Executive summary

According to the 2022 IPCC Assessment Report, greenhouse gas emissions (GHG) increased across all major economic sectors globally between 2010 and 2019, making the climate crisis more urgent than ever. Climate change is also likely to have an impact on infrastructure networks, which are the backbone of any modern society (i.e. water and energy systems, telecommunication, transport, health, etc.). In Italy, the infrastructure system is particularly vulnerable to climate-induced extreme events. For example, between 2010 and 2021, subways and urban trains in major Italian cities were closed for a total of 83 days (29 days in Rome, 19 in Milan, 15 in Naples, 12 in Genoa, etc.), while extreme weather conditions disrupted electricity networks for a total of 89 days. For this reason, developing an infrastructure governance system capable of managing today's environmental challenges while strengthening resilience to climate change is key to ensure Italy's sustainable and resilient future.

Green infrastructure (GI) and nature-based solutions (NbS) are powerful instruments that can be harnessed to this end. In this report, GI is considered as a planning instrument to ensure that the protection of biodiversity, ecosystem services and ecological networks are considered, from the outset, in territorial and infrastructure development. The term "NbS" refers to specific project-level solutions, including the use of natural materials and the integration of mechanisms that mimic nature in infrastructure projects (e.g. the integration of green walls or roofs in buildings, or the use of permeable rather than impermeable pavement to improve water absorption and retention to mitigate the effects of heavy rains).

Both instruments are gaining attention in Italy. Unlike single-purpose, grey infrastructure, they can perform several functions simultaneously and at very low comparative cost, creating benefits for people, nature, and the economy. Nonetheless, the consideration and uptake of GI and NbS remain limited due to implementation challenges. Some of these challenges are linked to the intrinsic characteristics of GI, while others are related to an inadequate enabling environment (e.g. institutional, regulatory, and financing frameworks, as well as technical capacity).

OECD proposed integrated approach to green infrastructure

Building on international good practices and lessons learned, the OECD proposes an integrated approach to GI and NbS. This approach considers all the main trade-offs concerning GI and NbS and proposes solutions to integrate them in the planning, appraisal, financing, procurement, and maintenance of infrastructure investments. It is based on six pillars:

1. Define a sound institutional framework for GI that encourages co-ordination, provides a clear definition of roles and responsibilities, sets out guidance and develops technical skills for implementation.
2. Integrate GI in regulatory and planning instruments, both at the national and sub-national level.
3. Make use of existing funding instruments or develop new ones to promote GI.
4. Promote NbS in project planning, appraisal, and prioritisation using a combination of traditional appraisal tools and non-traditional methods.

5. Develop tools and strategies for governments and public buyers to facilitate the procurement of NbS.
6. Provide monitoring and maintenance of infrastructure projects across their lifecycle to ensure they fully deliver the expected results and intervene as needed.

GI and NbS in Italy

Italy has long-standing experience with environmental protection and the management of ecological networks. Regulatory frameworks and instruments for spatial planning already consider the potential impacts of territorial development on the environment and ecological networks to limit the expected negative impacts and reinforce positive ones. Moreover, GI and NbS are increasingly mentioned in key policy documents and strategies, including the National Biodiversity Strategy 2030. Nonetheless, more needs to be done if the country is to become a frontrunner in the adoption of a GI-integrated approach to infrastructure governance. While some isolated good practices exist at the subnational level, a more consistent adoption of these two instruments across the whole national territory is needed.

GI and NbS involve different levels of government, which often creates hurdles in their implementation. At the central level, the main administrations involved (MIT, the Ministry of Environment and Energy Security and the Ministry of Culture) tend to have different roles and responsibilities, which sometimes overlap. Moreover, in the absence of central-level guidance, subnational authorities (regions, municipalities, and metropolitan cities) are often responsible for integrating these two instruments in territorial development and infrastructure projects, with some regions and cities performing better than others.

At the project level, there are different tools in place to integrate environmental considerations in infrastructure planning and design, in project appraisal, and in the financing and delivery of public investment projects. However, these instruments often fail to promote the use of GI and NbS and could be further refined to integrate considerations of biodiversity and ecosystem protection and restoration.

Main recommendations for fostering GI and NbS implementation in Italy

Despite MIT's recent efforts to promote sustainability in public investment decisions, there is room for improvement for Italy to integrate GI in spatial planning and ensure a more widespread uptake of NbS in infrastructure projects across the national territory. Based on the challenges identified and the lessons learned from the selected case studies (e.g. the railway line Bicocca-Catenanuova, the metro line M4 in Milan, the Nodo Verde ("Green Node") in Bari, and the Ridracoli Dam in Emilia-Romagna), the OECD has developed a series of recommendations to help the Ministry promote GI and NbS across all levels of government:

1. **Define a policy and regulatory framework that enable GI**. Italy has sound sustainability requirements for infrastructure plans and projects; however, the notion of sustainability does not explicitly consider GI. The Italian government could consider developing a policy and regulatory environment for the uptake of GI in infrastructure planning and NbS in project planning, including the full consideration of the ecosystem and the long-term benefits that these tools have to offer.
2. **Define an institutional setup for GI, including clear roles and responsibilities and co-ordination mechanisms across key stakeholders**. In the current institutional setup governing GI in Italy, many actors are involved in planning and implementation, but their roles and responsibilities often overlap. It is important to define a common reference framework that assigns clear tasks and responsibilities. Co-ordination is important to promote coherence and synergies across the different initiatives relevant for GI, as well as to address the trade-offs. A cross-sectoral and cross-governmental approach is needed to raise awareness, enhance technical capacity, and improve the policy and regulatory environment.

3. **Build a knowledge base and technical competences**. Knowledge and technical capacities vary among people working at different levels of government. Uncertainty around GI and NbS often results in a tendency to favour traditional grey infrastructure. Italy would benefit from better understanding and raising awareness of the potentials and limitations of GI and NbS, as well as of how to effectively implement them. A first step would be to develop a specific analysis of Italy's natural assets, map the risks local territories are likely to face, consider how future scenarios could affect NbS and GI, and design methods to monitor their lifecycles.