



Ninth Environment for Europe Ministerial Conference

Nicosia, 5–7 October 2022

**Greening the economy in the pan-European region: working
towards sustainable infrastructure**



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Item 5 of the provisional agenda

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working towards sustainable infrastructure**

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Note by the United Nations Economic Commission for Europe Committee on Environmental Policy and the United Nations Environment Programme

Summary

The United Nations Economic Commission for Europe Committee on Environmental Policy at its twenty-fifth session (Geneva, 13–15 November 2019) agreed on the following two themes for the Ninth Environment for Europe Ministerial Conference (Nicosia, 5–7 October 2022):

- (a) Greening the economy in the pan-European region: working towards sustainable infrastructure;
- (b) Applying principles of circular economy to sustainable tourism.^a

At its twenty-seventh session (Geneva (hybrid), 3–5 November 2021), the Committee considered the drafts of two background thematic documents on the above-mentioned themes and asked:

- The Committee to make concrete suggestions and proposals on the first drafts of the two background thematic documents on the themes for the Ninth Environment for Europe Ministerial Conference and to send them to the secretariat, preferably by the end of November but no later than 31 December 2021.
- The Bureau, with support from the secretariat and in cooperation with relevant stakeholders, to further develop the two drafts and submit them to the special session of the Committee in May 2022.^b

Comments on the first draft of the background thematic document “Greening the economy in the pan-European region: working towards sustainable infrastructure” were received from Czechia, Hungary and Sweden.



A consultant was contracted by the United Nations Economic Commission for Europe to assist the secretariat in revising and further developing the first draft of the background thematic document.

At its special session (Geneva (hybrid), 9–12 May 2022), the Committee on Environmental Policy:

- Expressed its appreciation for the work undertaken by the Bureau, with the assistance of the secretariat and the United Nations Economic Commission for Europe consultants, the Organisation for Economic Co-operation and Development, the United Nations Environment Programme and the World Tourism Organization, to prepare the revised drafts of the background thematic documents on the themes for the Ninth Environment for Europe Ministerial Conference.
- Asked the Bureau, with support from the secretariat and in cooperation with relevant stakeholders, to further refine and finalize the two drafts and issue them as official documents for the Nicosia Conference.

The document aims to facilitate the ministerial discussion by providing background information to support delegations in preparing for the Conference, in particular for the discussion under agenda item 5.

^a ECE/CEP/2019/15, para. 21 (b) (i) and (ii).

^b ECE/CEP/2021/2, para. 25 (c) and (d).

^c ECE/CEP/S/2022/2, para. 24 (a) and (b), available at <https://unece.org/node/364855>.

Introduction: setting the scene

A. Driving forces for sustainable infrastructure¹

1. Greening the economy is increasingly becoming a strategic priority for Governments worldwide. In an effort to promote the green economy in the pan-European region, the United Nations Economic Commission for Europe (ECE) Committee on Environmental Policy, with support from ECE and the United Nations Environment Programme (UNEP), and in cooperation with other key actors such as the Organisation for Economic Co-operation and Development (OECD) and the European Environment Agency, developed the Pan-European Strategic Framework for Greening the Economy. The Batumi Initiative on Green Economy is the implementation mechanism for the Framework in the period 2016–2030, through voluntary commitments by interested countries and organizations.

2. Sustainable infrastructure plays an important role for the green economy transition, as it sits at the heart of the Sustainable Development Goals, cutting across all 17 Goals and influencing 92 per cent of their 169 targets.

3. The Fourth Session of the United Nations Environment Assembly of UNEP (Nairobi, 11–15 March 2019) adopted resolution 4/5 on sustainable infrastructure,² acknowledged its importance and called for different actions towards sustainable consumption and production patterns, sustainable investments, capacity-building, development and maintenance of infrastructure within a sustainable framework, among many other things. The Fifth Session of the United Nations Environment Assembly of UNEP (Nairobi, 28 February–2 March 2022) adopted resolution 5/9 on sustainable and resilient infrastructure,³ highlighting the importance of sharing good practices among Member States, promoting the implementation of existing tools and facilitating private sector engagement in different project phases.

4. ECE has contributed to greening the economy and making infrastructure more sustainable through promoting implementation of its relevant legal instruments, including the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and its Protocol on Strategic Environment Assessment. ECE has also promoted key enablers of sustainable infrastructure, namely the rule of law, transparency and effective, safe and inclusive public participation in decision-making through the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) and its Protocol on Pollutant Release and Transfer Registers, which govern government obligations and public rights in transboundary contexts.

5. ECE – under the auspices of its Convention on the Transboundary Effects of Industrial Accidents (Industrial Accidents Convention) – has been engaging in infrastructure resilience work, by managing disaster risks and reducing the exposure and vulnerability of the population and the environment, notably through risk assessments, land-use plans and project-related siting decisions. ECE has supported countries' efforts to enhance climate resilience, in particular in relation to hazards and risks, such as those arising from mine tailings management facilities, which could cause vast transboundary consequences through accidental water pollution via failure or flooding events.

¹ Sustainable infrastructure (sometimes also called “green infrastructure”) systems are 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. Sustainable infrastructure can include built infrastructure, natural infrastructure or hybrid infrastructure that contains elements of both. See United Nations Environment Programme (UNEP), *International Good Practice Principles for Sustainable Infrastructure: Integrated, Systems-level Approaches for Policymakers – First Edition* (Nairobi, 2021), p. 10.

² UNEP/EA.4/Res.5.

³ UNEP/EA.5/Res.9.

B. Trends for sustainable infrastructure in the pan-European region

6. Prior to the coronavirus disease (COVID-19) pandemic, the pan-European region was already working to foster green economies in more sustainable ways. Despite exacerbating gaps in areas such as gender equality and access to essential services, the COVID-19 pandemic highlighted opportunities to make infrastructure investments a vehicle for faster progress towards sustainability and prosperity. The following three key trends have been identified in the region.⁴

C. Regional and national efforts to promote circularity and the green economy are gaining force in Europe and beyond

7. The circular economy⁵ is critical to implementing long-term climate change policies, and to reducing the carbon, water and resource footprint of infrastructure projects. Due to the high resource intensity of infrastructure development, it plays a central role in achieving circular economy principles and targets,⁶ both in terms of applying principles of circularity to infrastructure itself to improve its resource efficiency, as well as planning infrastructure in such a way that it enables circularity in other sectors. The circular economy is strongly backed by the European Commission and other European Union institutions, as well as by a growing number of cities and countries across Europe. It is also attracting public and private investors.

8. The European Investment Bank (EIB) has a long track record of lending to projects that focus on recycling and the recovery of waste and by-products in various sectors. EIB aims to increase financing for circular economy projects in the European Union and other countries that systematically design out waste, extend the life of assets and include new business models, supporting the European Commission new Circular Economy Action Plan.⁷ EIB has also supported other efforts on land-use planning, disaster risk reduction and natural hazards triggering technological accidents.

9. The European Union's multi-stakeholder "EU4Environment" Programme, developed for the period 2019–2022 and financed mainly by the European Union (about €20 million), aimed to help six partner countries (Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine) by supporting environment-related action, demonstrating and unlocking opportunities for greener growth, and setting up mechanisms to better manage environmental risks and impacts.

Sustainable infrastructure investment is a mechanism for COVID-19 recovery strategies.

10. The current investment gap in the energy sector on a global level is estimated at \$2.9 trillion, including \$250 billion in Europe, and represents an opportunity for investors to mainstream greener alternatives to fossil fuels.⁸ According to the Global Recovery

⁴ More concrete actions from the United Nations Economic Commission for Europe (ECE) region are listed in annex I to the present document.

⁵ "A circular economy is a systemic approach to economic development designed to benefit businesses, society and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources." See Ellen MacArthur Foundation, "The Circular Economy in Detail", archive, available at https://archive.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail?gclid=CjwKCAjwoNuGBhA8EiwAFxomA71XXmB5aYg32WcHpNWQoxwxJKrfGML2YYLA3pEhZcEKNEr0y5WJbBoCnmoQAvD_BwE.

⁶ The circular model builds economic, natural and social capital. It is based on three principles: Design out waste and pollution, keep products and materials in use, and regenerate natural systems. See Ellen MacArthur Foundation, "What is a circular economy?", available at www.ellenmacarthurfoundation.org/circular-economy/concept?gclid=CjwKCAjwoNuGBhA8EiwAFxomA85B_35vtUn28wZESwVEmrvzShvzYob8G1JGCIFCu9c-L-w_kT2tQxoCmloQAvD_BwE.

⁷ European Investment Bank (EIB), *The EIB Circular Economy Guide: Supporting the circular transition* (n.p., 2020).

⁸ See <https://outlook.gihub.org/sectors/energy>.

Observatory, \$66.1 billion in green energy spending was announced as pandemic recovery packages in 2020. Much of this investment (\$25.3 billion) was directed towards new or refurbished renewable energy generation facilities.⁹ Based on analysis by the Global Recovery Observatory, green energy was a priority for recovery investments in 2021.¹⁰ Even though progress has been made in redirecting and reprioritizing green investments, there is still a long way to go.

11. The 2021–2027 multiannual financial framework and “NextGeneration EU” encompass a recovery plan that will be the largest stimulus package ever financed in Europe. A total of €1.8 trillion will be allocated to rebuilding a greener, more digital and more resilient Europe.¹¹ Around €374 billion will be allocated to natural resources and the environment.¹² Mayors from European cities such as Berlin, Bristol (United Kingdom of Great Britain and Northern Ireland), Oslo and London have pledged to shift from fossil fuels to green energy, buildings, transport and other infrastructure investments as a recovery strategy, covering around \$295 billion in assets.¹³ Similarly, mayors from the ECE region adopted the *Geneva Declaration of Mayors* in 2020, committing to strengthen the resilience of cities and take ambitious climate action, accelerating the transition towards sustainable energy and ensuring sustainable transportation.¹⁴

Digitalization and data-driven solutions are key to sustainable infrastructure development and help to integrate systems, sectors and stakeholders.

12. The pandemic has forced regions worldwide to mainstream digital tools and smart solutions, as well as to use data to inform decision-making. Governments are shifting attention towards emerging technologies such as artificial intelligence, blockchain and fifth generation mobile network infrastructure. The need for innovation to overcome unexpected challenges is gaining salience in the pan-European region, especially due to intense pressure on health systems and other interrelated sectors (both social and economic infrastructure)¹⁵ and infrastructure systems¹⁶ (natural, built and hybrid).¹⁷ The pandemic has overwhelmed health systems, making strategic planning and coordination actions hard to balance and prioritize. Market effects from health-care pressures can affect other infrastructure sectors. For instance, transport infrastructure is critical for effective medical supply logistics, while

⁹ The countries included in this figure are Australia, Canada, China, Denmark, Finland, France, Germany, Norway, Poland, the Republic of Korea, Spain, the United Kingdom of Great Britain and Northern Ireland and other small spender countries, See

<https://wedocs.unep.org/bitstream/handle/20.500.11822/35281/AWBBS.pdf>.

¹⁰ See <https://wedocs.unep.org/bitstream/handle/20.500.11822/35281/AWBBS.pdf>.

¹¹ See <https://op.europa.eu/en/publication-detail/-/publication/0252fa70-65cf-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-search>.

¹² “Natural resources and the environment” is the second biggest heading of the multiannual financial framework long-term European Union budget (2021–2027). This includes programmes and funds supporting agriculture and maritime policy, environment and climate change. See [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI\(2021\)690543](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2021)690543).

¹³ See

[https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658186/IPOL_BRI\(2020\)658186_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658186/IPOL_BRI(2020)658186_EN.pdf).

¹⁴ See <https://unece.org/housing/publications/geneva-declaration-mayors-2020>.

¹⁵ “Social infrastructure” is infrastructure (mostly facilities in the form of buildings) that accommodates social services. For example, hospitals, schools, universities, prisons, social housing, law courts, etc. “Economic infrastructure” is infrastructure that makes business activity possible, such as communications and transportation (for passengers and freight), as well as utility networks, systems and plants such as in water, waste and energy supply systems. See https://ppp-certification.com/ppp-certification-guide/4-where-ppps-are-used-%E2%80%93-infrastructure-sectors#_ftn30.

¹⁶ Infrastructure systems comprise physical assets (also referred to as “hard infrastructure”), plus the knowledge, institutions and policy frameworks (also referred to as “soft infrastructure”) in which they exist and that enable them to function. These include both built, or “grey”, infrastructure in all sectors, and natural, or “green”, infrastructure. UNEP, *International Good Practice Principles for Sustainable Infrastructure: Integrated, systems-level approaches for policymakers – First Edition* (Nairobi, 2021).

¹⁷ See

www.greengrowthknowledge.org/sites/default/files/uploads/SI%20Good%20Practice%20Guidance_Review%20Draft_ENG.pdf.

travel bans indirectly affect sectors (e.g., airport management and planning). In this context, smart technologies can support the cost-effective functioning of infrastructure systems, by reducing costs of data information and enhancing strategic planning and operational optimization for Governments and key stakeholders.¹⁸ Data management and digital infrastructure are key aspects for infrastructure resilience and risk management, accessibility to beneficiaries, and for increased transparency between key stakeholders.

13. The “Smart Cities Marketplace” is a European Commission-backed initiative bringing together cities, industry, small businesses, banks, research and others. The initiative’s goal is to improve urban life through more integrated solutions and to address city-specific challenges from different sectors such as energy, transport and information and communications technology. It builds on engagement to develop solutions and participate in city governance.¹⁹

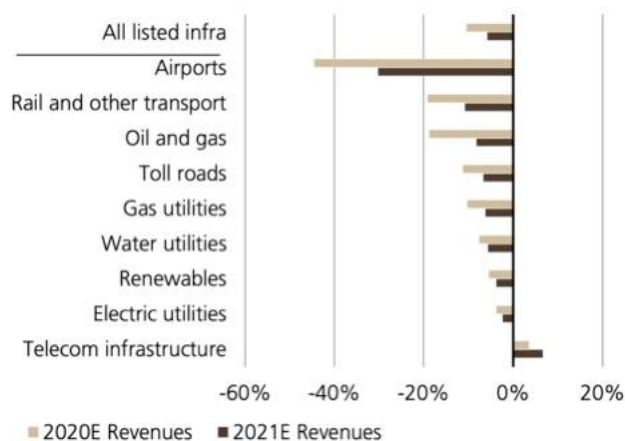
14. All these trends towards circular economy, sustainable economic recovery and digitalization represent different elements of sustainable infrastructure. However, the region still lacks a common definition; having one would help to standardize the data gathering process and ensure comparison between countries and subregions.

D. Pressures of infrastructure development

15. The pandemic has demonstrated how dependent the current economy is on the adequate functioning of existing infrastructure systems. In particular, most sectors exposed to economic shock are those with gross domestic product (GDP)-correlated assets such as airports, ports and toll roads. Social infrastructure, renewables and electric utilities have seen less impact.²⁰ In contrast, telecommunications infrastructure has experienced positive results due to high demand for mobile and communications networks (see figure 1 below).²¹

Figure 1

Year to date Estimated Revenues 2020 and 2021



Source: Image UBS (Bloomberg November 2020).

Abbreviations: E, Estimated.

16. Given the long lifespan of infrastructure, failure to invest in clean, sustainable and resilient infrastructure results in long-term negative environmental impacts, such as pollution (air, water, soil, noise, etc.), greenhouse gases emissions, land-use change and damage to

¹⁸ See

<https://www.mckinsey.com/~media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/Smart%20cities%20Digital%20solutions%20for%20a%20more%20livable%20future/MG1-Smart-Cities-Executive-summary.pdf>.

¹⁹ See https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en.

²⁰ UBS, “Key themes for 2021: Infrastructure Outlook”, 7 December 2020.

²¹ See www.pwc.com/us/en/library/covid-19/coronavirus-telecommunication-impact.html.

biodiversity and ecosystems. These impacts can, in turn, threaten the viability and resilience of infrastructure systems themselves. Increasing natural disasters can cause direct damage to infrastructure.

17. While infrastructure programmes are designed to target social requirements and deliver essential services, they sometimes do not achieve this aim. If infrastructure programmes and projects are not adequately planned and implemented to take into account social aspects, negative social pressures can be generated (e.g., displacement, unemployment, gender inequalities, etc.). Ageing populations, depopulation, and migration to cities are some of the main issues. It is crucial to take into account these changes and perspectives of beneficiaries and key stakeholders at the beginning by conducting social impact assessments.²² If sustainable infrastructure is designed taking into account public participation and the stakeholder engagement process, this can facilitate inclusive infrastructure projects that generate benefits for all citizens, especially those with lower incomes. Additionally, beyond direct economic benefits of infrastructure projects, the integration of social considerations into projects and programmes can enhance human capital youth labour force development and deliver better services tailored to ageing populations.²³

18. Prior to the pandemic, the world faced an infrastructure investment gap of \$15 trillion.²⁴ According to the International Monetary Fund (IMF), for advanced economies, investing an extra 1 per cent of GDP in infrastructure will yield, on average, a 1.5 per cent increase in GDP within four years. In emerging economies, this economic benefit can be even greater.²⁵

I. Infrastructure and sustainability: Challenges and opportunities

A. Key enablers of sustainable infrastructure

19. The development of sustainable infrastructure starts well before the definition of a given project or programme. An enabling environment conducive to the integration of sustainability practices into the decision-making process for infrastructure-related policies, plans and projects needs to be ensured. As defined on the [Sustainable Infrastructure Tool Navigator](#) platform, “Enabling environment” refers to the policy, regulatory and institutional conditions that enable the integration of sustainability practices into infrastructure planning and development throughout the entire life cycle. These conditions may differ depending on the context.²⁶ Some specific aspects that are traditionally considered enablers of sustainable infrastructure include but are not limited to: (a) sound investment climate; (b) regulatory frameworks and the rule of law; (c) adequate levels of technical and institutional capacity; (d) well-defined sustainability policies; and (e) transparent, effective, safe and inclusive public participation.

20. All these considerations are necessary to ensure the right investment climate, technical conditions and political willingness to deploy sustainability at scale.

²² See <https://ec.europa.eu/futurium/en/system/files/ged/eprs-briefing-633160-demographic-trends-eu-regions-final.pdf>.

²³ See [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658186/IPOL_BRI\(2020\)658186_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658186/IPOL_BRI(2020)658186_EN.pdf).

²⁴ See <https://outlook.gihub.org/>.

²⁵ See www.elibrary.imf.org/view/books/081/21398-9781498331555-en/21398-9781498331555-en-book.xml.

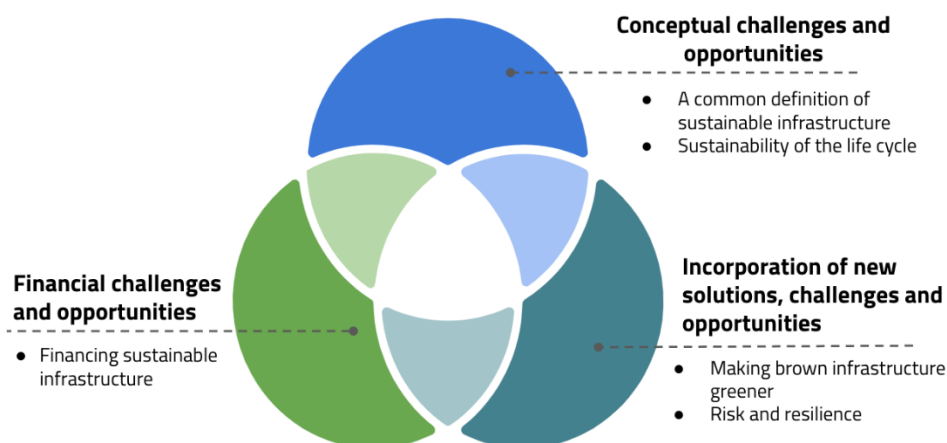
²⁶ See <https://sustainable-infrastructure-tools.org/glossary/>.

B. Challenges and opportunities in key factors for sustainable infrastructure

21. There are key factors that can mainstream sustainable infrastructure and help reduce the impact of different infrastructure sectors on the environment for the pan-European region. These factors involve both challenges and opportunities to achieve a tangible impact (See figure 2 below).

Figure 2

Challenges and opportunities in key factors for sustainable infrastructure



Source: developed by Ms. Cristina Contreras Casado, the ECE consultant.

A common definition for sustainable infrastructure and developing criteria and indicators

22. Common definitions for “sustainable infrastructure” and developing criteria and measurement indicators are critical for sustainable infrastructure implementation success, as well for countries to be able to benchmark progress in the region, share good practices, compare projects, and comprehensively integrate sustainability.

23. Challenges: Harmonizing a common definition of “sustainable infrastructure” and developing criteria and indicators is a challenging aspect for data analysis, since countries use different methodologies or impact indicators at the national, sectoral and even the project level (e.g., small- or large-scale city projects). Additionally, not all pan-European region countries have the same amount of data, digitalization maturity, or the right governance structures to measure information, making the accountability process more difficult. Even where indicators already exist, what is missing is a common understanding of what sustainable infrastructure is, and the frameworks for measuring sustainability of infrastructure at the aggregate or portfolio level (e.g., measuring the sustainability of a country’s overall infrastructure mix). Project-level indicators and measurement frameworks cannot, for example, be used to effectively measure progress towards target 9.1 of the Sustainable Development Goals.

24. Opportunities: There are many existing principles, methodologies and indicators applicable at the national/subnational, programme/sector and project levels. For example, the multilateral development banks have issued a short list of 16 common indicators for infrastructure projects, by harmonizing and mapping existing approaches.²⁷ There are

²⁷ The mapping exercise covers: the Asian Development Bank Green, Resilient, Inclusive and Sustainable Indicators; the European Bank for Reconstruction and Development Infrastructure Indicators within the Compendium of Indicators; the Inter-American Development Bank Sustainable Infrastructure Framework; the International Finance Corporation Quality Infrastructure Indicators Framework; and the Public-Private Infrastructure Advisory Facility Aligned Set of Sustainability Indicators. See <https://publications.iadb.org/publications/english/document/MDB-Infrastructure-Cooperation-Platform-A-Common-Set-of-Aligned-Sustainable-Infrastructure-Indicators-SII.pdf>.

indicators applicable at the city level; the European Union has common indicators for cities or urban areas.²⁸ There are also efforts at the country level; Czechia has published a methodology to support the development of territorial impact assessment, to better understand and quantify the territorial impacts of new developments.²⁹ In February 2021, UNEP released a publication setting out 10 guiding principles that policymakers can follow to help integrate sustainability into infrastructure planning and delivery.³⁰ The principles provide a framework for integrated approaches and systems-level interventions that Governments can carry out to create an enabling environment for sustainable infrastructure, and were recognized in United Nations Environment Assembly of UNEP resolution 5/9 on sustainable and resilient infrastructure, which encourages their implementation.³¹ There is an opportunity for UNEP and ECE to collaborate with other specialized agencies of the United Nations system, OECD, the multilateral development banks, the European Commission and other key organizations to apply existing methodologies and tools with the purpose of implementing the *UNEP International Good Practice Principles for Sustainable Infrastructure*. This exercise could include identifying or selecting key categories, indicators and measurement approaches at the system level, while supporting benchmark exercises in the pan-European region. Additionally, digitalization agendas in pan-European region countries could also provide an opportunity to improve data management.

25. Due to the proliferation of different tools and frameworks for the quantification of sustainable infrastructure, the “Sustainable Infrastructure Tool Navigator”³² online platform was recently launched by the German Agency for International Cooperation in collaboration with UNEP. This platform helps users to navigate the various existing tools to identify those that best fit their needs.

Sustainability of the infrastructure life cycle

26. Good infrastructure management requires systematic and integrated planning, financing, prioritization, design, construction, maintenance, operation and evaluation to sustain public infrastructure assets.³³ Sustainability principles, management and assessment strategies should be integrated into each of the phases of the infrastructure life cycle.

27. Challenges: Infrastructure development is complex, requiring significant resources and capacity. Planning and selecting the right programmes and investments becomes a challenge if Governments do not have: (a) the right technical and institutional capacity; (b) a long-term development strategy or national infrastructure plan; (c) the knowledge and resources to sustain infrastructure systems; and (d) a monitoring plan in place that ensures long-term performance.

28. Opportunities: Capacity-building efforts in the pan-European region for each of the management and process phases of sustainable infrastructure development could support countries to effectively prepare and manage infrastructure programmes and projects on multiple levels. Case studies showcasing good practices and lessons learned at the different development stages could support knowledge sharing and replicability in these countries, especially in the context of the government commitments from the Eighth Environment for Europe Ministerial Conference (Batumi, Georgia, 8–10 June 2016). Publication of these case studies could help exemplify the process, policy instruments, management approaches and technological solutions followed by both public and private stakeholders, following existing initiatives with OECD and UNEP. For instance, OECD is currently leading an upstream capacity-building project in Central and South-East Asia, with plans for its implementation

²⁸ See https://ec.europa.eu/eurostat/cache/metadata/en/urb_esms.htm.

²⁹ See <https://www.tiammr.cz/> (Czech only).

³⁰ UNEP, *International Good Practice Principles*.

³¹ UNEP/EA.5/Res.9.

³² This new initiative provides access to a comprehensive database of sustainable infrastructure tools that users can navigate by keyword, filter, type of tools, sector or infrastructure life cycle phase, amongst other things. See <https://sustainable-infrastructure-tools.org/>.

³³ See <https://www.rics.org/globalassets/rics-website/media/knowledge/research/insights/infrastructure-management-current-practices-and-future-trends-rics.pdf>.

in cooperation with the Partnership for Action on Green Economy³⁴ in selected countries. This could be linked to UNEP and ECE³⁵ work in the pan-European region.

Financing sustainable infrastructure

29. Financing infrastructure is a critical component. Investments, resources and risks should be carefully evaluated, while following principles that prioritize sustainable outcomes.³⁶

30. Challenges: The financing aspect of infrastructure is determinant for government development plans. Even if the public sector is responsible for the planning and prioritization of infrastructure investments, it requires complementary financing and innovation. Public-private partnerships have been employed as a mechanism in Europe to mainstream long-term financing models (e.g., the Project Finance Initiative in the United Kingdom of Great Britain and Northern Ireland) for different types of infrastructure, following more sustainable or circular approaches (e.g., retrofit or technology upgrades). However, if not correctly planned and executed, such partnerships can have negative economic or fiscal consequences, since their full fiscal implications are sometimes overlooked in the short-term. The fiscal implications become clear once public-private partnership-related payment obligations are met, affecting the budget during operation.³⁷ Additionally, public financing has not always been prioritized or incentivized.

31. Opportunities: Governments have been collaborating with multilateral development banks, specialized agencies of the United Nations system and other financial institutions regarding access not only to financing, but also to strategic guidance from the legal, technical and governance perspectives throughout the entire infrastructure development cycle. Continuous collaborative work and agendas can enable smart investments and the opportunity to finance sustainable infrastructure projects that result in environmental, economic and social benefits. Partnerships with the private sector should be channelled to finance projects for innovative business models,³⁸ technologies and solutions that enhance high quality performance for each sustainability dimension. Stimulus packages for countries that promote sustainable infrastructure as part of their economic recovery plans could be a strategy to attract private financing and prioritize investments. For example, under the current European Union stimulus package, the Just Transition Mechanism provides targeted support to help mobilize at least €65 billion–€75 billion over the period 2021–2027 for the transition to climate neutral economy in most affected regions. This includes mobilization of private sector investments.³⁹ The European Union Taxonomy serves as a standardized approach to assessing sustainability of assets, and is an incentive for infrastructure investments to meet

³⁴ See www.un-page.org/.

³⁵ In the period 2017–2021, the ECE secretariat to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and its Protocol on Strategic Environmental Assessment supported legislative reforms and/or capacity-building for the effective implementation of the two treaties in Kazakhstan Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, in cooperation with the Organization for Security and Cooperation in Europe (OSCE), with funding from the European Union, Germany and Switzerland. See <https://unece.org/central-asia>. Multilateral capacity-building activities under the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) and its Protocol on Pollutant Release and Transfer Registers strengthen the expert capacity of Parties and other interested States to implement infrastructure-related policies, plans and projects through effective, safe and inclusive public participation.

³⁶ An international group of institutional investors developed the “Principles for Responsible Investment” by reflecting the increasing relevance of environmental, social and corporate governance issues to investment practices. The process was convened by the Secretary-General. See www.unpri.org/pri/what-are-the-principles-for-responsible-investment.

³⁷ See <https://blogs.worldbank.org/ppps/fiscal-risk-ppps-whats-problem-what-do>.

³⁸ An example of an innovative business model in the health sector is the Managed Equipment Service model, where digital technologies, consulting, financing and management tools are delivered by the private sector over the long term.

³⁹ See https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/just-transition-mechanism_en.

the challenges posed by Europe’s transition to a greener and resilient economy.⁴⁰ However, more can and should be done to promote investments in sustainable infrastructure by pan-European region Governments, while avoiding carbon-intensive and inefficient pathways. Economy-wide decarbonization and resource efficiency are essential to achieving the Sustainable Development Goals and meeting the Paris Agreement targets.

Making “brown” infrastructure more sustainable and integrating “grey” and “green”⁴¹ infrastructure⁴²

32. A just sustainable transition of “brown” or “grey” infrastructure and deploying nature-based solutions are both critical aspects of focus, especially due to climate change threats. Considering nature and nature-based solutions in infrastructure systems enhances resource efficiency, resulting in more resilient service delivery, and the creation of positive externalities such as carbon sequestration or reducing air pollution. Focusing on effectively integrating both “grey” and “green” infrastructure to deliver essential services can help to address the need for climate mitigation and adaptation, while addressing other challenges such as biodiversity protection.

33. Challenges: Shifting away from traditional hard infrastructure towards solutions that work to adapt to natural conditions is a challenge for Governments. “Brown” or “unsustainable” infrastructure encompasses projects that often damage or destroy natural habitats, reduce ecosystem services, and have a negative impact on biodiversity. It can also encompass sites where expansion, redevelopment or reuse may be rendered difficult by the presence of a hazardous substance, pollutant or contaminant. Making “brown” infrastructure more sustainable comes with certain risks and responsibilities that may lead to increasing costs, new technology requirements and cross-sectoral linkages (e.g., clean energies required to green other sectors), among other things.⁴³ Moreover, the complexity of natural systems makes the assessment of interactions between “grey” or “built” and “green” or “natural” infrastructure more difficult. This can be time-consuming, costly in the beginning, and require new skill sets, including new sources of finance and financial mechanisms. Even today, “green” or “natural” infrastructure assets may not generate the same cash flows as traditional infrastructure projects, and the return of the investment is not well understood. However, it is commonly agreed that the gains of greening “brown” or “grey” infrastructure and deploying “green” infrastructure have a long-term positive impact that far exceeds the short-term economic benefits of infrastructure practices employed in the past.

34. Opportunities: Nature-based solutions infrastructure has gained momentum for Governments, development agencies and multilateral development banks looking to make nature-based solutions viable at scale and create natural infrastructure projects. Policies and investments that aim at mainstreaming integrated approaches for “grey” and “green” infrastructure assets, where nature-based solutions⁴⁴ are feasible, can be advantageous for the transition of new and existing infrastructure. Furthermore, environmental benefits of developing sustainable projects at unsustainable sites include clean up or containment to prevent exposure, reducing the threat to human and ecological health and helping to reduce toxic run-off, improving water quality. In general terms, it is preferable to develop existing

⁴⁰ See www.novethic.com/sustainable-finance/isr-rse/greening-european-infrastructure-a-challenge-the-eu-taxonomy-is-not-prepared-to-meet-149436.html.

⁴¹ For the purposes of this section, “brown” refers to unsustainable infrastructure, “grey” to built as opposed to green or natural infrastructure (“grey” infrastructure could be considered to be more or less sustainable, based on its social, environmental and economic impacts) and “Green”, in this case, refers to “natural” infrastructure (since it is sometimes called ecological infrastructure, environmental infrastructure or green infrastructure). It refers to a strategically planned and managed network(s) of natural lands, such as forests and wetlands, working landscapes, and other open spaces that conserves or enhances ecosystem values and functions and provides associated benefits to human populations. UNEP, *International Good Practice Principles*.

⁴² See <https://openknowledge.worldbank.org/handle/10986/31430>.

⁴³ See <https://sustainableinfrastructure.org/wp-content/uploads/EnvisionV3.9.7.2018.pdf>.

⁴⁴ Nature-based solutions are actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, while providing human well-being and biodiversity benefits. See www.iucn.org/our-work/nature-based-solutions.

sites rather than to encroach on undeveloped land.⁴⁵ Investments can and should be deployed towards pilot demonstration projects, and to explore technologies and engineering and financing approaches that deliver environmental, economic and social benefits of “green-grey” infrastructure. Existing technology has demonstrated that it can improve technical performance of cross-sector projects that combine both “grey” and “green” infrastructure. For instance, some technologies can serve to meet environmental standards (e.g., water systems), while new technologies (e.g., Systems for Business Intelligence) can promote cost-effective data collection and improve the performance of monitoring and modelling tools. Governments should aim overall to increase adaptive and regenerative capacity, long-term viability, climate resilience, community participation and cost-effective investments with increased monetary values.

Risks and resilience

35. A resilient infrastructure system is characterized by its capacity to deliver its intended services under both “normal” usage, including degradation and obsolescence, as well as changing conditions or “abnormal” scenarios, including climate change and other natural hazards.⁴⁶ Strengthening the resilience of infrastructure systems and the community as a whole requires close collaboration between key stakeholders.⁴⁷

36. Challenges: Establishing clear resilience goals and strategies is critical when developing infrastructure; however, challenges arise during their development. Resilience strategies could include vulnerability reduction, reduction of impacts or consequences of the potential threat, or even no action if the risks are acceptable.⁴⁸ However, risk assessment and management are challenging without conducting the right risk evaluation of acute shocks (e.g., hurricanes, health epidemics) or chronic stressors (e.g., ageing infrastructure, climate change). Climate change and the global pandemic, among other regional or local shocks or stressors, are threatening infrastructure at the system level. Pan-European region countries face the challenge of defining resilience goals, strategies and the right evaluation approaches when designing or restoring infrastructure.

37. Opportunities: The benefits of increased resilience include avoided loss of life, health, assets and/or service delivery and their associated costs. Countries of the pan-European region should aim to increase resilience, life cycle system performance, and the ability to withstand hazards while maximizing durability. Since Governments themselves cannot bear all potential risks, cooperation with the private sector and the right instruments can support a faster recovery to build better infrastructure. Public-private partnerships can transfer risk; however, risks should be assessed and managed effectively. In this regard, financial institutions developed the “Equator Principles” as a risk management framework to provide a standard for responsible risk decision-making when determining, assessing and managing environmental and social risks of infrastructure projects. Accordingly, these principles also converge with multilateral development banks, export credit agencies and OECD.⁴⁹

⁴⁵ See <https://sustainableinfrastructure.org/wp-content/uploads/EnvisionV3.9.7.2018.pdf>.

⁴⁶ See <https://www.oecd.org/g20/topics/infrastructure/Building-Infrastructure-Resilience-OECD-Report.pdf>.

⁴⁷ See <https://sustainableinfrastructure.org/wp-content/uploads/EnvisionV3.9.7.2018.pdf>.

⁴⁸ Ibid.

⁴⁹ See <https://equator-principles.com/about/>.

II. Practice and experience for sustainable infrastructure in the region

A. Global policy actions for infrastructure that deliver the Sustainable Development Goals⁵⁰

38. Global agendas are increasingly targeting specific elements that are characteristic of sustainable infrastructure projects. In June 2021, the Group of Seven agreed on a global action to build back better with strong focus on climate and the environment for a transition to net zero economies, by increasing energy efficiency, accelerating renewables, and promoting industrial and transport system decarbonization.⁵¹

39. The implementation of principles and tools is individually decided on by Governments according to their own needs and possibilities. This leads unfortunately to a lack of consensus or more harmonized approaches, especially with regard to the implementation of recommendations and actions required. However, United Nations Environment Assembly of UNEP resolutions 4/5, on sustainable infrastructure (UNEP/EA.4/Res.5) and 5/9, on sustainable and resilient infrastructure (UNEP/EA.5/Res.9), adopted in March 2019 and March 2022, respectively, could function as strategic mechanisms for consensus in the pan-European region, as they recognize the important role of infrastructure in achieving the Sustainable Development Goals.

40. UNEP has made progress on these resolutions by collaborating with partners to host events and publish knowledge products relating to various aspects of sustainable infrastructure, including social inclusiveness, climate, biodiversity, resource efficiency infrastructure, sustainable public procurement, the role of the private sector, the integration of green and grey infrastructure, and roles in a green post-pandemic recovery. UNEP has been engaged in capacity-building and country support by partnering with the World Conservation Monitoring Centre and the University of Oxford (United Kingdom of Great Britain and Northern Ireland), among others. At a regional level, with financial support from the Government of China, UNEP has developed three week-long regional capacity-building workshops for policymakers on sustainable infrastructure in Central Asia.⁵²

41. Furthermore, the progress report on the implementation of resolution 4/5 on sustainable infrastructure highlights recommendations to the United Nations Environment Assembly of UNEP by recognizing the importance of sustainable infrastructure to “building back better” and a green post-pandemic recovery, and to consider how investments in social, economic and ecological infrastructure can support economic recovery. Additionally, it fosters the adoption of guidelines that, together with associated policies and regulatory incentives, promote compliance with resolution 4/5. This involves including the development and strengthening of national and regional systems-level strategic approaches to infrastructure planning, and promoting nature-based solutions as key components of such approaches.⁵³

42. Specialized agencies of the United Nations system and other international organizations have made efforts to provide guidance on sustainable infrastructure development. Principles have followed existing practices and consultations with project practitioners and policymakers. Some key guidelines from selected organizations are listed as follows:

(a) ECE: ECE has also led several efforts in relation to sustainable infrastructure, including support on implementing different resolutions across programmes. Examples include Sustainable energy in the United Nations Economic Commission for Europe Region

⁵⁰ Annex I below outlines a list of global policy actions for infrastructure that deliver the Sustainable Development Goals.

⁵¹ See www.whitehouse.gov/briefing-room/statements-releases/2021/06/13/carbis-bay-g7-summit-communicue/.

⁵² Progress in the implementation of resolution 4/5 on sustainable infrastructure, UNEP/EA.5/7, paras. 14–16.

⁵³ *Ibid.*, paras. 18–19.

(ECE/ENERGY/133/Add.1), published in 2020, and the Committee on Urban Development, Housing and Land Management Housing and Land Management Unit and its Working Party on Land Administration and the Real Estate Market Advisory Group.⁵⁴ The Committee aims to promote: adequate and climate-neutral housing; compact, inclusive, circular, resilient, smart and sustainable cities; and transparent and efficient land use and property registration;⁵⁵

(b) UNEP: As part of the implementation of resolution 4/5 on sustainable infrastructure, UNEP released *International Good Practice Principles for Sustainable Infrastructure*, complemented by *Integrated Approaches in Action: A Companion to the International Good Practice Principles for Sustainable Infrastructure*,⁵⁶ which includes a selection of cases on how environmental, social and economic sustainability must be integrated right across infrastructure policymaking at the systems level. Both publications aim to inform the forthcoming wave of global infrastructure investment.⁵⁷ At the cities level, UNEP has also developed the “Integrated Guidelines for Sustainable Neighbourhood Design”,⁵⁸ which broaden the scope of urban planning and design to incorporate four core objectives: making more efficient use of natural resources; accelerating climate plans and targeting climate neutral cities by 2050; protecting biodiversity and the natural environment; and making cities more resilient;

(c) Multilateral development banks: Multilateral development banks have remained at the forefront of the sustainability agenda in the past few years with the definition of sustainable infrastructure frameworks that have served as references for policymakers and financiers interested in integrating sustainable infrastructure practices into infrastructure projects and programmes. Most recently, the Multilateral Development Bank Infrastructure Cooperation Platform (a worldwide coalition of multilateral development banks) has worked on the analysis and consolidation of the different approaches used by different multilateral development banks. This work makes it possible to enhance a common framework of indicators applicable to Governments worldwide when developing sustainable infrastructure projects, and thereby helps to mobilize public and private investment. The publication *MDB Infrastructure Cooperation Platform: A Common Set of Aligned Sustainable Infrastructure Indicators (SII)*⁵⁹ represents an initial step for a common language and consistency across the infrastructure project cycle. The indicators cover topics such as environmental sustainability, climate change and resilience, social inclusion and institutional governance;

(d) OECD: The organization released the Group of 20 Principles for Quality Infrastructure Investment, as well as a compendium with a unique set of existing integrated and multidisciplinary international good practices that policymakers and practitioners in both developed and developing economies can use on a voluntary basis. This compendium contains more than 340 good practices and measures drawn from over 50 OECD standards and other guidance developed across more than 20 substantive committees and their subsidiary bodies on quality infrastructure;⁶⁰

(e) The Global Infrastructure Hub: The Hub, under the aegis of the Group of 20, has introduced the Inclusive Infrastructure and Social Equity tool. It provides a practical evidence-based framework for practitioners to maximize the impact of infrastructure investment on reducing inequality and promoting shared prosperity. The framework is divided into six action areas, with relevant guidance, real life examples and case studies.⁶¹ Additionally, the Hub has commenced an initiative in response to the Group of 20 priorities

⁵⁴ See <https://unece.org/housing>.

⁵⁵ Ibid.

⁵⁶ Nairobi, 2021.

⁵⁷ These publications were financed with the support of the Global Environment Facility, the Swiss Federal Office for the Environment and UNEP.

⁵⁸ See <https://www.neighbourhoodguidelines.org/>.

⁵⁹ See <https://publications.iadb.org/en/mdb-infrastructure-cooperation-platform-common-set-aligned-sustainable-infrastructure-indicators>.

⁶⁰ See <https://www.oecd.org/finance/OECD-compendium-of-policy-good-practices-for-quality-infrastructure-investment.pdf>.

⁶¹ See <https://inclusiveinfra.gihub.org/>.

to examine the role that infrastructure can play in the transition to a circular economy. Discussion workshops and a circular economy road map are envisaged.⁶²

B. Rating systems for sustainable infrastructure

43. Both public and private organizations, among other finance institutions, develop their own rating systems to measure the impact of projects on sustainability and resilience (see annex II below). In addition, other research organizations have equally well-developed voluntary standards and certification schemes to rate sustainable impact across the entire project cycle. Normally, these ratings are conducted on a project basis and mostly for economic infrastructure following different methodologies. Although there are sources of infrastructure analysis by countries and sectors, there is an absence of rating systems in place to assess indicators beyond the project level.

44. The ECE People-first Infrastructure Evaluation and Rating System aims at scoring infrastructure projects against the Sustainable Development Goals and the ECE People-first Public-Private Partnerships criteria, integrating resilience, circularity and sustainability considerations. The methodology is currently in a test phase and available online for self-assessments.⁶³ This rating system in particular could be a potential instrument for the pan-European region to assess infrastructure projects.

C. Measuring progress towards Sustainable Development Goals for harmonized approaches in the region

45. Although Sustainable Development Goal 9 explicitly refers to building sustainable, inclusive and resilient infrastructure, its development has an impact across all the Sustainable Development Goals.⁶⁴

46. The United Nations Office for Project Services (UNOPS) and the University of Oxford-led Infrastructure Transitions Research Consortium developed a tool called “SustainABLE”, which integrates practical actions and examples of infrastructure projects that support the achievement of the different targets of the Sustainable Development Goals.⁶⁵

47. A consultation report with evidence from the pan-European region on Sustainable Development Goal 9 and its implications for other Sustainable Development Goals could be a way to showcase good practices and measure progress (see table 1 below). Hybrid (or mixed) approaches, methodologies and surveys with member States could help retrieve both qualitative and quantitative information on the inputs, processes and outputs already attained or required for sustainable infrastructure in the region, and the implications of outcomes and impacts of an integrated approach in infrastructure systems. This could be done by following the UNEP *International Good Practice Principles for Sustainable Infrastructure* and considering other initiatives (e.g., the 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns),⁶⁶ while mapping to targets of the Sustainable Development Goals, similarly to the “SustainABLE” example of UNOPS.

⁶² See <https://www.github.org/infrastructure-and-the-circular-economy/>.

⁶³ See https://unece.org/ppp/em#accordion_.

⁶⁴ See https://content.unops.org/publications/The-critical-role-of-infrastructure-for-the-SDGs_EN.pdf?mtime=20190314130614&focal=none.

⁶⁵ See <https://sustainable.unops.org/>.

⁶⁶ See <https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1444&menu=35>.

Table 1
Chart of potential information to be retrieved for consultation on inclusive and green infrastructure (for exemplification purposes only)

| <i>Evidence category</i> | <i>Definition^a</i> | <i>Potential example ECE context (SDG target 9.1)</i> |
|--------------------------|--|---|
| Input | Measures the material and immaterial pre-conditions and resources – both human and financial – provided for an activity, projects, programmes or interventions | <ul style="list-style-type: none"> • Regional budget for green and inclusive infrastructure • National budget • Total budget (sum of regional and national budgets) |
| Process | Measures the progress of processes or actions that use inputs and ways in which programme services and goods are provided | <ul style="list-style-type: none"> • Political engagement and implementation mechanism for green and inclusive infrastructure • Policy work and commitments • Scope of finance: regional/transboundary/national investments • Form of finance and type of support: grants (number)/financial instruments (number) • Projects supported (mega/large/small-scale) (number) |
| Output | Measures the quantity, quality and efficiency of production of goods or services as a result of an activity, project, programme or intervention | <ul style="list-style-type: none"> • Physical output: Surface of rehabilitated land (m²) by green infrastructure. • Intangible output (e.g., technology and knowledge transfer, especially following inclusive approaches) |
| Outcome | Measures the intermediate broader results achieved through the provision of outputs | <ul style="list-style-type: none"> • Larger protected areas • Larger population served |
| Impact | Measures the quality and quantity of long-term results generated as a result of achieving specific outcomes | <ul style="list-style-type: none"> • Improved condition of biodiversity and sustainability of ecosystem services • Improved access to essential services • Improved economic development |

Abbreviations: SDG, Sustainable Development Goal.

^a Definitions retrieved from OECD theory of change on biodiversity, available at <https://www.oecd.org/environment/resources/biodiversity/report-the-post-2020-biodiversity-framework-targets-indicators-and-measurability-implications-at-global-and-national-level.pdf>.

^b Hypothetical examples following a similar approach to the European Union system of common indicators for European Regional Development Fund and Cohesion Fund Interventions after 2020. See

https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/indic_post2020/indic_post2020_p1_en.pdf.

D. National experiences for sustainable infrastructure and stimulus for pandemic recovery

48. Pan-European region countries, as part of the Environment for Europe process commitments, have introduced either programmes, plans or strategies to promote the green economy, covering to some extent sustainable infrastructure projects, including energy efficiency (see annex I below).⁶⁷ Additionally, some Governments have introduced pandemic-related recovery stimulus packages through fiscal policies to: support companies (e.g., additional health spending, loan and wage subsidies); support individuals (e.g., pensioners, low-income households); and increase social benefits (e.g., unemployment insurance and public works).

49. The Recovery, Transformation and Resilience Plan (2021–2023) in Spain: The country, as part of its pandemic recovery plan, includes specific investments for sustainable infrastructure. In all, 37 per cent of the Plan's total budget will be invested in a fair ecological transition, including sustainable infrastructure, resilient ecosystems and nature-based solutions.⁶⁸

50. OECD issued a policy paper with a compilation of pandemic policy responses and recommendations in greening the economies of Eastern Europe, the Caucasus and Central Asia (see table 2 below). This is a substantial contribution for the regional lens required to build back better, identifying examples of exiting practices that could potentially have positive or negative environmental consequences. It is highlighted that further work has to be conducted to expand the inventory of information and assess the impact of measures. Recommendations include: maintaining and increasing commitments to fund green measures, when possible; sharing good practices on effective greening of economic stimulus packages among the countries of the region and beyond; and ensuring social and economic resilience to future shocks, including impacts on climate change.⁶⁹

Table 2

Organisation for Economic Co-operation and Development examples of government responses to the pandemic with positive and potentially negative environmental implications

| <i>Country</i> | <i>No. of potential positive measures</i> | <i>Type of recovery policies with potential positive impact</i> | <i>Sectors that include recovery measures with mixed environmental consequences</i> |
|----------------|---|---|---|
| Armenia | 3 | <ul style="list-style-type: none"> • Green elements in pandemic response and recovery plans • Green support to MSMEs • Green elements in international initiatives in support of pandemic response | Energy and waste management |
| Azerbaijan | 2 | <ul style="list-style-type: none"> • Acceleration of green elements of pre-existing national plans • Green elements in international initiatives in support of pandemic response | Air quality, energy and waste management |
| Belarus | 2 | <ul style="list-style-type: none"> • Acceleration of green elements of pre-existing national plans • Green elements in international initiatives in support of pandemic response | Energy and waste management |

⁶⁷ See <https://unece.org/fileadmin/DAM/env/documents/2019/ece/cep/ece.cep.2019.4.e.pdf>.

⁶⁸ Information provided by ECE.

⁶⁹ See www.oecd.org/coronavirus/policy-responses/covid-19-and-greening-the-economies-of-eastern-europe-the-caucasus-and-central-asia-40f4d34f/.

| <i>Country</i> | <i>No. of potential positive measures</i> | <i>Type of recovery policies with potential positive impact</i> | <i>Sectors that include recovery measures with mixed environmental consequences</i> |
|-----------------|---|--|---|
| Kazakhstan | 4 | <ul style="list-style-type: none"> • Acceleration of green elements of pre-existing national plans • Green elements in pandemic response and recovery plans • Green support to MSMEs • Green elements in international initiatives in support of pandemic response | Energy, agriculture and waste management |
| Kyrgyzstan | 3 | <ul style="list-style-type: none"> • Green elements in pandemic response and recovery plans • Acceleration of green elements of pre-existing national plan • Green elements in international initiatives in support of pandemic response | Air quality and waste management |
| Rep. of Moldova | 4 | <ul style="list-style-type: none"> • Acceleration of green elements of pre-existing national plans • Green elements in pandemic response and recovery plans • Green support to MSMEs • Green elements in international initiatives in support of pandemic response | Energy |
| Tajikistan | 2 | <ul style="list-style-type: none"> • Green elements in pandemic response and recovery plans • Green elements in international initiatives in support of pandemic response | Energy |
| Turkmenistan | 1 | <ul style="list-style-type: none"> • Green elements in international initiatives in support of pandemic response | |
| Ukraine | 1 | <ul style="list-style-type: none"> • Green elements in international initiatives in support of pandemic response | Waste management, water, sanitation and hygiene |
| Uzbekistan | 2 | <ul style="list-style-type: none"> • Acceleration of green elements of pre-existing national plans • Green elements in international initiatives in support of pandemic response | Agriculture water, sanitation and hygiene |

Abbreviations: MSMEs, micro-, small- and medium-sized enterprises.

III. Measuring sustainable infrastructure in the region

51. In alignment with the different references and existing work identified in this document, eight indicators have been suggested around four main sustainable infrastructure categories. These categories include: (a) environmental sustainability and resilience; (b) social sustainability; (c) institutional sustainability; and (d) economic and financial sustainability.

52. For the identification of the suggested indicators, a thorough analysis was conducted of the following frameworks: (a) the Pan-European Strategic Framework for Greening the Economy; (b) the Multilateral Development Bank Common Set of Aligned Sustainable Infrastructure Indicators (SII); (c) the UNEP *International Good Practice Principles for Sustainable Infrastructure*; (d) the Group of 20 Principles for Quality Infrastructure Investment; (e) the Finance to Accelerate the Sustainable Transition-Infrastructure (Fast-Infra) initiative; and (f) the European Union Taxonomy for Sustainable Activities. The definition of the indicators has been constrained by the information currently available in the different countries of the region. As such, the indicators provided represent a first step in the quantification of sustainable infrastructure in the region rather than the end goal. These indicators are presented in table 3 below.

Table 3
Sustainable infrastructure indicators

| Indicator | Definition | Subindicator | Quantification criteria |
|--|---|--|---|
| Category: Environmental sustainability and resilience | | | |
| 1. Climate change adaptation and mitigation | Infrastructure projects should reduce/avoid GHG emissions, be climate-resilient and integrate adaptation and mitigation strategies through full cycle | Subindicator 1.1: GHG emission reduction | Total GHG emissions in pan-European region (without land use, land-use change and forestry) by subregion, million tons of CO ₂ equivalent (2014–2018) |
| 1. Climate change adaptation and mitigation | Infrastructure projects should reduce/avoid GHG emissions, be climate-resilient and integrate adaptation and mitigation strategies through full cycle | Subindicator 1.2: Disaster risk reduction strategies | Score of adoption and implementation of national disaster risk reduction strategies in line with Sendai Framework for Disaster Risk Reduction 2015–2030 in pan-European region (2018) |
| 2. Environmental conservation and biodiversity protection | Infrastructure projects should avoid negative impacts and/or restore biodiversity and environment while preserving ecosystems and ecosystem services during entire life cycle | Subindicator 2.1: Biodiversity protection | Number of countries in pan-European region that established national targets in accordance with Aichi Biodiversity target 2 of Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans |
| 2. Environmental conservation and biodiversity protection | Infrastructure projects should avoid negative impacts and/or restore biodiversity and environment while preserving ecosystems and | Subindicator 2.2: Ecosystem services protection | Proportion of land degraded over total land area, 2015 |

| <i>Indicator</i> | <i>Definition</i> | <i>Subindicator</i> | <i>Quantification criteria</i> |
|--|--|--|---|
| 3. Circular Economy | ecosystem services during entire life cycle Infrastructure projects should be planned, designed, constructed, operated and decommissioned considering efficient use of resources, as well as principles of circular economy (including repurpose, recycle, reduce, reuse, repair, refurbish and remanufacture) | Indicator 3: Circular Economy | Recovery rate of construction and demolition waste in European Union (2014–2018) Recovery rate of construction and demolition waste in other pan-European region countries (non-European Union) |
| Category: Social sustainability | | | |
| 4. Gender equality and empowerment | Infrastructure projects should promote social inclusion, gender equality and human rights protection by fostering economic empowerment, social mobility and equal opportunities for all | Indicator 4: Gender equality and empowerment | Gender employment gap across pan-European region (2020) |
| 5. Life cycle cost accounting | Infrastructure projects should consider net economic and social returns, as well as real cost of economic activities and natural capital over entire project life cycle (including during maintenance and decommissioning, where appropriate), taking into consideration both positive and negative externalities and life cycle cost accounting | Indicator 5: Life cycle cost accounting | Sectors in which countries usually perform cost-benefit analysis (2014) |
| 6. Access to basic services | Infrastructure projects should improve physical and economic access to basic services (including drinking water, sanitation, electricity and digital technology) ensuring healthier living conditions and well-being | Indicator 6: Access to basic services | Percentage of population using basic drinking water services by location (2020) Percentage of population using basic sanitation services by location (2020) Percentage of population with access to electricity by location (2020) Proportion of population covered by at least 2G, 3G and 4G mobile network across pan-European region (2018) |

| <i>Indicator</i> | <i>Definition</i> | <i>Subindicator</i> | <i>Quantification criteria</i> |
|--|---|---|--|
| Category: Institutional sustainability | | | |
| 7. Transparency and anti-corruption | Infrastructure development should be planned, designed, constructed and operated in transparent manner, so as to guarantee that relevant information is available and accessible to all stakeholders. Projects should have anti-corruption and anti-bribery management systems in place, for long-term monitoring | Indicator 7: Transparency and anti-corruption | Score for pan-European subregions on Corruption Perceptions Index 2020 European Union performance on Corruption Perceptions Index during period 2016–2020 |
| Category: Economic and financial sustainability | | | |
| 8. Financial sustainability and innovative finances | Infrastructure development should guarantee financial sustainability of assets through full life cycle, including mobilization of innovative sources of capital at scale | Indicator 8: Sustainable investment | Contribution to international \$100 billion commitment on climate-related expenditure (2014–2019) |

Abbreviations: CO₂, carbon dioxide; GHG, greenhouse gas; 2G, second generation; 3G, third generation; 4G, fourth generation.

53. One of the main trends identified across the different indicators is the lack of information regarding how infrastructure has an impact on the achievement of those indicators, either positively or negatively. For instance, there may be specific information about environmental degradation and biodiversity disruption; however, it is unclear to what extent those challenges may be associated with infrastructure development. A similar example can be identified in the social indicators. For instance, gender equality and empowerment has been deemed to be a topic of key relevance and a key consideration in the global agenda; however, limited information exists regarding women's role in the infrastructure sector, or how access to quality infrastructure could help bridge the inequality gap. As such, more detailed information should be gathered on the different indicators identified and the impact that infrastructure development has on achieving them.

IV. Place of the pan-European region in the future

54. Collective response: The current trends, actions, methodologies and principles outlined in this document show how organizations and countries are responding to infrastructure development and that it should now be designed, implemented and maintained from a holistic perspective. From regional and national perspectives, it has been shown how European Union institutions and countries of the pan-European region are developing stimulus packages that support innovation, making sustainable infrastructure a driving force for the green economy. In this context of collective response, ECE and UNEP are two leading agencies that can collaborate with and support member States in developing the right regulatory frameworks, upstreaming planning and collective actions that drive cooperation with other key stakeholders such as the private sector, financing institutions, investors and OECD.

Next steps in the Environment for Europe process

55. Seize the opportunity to discuss a road map of next steps during the follow-up discussion of the Fifth United Nations Environment Assembly of UNEP (Nairobi, 28 February–2 March 2022): UNEP resolutions 4/5 and 5/9 on sustainable infrastructure already encourage the promotion of existing UNEP guidelines and good practices based on relevant UNEP initiatives.⁷⁰ In this context, Governments are encouraged to define implementation measures of the UNEP *International Good Practice Principles for Sustainable Infrastructure* with demonstration projects and monitoring actions, considering a pan-European regional approach.

56. Collaborate with key stakeholders on stimulus approaches and capacity-building efforts to develop sustainable infrastructure and promote sustainability of “grey” and “brown” infrastructure: ECE, in cooperation with OECD, UNEP and UNOPS, and in consultation with other key stakeholders such as the World Bank, EIB and the European Bank for Reconstruction and Development, could work on collaborative projects that build capacity to define the right strategies, inputs and interventions required to make a shift towards sustainable infrastructure. Moreover, from a project perspective, the ECE region could use ECE People-first Infrastructure Evaluation and Rating System methodology on infrastructure projects deployed specifically with public-private partnership models.

57. Develop a compendium of use cases, commitments and good practices across the region: The above-mentioned steps could be integrated into a publication to provide guidance to Governments on the right instruments to deploy sustainable infrastructure. These cases could reflect actions in the value chain process of infrastructure systems, as well as good practices that other countries can use for reference purposes. Voluntary commitments submitted to the Batumi Initiative on Green Economy through its Nicosia Call may provide valuable information in this regard.

V. Conclusions and the way forward

1. Holistic approach to sustainability

58. Traditionally, when referring to sustainability or green recovery, the approach taken is limited to environmental and climate change considerations. However, sustainable infrastructure projects should be socially, institutionally and economically, as well as environmentally, sustainable. For instance, environmental and health impacts of economic development planning should be systematically assessed and addressed early on. Effective, safe and inclusive public participation in decision-making shall be ensured at all stages, from the outset, in the conception of the related projects, plans, programmes and policies.

2. Systemic approach for different types of infrastructure planning and management

59. Infrastructure planning, management and maintenance should follow a systemic and inclusive approach for them to be resilient to increasing shocks and stresses such as climate change and the pandemic, avoiding unsustainable consumption paths. Transformational approaches in infrastructure should no longer be just an aspirational vision but, rather, common practice.

3. Full life cycle approach to infrastructure development

60. Infrastructure assets – complex and interconnected systems – will be in place for many generations to come. Thus, an institutional framework and policies are needed to ensure that sustainability will be incorporated into all the different steps of the process. This starts during the upstream phase, with the strategic planning and prioritization of investments, and

⁷⁰ The 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, the Sustainable Buildings and Climate Initiative and the Sustainable Public Procurement programme are the main initiatives to be considered for United Nations Environment Assembly of UNEP resolution 4/5 on sustainable infrastructure.

continues at the project level, with project planning and design, procurements, financing, construction, operation and, lastly, decommissioning

4. Development of a common definition of “sustainable infrastructure”

61. During the last decades, many papers have been published regarding the importance of sustainable infrastructure and quantification criteria to measure progress. The pan-European region should develop a common definition of “sustainable infrastructure”, ensuring that it suits the region’s specific needs and long-term vision.

5. Way forward – Responses should be collaborative and collective to enhance transparency and support effective policies, instruments and strategies for the upcoming transformation

62. The way forward for the pan-European region should be collective, with common goals, targets and criteria for policymaking, performance monitoring and replicability of practices best suited to domestic needs, while following and promoting the implementation of existing guidance as established in UNEP resolutions 4/5 and 5/9 on sustainable infrastructure, as well as long-standing relevant legal instruments such as the Protocol on Strategic Environmental Assessment. Moreover, current technological developments and digital trends should be used for both existing and new infrastructure assets. Policies, incentives and financial instruments should be continuously perfected to promote sustainable solutions. To that end, the region should make efforts to analyse data for the entire infrastructure life cycle.

6. Sustainable infrastructure should be at the core of green economy policies and commitments

63. Sustainable infrastructure should be recognized by countries as a development mechanism and must be at the core of green economy action plans, instead of focusing only on concrete sectors individually. Even though they may address local, subnational or national needs by focusing on concrete sectors for the provision of essential services, programmes and projects should take into consideration entire infrastructure systems, especially in order to manage increasing pressures and enhance resilience.

Annex I**List of action examples – United Nations Economic Commission for Europe region**

| <i>Action initiatives</i> | <i>Description</i> | <i>Scope</i> | <i>Country</i> |
|--|---|---|-----------------|
| Recovery, Transformation and Resilience Plan (2021–2023) | Road map for: modernization of Spanish economy; recovery of economic growth and job creation; robust, inclusive and resilient economic rebuilding after Covid-19 crisis; and responding to challenges of coming decade. Plan includes specific investments for sustainable infrastructure. In all, 37 per cent of Plan's total budget will be invested in fair ecological transition, including sustainable infrastructure, resilient ecosystems and nature-based solutions | National-level COVID-19 stimulus | Spain |
| National Strategy for Sustainable Infrastructure and Ecological Restoration (October 2020) | Strategy comprises eight goals and highlights need for development of “innovative investment mechanisms”, naming some instruments that may promote public and private investment | National-level sustainable infrastructure strategy | Spain |
| National Action Plan for Green Public Procurement for 2015–2017 | Plan for Green Public Procurement has target of 50 per cent of procurement in green contracts by 2020, including infrastructure services (telecommunications). Ministry of Environmental Protection and Energy also promoted use of European Union Label | National-level green procurement- (CEP commitment action) | Croatia |
| Action Plan for Green Economy Promotion 2018–2020 | Establishment and activities of an interministerial working group on sustainable development and green economy in 2017 (co-chaired by Ministry of Economy and Infrastructure and Ministry of Agriculture, Regional Development and Environment) with following results: <p>(a) Process of green economy promotion in Rep. of Moldova, development of national objectives, elaboration of policy documents in the domain, monitoring of indicators and reporting;</p> <p>(b) Development and approval of Programme on the Promotion of Green Economy in Rep. of Moldova and of Action Plan for its implementation for 2018–2020;</p> <p>(c) Elaborated and published National Report on Green Growth Indicators and developed and promoted Law on Strategic Environmental Assessment in 2017</p> | National green economy strategies with indicators (CEP commitment action) | Rep. of Moldova |
| Infrastructure Investment and Jobs Act | In 2021, Government of United States approved “Infrastructure bill” to stimulate national economy, create jobs and upgrade current state of infrastructure in country. Policy aims to provide \$1.2 trillion in investment in next years. ^a According to official estimates, “Infrastructure bill” will create 1.5 million jobs per year for next 10 years. ^b | National-level, greening the economy, job creation and infrastructure development and upgrade | United States |

Abbreviations: CEP, Committee on Environmental Policy; COVID-19, coronavirus disease.

^a See https://www.ey.com/en_us/infrastructure-investment-and-jobs-act?WT.mc_id=10816686&AA.tsrc=paidsearch&gclid=Cj0KCCQiAweaNBhDEARIsAJ5hwbfc7ZKKU42i45ENjkGAQUz_tOonj6lqcJ_uXIMQq4LNUY301CWZZQaAtGvEALw_wcB.

^b See <https://www.whitehouse.gov/bipartisan-infrastructure-law/>.

Annex II

Principles, indicators and rating examples

| <i>Principles and indicators</i> | <i>Organization</i> | <i>Applicability</i> | <i>Description</i> |
|---|--------------------------|---------------------------|---|
| MDB Infrastructure Cooperation Platform: A Common Set of Aligned Sustainable Infrastructure Indicators (SII) (Link) | IDB/MDBs | Global | MDB insights for an aligned set of sustainable infrastructure indicators to mobilize both public and private sustainable investments and how key public and private players can incorporate/monitor them at various stages |
| European Commission Indicators for Sustainable Cities (Link) | European Commission | European Union/ Global | Document comprises a set of existing instruments and tools of indicators for cities globally and in Europe |
| ECE Guiding Principles on People-first Public-Private Partnerships (Link) | ECE | ECE region/ Global | Principles outline how PPPs should be “People-first” to meet SDGs. Principles introduce five outcome-based criteria and are complemented by an evaluation methodology |
| The development and use of biodiversity indicators in business: an overview (Link) | IUCN | Global | Paper introduces overarching process, acknowledging full spectrum of business applications to help businesses use existing indicators or embark on developing new ones for biodiversity performance |
| What is Sustainable Infrastructure? A Framework to Guide Sustainability Across the Project Cycle (Link) | IDB | Americas/ Global | Document presents framework for both public and private sectors to support planning, design and financing of economically, financially, socially, environmentally and institutionally sustainable infrastructure, covering four main principles and 60 criteria |
| Benchmarking Infrastructure Development 2020 (Link) | World Bank | Global | Report assesses regulatory quality of large infrastructure projects through both PPPs and TPIs in 140 and 40 economies, respectively. Corresponding online platform highlights key findings resulting from data, organized around infrastructure project cycle phases |
| Swedish Four-Step Principle (Link) | Swedish Transport Agency | Sweden | Swedish Transport Agency has four-step principle that might be of interest (Rethink, Optimize, Rebuild and Build new). It is meant to ensure sound resource management and contribute to sustainable societal development |

Abbreviations: ECE, United Nations Economic Commission for Europe; IDB, Inter-American Development Bank; IUCN, International Union for Conservation of Nature; MDB, multilateral development bank; PPP, public-private partnership; SDG, Sustainable Development Goal; TPI, traditional public investment.

Other rating systems at project level

CEEQUAL is a sustainability assessment tool for both infrastructure projects and contracts. It offers five holistic assessment types, prior to construction or for the project as a whole. It targets the United Kingdom and Ireland, among other international projects.^a

The voluntary standard SuRe introduced by Global Infrastructure Basel is globally applicable to infrastructure projects across different sectors and relies on independent verification and certification by third parties. In all, 175 projects with a total of \$52 billion in capital expenditure in 47 countries have been already assessed with this methodology.^b

ENVISION rating system. The Institute for Sustainable Infrastructure assesses sustainability and resilience of infrastructure projects, awarding them verification levels. It has applied a holistic methodology of 64 criteria for 100 projects, mainly in North American and Italy, collectively worth more than \$106 billion^c

^a See www.ceequal.com/methodology/.

^b See <https://sure-standard.org/>.

^c See <https://sustainableinfrastructure.org/wp-content/uploads/2021/03/Final-Envision-3-17-21-1.pdf>.
