Sustainable Infrastructure Principles can be mainstreamed with the QII Principles as a means of implementing the UNEA resolution on sustainable and resilient infrastructure in national policy frameworks. For example, the Sustainable Infrastructure Principles offer a guiding framework to advance Principle 3 of the QII Principles (Integrating Environmental Considerations in Infrastructure Investments). As G20 members elaborate national infrastructure plans, different ministries will require specific tools to enhance environmental sustainability

as well as quality. This includes methodologies to assess and incorporate natural infrastructure and resource-efficient, low-carbon solutions across systems. To facilitate local action and sustainable lifestyles in long term, demand and supply dynamics can also be influenced by broader government policies (India, Ministry of Environment, Forest and Climate Change and NITI Aayog, 2022). Infrastructure ministries can embed comprehensive sustainability criteria in procurement processes, from needs assessments to awarding and execution of contracts (UNEP, 2021). In addition, finance ministries can demonstrate commitment by aligning public budgets for infrastructure with sustainability and performance objectives.

Internationally, there is scope to further promote collective action on sustainable infrastructure among G20 members, and also support non-G20 members where required. The UNEA resolution encourages all UN member states and other stakeholders, as appropriate, to “cooperate internationally to strengthen frameworks, including for financing, for sustainable and inclusive infrastructure that maintains and enhances ecological connectivity, avoids further fragmentation, and minimises other potential impacts on ecosystems and livelihoods” (UNEA of UNEP, 2022). Consideration should be given to ensuring that sustainability is integrated in both bilateral and multilateral financing for infrastructure.

In the current G20 cycle, there have been several relevant events leading up to the G20 Leaders’ Summit in September 2023. Beyond the Infrastructure Working Group Meetings, the discussion questions of the Disaster Risk Reduction Working Group included, “How can we further build

upon the Principles of Quality Infrastructure Investment Indicators that G20 members have adopted?” (G20, 2023b). Further responding to this, the recommendations developed in this paper offer potential pathways for deepening the sustainability of infrastructure systems.

In order to deepen the sustainability of infrastructure systems, G20 members can:

- Assess and measure the role of the natural environment as a key component of infrastructure systems, including for Disaster Risk Reduction and wider service provision.
- Prioritise infrastructure forms, siting, materials and resource use options that support sustainable lifestyles.
- Mainstream the *International Good Principles for Sustainable Infrastructure* with the *G20 Principles for Quality Infrastructure Investment*, integrating them into national infrastructure plans, procurement processes, fiscal policies and financing.

References

- Bringezu, S., Ramaswami, A., Schandl, H., O’Brien, M., Pelton, R., Acquatella, J., Ayuk, E., Chiu, A., Flanegin, R., Fry, J., Giljum, S., Hashimoto, S., Hellweg, S., Hosking, K., Hu, Y., Lenzen, M., Lieber, M., Lutter, S., Miatto, A., Singh Nagpure, A., Obersteiner, M., van Oers, L., Pfister, S., Pichler, P., Russell, A., Spini, L., Tanikawa, H., van der Voet, E., Weisz, H., West, J., Wijkman, A., Zhu, B and Zivy, R. 2017. Assessing Global Resource Use: A Systems Approach to Resource Efficiency and Pollution Reduction. International Resource Panel and UNEP, Nairobi, Kenya.
- G20. 2019. G20 Principles for Quality Infrastructure Investment. Japan: G20.
- G20. 2022a. G20 Bali Leaders’ Declaration. Bali: Indonesia; 15-16 November 2022.
- G20. 2022b. Compendium of Quality Infrastructure Investment Indicators. Infrastructure Working Group. Indonesia: G20.

- G20. 2023a. G20 High Level Principles on Lifestyles for Sustainable Development. Varanasi Development Ministerial Meeting, Varanasi, Uttar Pradesh, 12 June 2023.
- G20. 2023b. Disaster Risk Reduction Working Group – Issue Note. India: G20.
- Global Infrastructure Hub. 2018. Roadmap to Infrastructure as an Asset Class. Available from: <https://cdn.gihub.org/umbraco/media/2572/roadmap-to-infrastructure-as-an-asset-class-50.pdf>.
- Global Infrastructure Hub. 2023. Global Infrastructure Outlook. Available from: <https://outlook.gihub.org/>.
- Herbert, K. 2023. How to Build a Bike City: Lessons from CDMX. Available from: <https://www.peopleforbikes.org/news/how-to-build-a-bike-city-lessons-from-cmdx>.
- India, Ministry of Environment, Forest and Climate Change and NITI Aayog. 2022. LIFE - Lifestyle for Environment.
- Institute for Transportation and Development Policy. 2021. Sustainable Transport, number 33. ITDP, New York, USA.
- Lieuw-Kie-Song, M. and Pérez-Cirera, V. 2020. Nature Hires: How Nature-based Solutions Can Power a Green Jobs Recovery. ILO and WWF, Geneva, Switzerland.
- Mukherjee, M., Wickramasinghe, D., Chowdhoree, I., Chimi, C., Poudel, S., Mishra, B., Faruqi Ali, Z and Shaw, R. 2022. Nature-based Resilience: Experiences of Five Cities from South Asia. *Int. J. Environ. Res. Public Health*, 19 (19).
- Oppla. 2023. Green Roofs in the Slums of Rio de Janeiro, Brazil. Available from: <https://oppla.eu/casestudy/23397#:~:text= Succulents%2C%20herbs%2C%20and%20small%20shrubs,for%20low%20maintenance%20green%20roofs.>
- Pearlmutter, D., Theochari, D., Nehls, T., Pinho, P., Piro, P., Korolova, A., Papaefthimiou, S., Garcia Mateo, M.C., Calheiros, C., Zluwai, I., Pitha, U., Schosseler, P., Florentin, Y., Ouannou, S., Gal, E., Aichen, A., Arnold, K., Igondova, E. and Pucher, B. 2020. Enhancing the Circular Economy with Nature-based Solutions in the Built Urban Environment: Green Building Materials, Systems and Sites. *Blue-Green Systems*, 2(1): pp. 46–72.
- SEEDS India. 2023. Implementing Nature-based Solutions: Wazirabad Lake Restoration. Available from: <https://www.seedsindia.org/portfolio/wazirabad-lake-restoration/#>.
- Seiler, A. 2003. Effects of Infrastructure on Nature. Office for Official Publications of the European Communities.
- Sturm, R. and Cohen, D. 2014. Proximity to Urban Parks and Mental Health. *J Ment Health Policy Econ*, 17(1): pp. 19–24.
- Thacker S., Adshead D., Morgan G., Crosskey S., Bajpai A., Ceppi P., Hall J.W. and O'Regan N. 2018. Infrastructure: Underpinning Sustainable Development. UNOPS, Copenhagen, Denmark.
- United Nations Environment Assembly of the United Nations Environment Programme. 2022. Sustainable and Resilient Infrastructure. Nairobi, Kenya: UNEP/EA.5/Res.9; 7 March 2022.
- United Nations Environment Programme. 2021. Sustainability Through Public Procurement of Infrastructure. Policy Brief – September 2021. Available from: <https://www.greengrowthknowledge.org/research/policy-brief-driving-sustainability-through-public-procurement-infrastructure>.
- United Nations Environment Programme. 2022a. International Good Practice Principles for Sustainable Infrastructure. Nairobi, Kenya.
- United Nations Environment Programme. 2022b. Enabling Sustainable Lifestyles in a Climate Emergency. Nairobi, Kenya.
- United Nations Office for Project Services, United Nations Environment Programme and University of Oxford. 2021. Infrastructure for Climate Action. UNOPS, Copenhagen, Denmark.

Appendix

Table 1: Overview of QII Principles

QII Principle:	Summary:
Principle 1: <i>Maximizing the positive impact of infrastructure to achieve sustainable growth and development</i>	The first principle recognizes the role of quality infrastructure in setting off a virtuous circle of economic activities, and the importance of having sustainable development and connectivity at the core of developing infrastructure. This contributes to ensuring that infrastructure is broadly available, accessible, inclusive, and beneficial to all. Quality infrastructure investment also needs to be tailored to individual country conditions and consistent with local laws and regulations.
Principle 2: <i>Raising Economic efficiency in view of life-cycle cost</i>	The second principle highlights the significance of considering the life-cycle cost of infrastructure investments in ensuring efficiency. Quality infrastructure investment should attain value for money and remain affordable with respect to life-cycle costs.
Principle 3: <i>Integrating environmental considerations in infrastructure investments</i>	The third principle highlights the importance of environmental considerations for quality infrastructure. Both positive and negative impacts of infrastructure projects on ecosystems, biodiversity, climate, weather, and the use of resources should be internalized. Infrastructure projects should align with national strategies and nationally determined contributions for those countries determined to implement them, and with transitioning to long-term low emissions strategies, while being mindful of country circumstances. These environmental considerations should be entrenched in the entire life cycle of infrastructure projects. Ecosystem-based adaptation should be considered. The environmental impact of infrastructure investment should be made transparent to all stakeholders.
Principle 4: <i>Building resilience against natural disasters and other risks</i>	The fourth principle recognizes the growing importance of designing infrastructure that is resilient to natural and human-made risks. The increasing number and heightened magnitude of natural disasters, and slow onset of environmental changes, imply an urgent need to ensure long-term adaptability and build resilience of infrastructure against these risks.
Principle 5: <i>Integrating social considerations in infrastructure investment</i>	The fifth principles capture importance of social inclusiveness considerations in infrastructure investments. Infrastructure should be inclusive, enabling the economic participation and social inclusion of all. Economic and social impacts should be considered as an important component when assessing the quality of infrastructure investment and should be managed systematically throughout the project life cycle.
Principle 6: <i>Strengthening infrastructure governance</i>	The sixth principle focuses on governance, recognizing the need to have clear rules, robust institutions, and good governance in the public and the private sector, reflecting countries' relevant international commitments. This will mitigate various risks related to investment decision-making, thus encouraging private-sector participation. Capacity building is also key in ensuring informed decision-making and effectiveness of anti-corruption efforts. In addition, improved governance can be supported by good private sector practices, including responsible business conduct practices.

Source: G20, 2022b

Table 2: Overview of SI Principles

	<p>1. STRATEGIC PLANNING to ensure the alignment of infrastructure policies and decisions with global sustainable development agendas and to strengthen the enabling environment.</p>
	<p>2. RESPONSIVE, RESILIENT, AND FLEXIBLE SERVICE PROVISION to meet actual infrastructure needs, allow for changes and uncertainties over time, and promote synergies between infrastructure projects and systems.</p>
	<p>3. COMPREHENSIVE LIFE CYCLE ASSESSMENT OF SUSTAINABILITY, including the cumulative impacts of multiple infrastructure systems on ecosystems and communities over their entire lifespans, to avoid “locking in” infrastructure projects and systems with various adverse effects.</p>
	<p>4. AVOIDING ENVIRONMENTAL IMPACTS of infrastructure systems and investing in natural infrastructure to make use of nature’s ability to provide essential, cost-effective infrastructure services and provide multiple co-benefits for people and the planet.</p>
	<p>5. RESOURCE EFFICIENCY AND CIRCULARITY to minimize infrastructure’s natural resource footprint, reduce emissions, waste and other pollutants, and increase the efficiency and affordability of services.</p>
	<p>6. EQUITY, INCLUSIVENESS, AND EMPOWERMENT through a balance between social and economic infrastructure investment to respect, protect and fulfil human rights and promote well-being, particularly of more vulnerable or marginalized groups.</p>
	<p>7. ENHANCING ECONOMIC BENEFITS through employment generation and support for the local economy.</p>
	<p>8. FISCAL SUSTAINABILITY AND INNOVATIVE FINANCING to close the infrastructure investment gap within the context of increasingly constrained public budgets.</p>
	<p>9. TRANSPARENT, INCLUSIVE, AND PARTICIPATORY DECISION-MAKING that includes stakeholder analysis, ongoing public participation, and grievance mechanisms for all stakeholders.</p>
	<p>10. EVIDENCE-BASED DECISION-MAKING that includes regular monitoring of infrastructure performance and impacts based on key performance indicators and the promotion of data sharing with all stakeholders.</p>

Source: UNEP, 2022a