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Designing inclusive urban spaces 2

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abstract

ESG principles and urban regeneration: challenges and opportunities

Antonio Bocca, Lorenzo Massimiano

Abstract

The growing interest in ESG (Environmental, Social, Governance) principles, stimulated by the awareness of climate change and social inequalities, is revolutionising the way cities are designed and managed. In particular, urban regeneration represents a privileged context for the application of these principles, offering the opportunity to rethink urban spaces in a sustainable, equitable and resilient way.

To assess the integration of ESG criteria in urban planning, this contribution adopts an approach that combines a review of scientific literature with the analysis of case studies applying ESG criteria. Subsequently, in relation to European directives and regulations, the compatibility between ESG criteria and existing urban planning instruments was analysed, identifying the opportunities and challenges of their integration.

The contribution proposes a multidisciplinary and integrated approach to the innovation of urban planning tools and sustainability assessment in urban regeneration projects, emphasising the need to involve multiple stakeholders and adopt a shared framework. This holistic approach would allow "stakeholders" and "communities" interests to be properly assessed in relation to contemporary issues and integrated into the urban planning and urban design project from the outset.

Keywords:
Ecological transition, urban development, sustainability

ESG e rigenerazione urbana: sfide e opportunità

Il crescente interesse per i principi ESG (*Environmental, Social, Governance*), stimolato dalla consapevolezza dei cambiamenti climatici e delle disuguaglianze sociali, sta rivoluzionando il modo in cui si progettano e gestiscono le città. In particolare, la rigenerazione urbana rappresenta un contesto privilegiato per l'applicazione di questi principi, offrendo l'opportunità di ripensare gli spazi urbani in chiave sostenibile, equa e resiliente.

Per valutare l'integrazione dei criteri ESG in urbanistica, il contributo ha adottato un approccio che combina la revisione della letteratura scientifica con l'analisi di casi studio che hanno applicato i criteri ESG. Successivamente, in relazione alle direttive e normative europee, è stata analizzata la compatibilità tra i criteri ESG e gli strumenti urbanistici esistenti, identificando le opportunità e le sfide della loro integrazione.

Il contributo propone un approccio multidisciplinare e integrato per innovare gli strumenti urbanistici e per la valutazione della sostenibilità nei progetti di rigenerazione urbana, sottolineando la necessità di coinvolgere molteplici attori e di adottare un quadro di riferimento condiviso. Questo approccio olistico permetterebbe di valutare adeguatamente gli interessi degli *stakeholder* e delle comunità in relazione alle tematiche contemporanee, oltre che integrarli fin da subito nel progetto urbano e urbanistico.

Parole Chiave:
Transizione ecologica, sviluppo urbano, sostenibilità

A framework for sustainable cities. ESG principles and urban regeneration

Antonio Bocca, Lorenzo Massimiano

1. Introduction

It is essential that the urban rethinking project embraces a culture of integrated and open planning to achieve a balance between environmental, ecological, and socio-economic components. The growing interest in Environmental, Social, Governance (ESG) principles, driven by public attention to the issues of climate change, social inequalities and the role of stakeholders in decision-making processes, is affecting urban regeneration processes (Pucker, King 2022). In alignment with the Paris Climate Agreement and the United Nations' Sustainable Development Goals (SDGs), the integration of ESG principles into urban planning and governance can facilitate the enhancement of urban quality, while simultaneously advancing environmental sustainability, public participation, and social inclusion. This assertion is further reinforced by the recent developments in European policy culture, particularly with regard to proximity, energy, and climate change, as well as the growing emphasis on stakeholder engagement.

The ESG model has its origins in the economic and financial sphere, and has subsequently become an increasingly significant phenomenon. The ESG model is predicated on the notion of evaluating investments not only in accordance with traditional financial parameters, but also in consideration of factors that can have a positive impact on society, including environmental sustainability, ethical considerations, and inclusion (Minkkinen, Niukkanen, Mantymaki, 2024). The origins of ESG principles can be traced back to the 1960s and 1970s, a period characterised by civil rights movements and the growing awareness of environmental issues. These principles have since evolved, first appearing on the international stage in the UN Global Compact's (2004) report, "Who cares wins: connecting financial markets to a changing world". The report primarily focused on the screening, selection and risk assessment of securities in financial portfolios. Subsequently, these parameters were incorporated into the United Nations "Principles for Responsible Investment" (PRI, 2006), a programme designed to provide a clear and unambiguous outline of the requirements for sustainable investment. The document explicitly states the intention to "incorporate environmental, social and governance (ESG) parameters into financial analysis and investment decision-making processes". However, the absence of specific and shared protocols has resulted in a vague and improper use of the term ESG, which is often applied generically to all investments that aspire to environmental or social impact (De Nicolò, 2021; Hill, 2020). Nevertheless, the application of the model's general principles in investment analysis has yielded positive outcomes, prompting companies to enhance their performance across the three categories and thereby indirectly benefiting

EBA Factors

Environmental	Social	Governance
Emissions	Employee relationship/labour	Ethical considerations
Energy efficiency	Customer relationships	Strategy and risk management
Water usage	Human Rights	Inclusiveness
Waste production	Poverty/famine	Transparency
Biodiversity and ecosystems		
Environmental hazards		

Tab. 1 - The table provides a summary of the factors presented in the EBA report. Source: EBA, 2021.

society. In a study published in 2021, the European Banking Authority (EBA) defined the parameters to be considered in the ESG approach, according to evaluation metrics (Table 1), and then ranked the most virtuous, attractive and sustainable companies.

Furthermore, technological advancement provides a substantial driving force for this process through the introduction of digital twins, the metaverse and blockchain technology (Kabbara, 2023). The utilisation of digital twins has the potential to facilitate the monitoring and optimisation of resource utilisation within urban environments. Connected to data from IoT (Internet of Things) devices, these tools facilitate the analysis of energy consumption, the management of greenhouse gas emissions and the enhancement of urban system efficiency, in addition to ESG criteria. In contrast, the metaverse presents novel avenues for social interaction and engagement, wherein virtual realms can be constructed for interaction and access to public services, irrespective of physical or socioeconomic constraints. Blockchain technology, renowned for its capacity to guarantee transparency and security in transactions, can be harnessed for the administration of urban resources, including energy, as evidenced by its deployment in certain Brooklyn neighbourhoods. This practice not only promotes energy self-sufficiency, but also improves community resilience in the event of power grid outages, thereby demonstrating how blockchain can contribute to more efficient and participatory governance. New technologies thus offer extraordinary potential for the dissemination and improvement of the ESG model applied at the urban scale, not only facilitating the implementation of sustainability-related principles, but also making the monitoring, management and evaluation of urban initiatives in line with these criteria more effective.

This contribution begins with an examination of the evolution of the ESG model and a review of the relevant literature. It then proceeds with a critical analysis of selected experimental practices in the Italian urban context. The aim is to demonstrate how ESG criteria can be regarded as drivers of innovation in urban transformation processes. The objective is to ascertain how the objective of sustainability and the implementation of ESG principles can impact urban regeneration processes and the configuration of public spaces in accordance with a novel open and flexible approach. The contribution is structured as follows: Section 1 outlines the scientific background of the topic, Section 2 sets out the methodology adopted, Section 3 focuses on the application of the ESG principles in the urban context, Section 4 sets out the results obtained, Section 5 is devoted to the debate, Section 6 sets out the conclusions and research perspectives.

2. Methodology

The research was conducted in accordance with a systematic methodology, comprising a series of defined stages. The initial stage of the research involved an analysis of the scientific literature with the objective of gaining an understanding of ESG principles and tracing their evolution. To this end, major academic search engines, such as Google Scholar and Scopus, were utilised through a structured search based on targeted keywords. The search terms included those related to ESG criteria, such as “ESG criteria”, “environmental social governance” and “ESG indicators”, in addition to keywords from the urban context, such as “urban area”, “urban planning”, “urban regeneration” and “city/es”. This approach was adopted in order to ensure comprehensive coverage of the core research topics and to facilitate investigation of their application in the urban context. This phase enabled the identification of existing gaps and the definition of the opportunities offered by the integration of these principles into sustainable urban planning. The report published by the European Banking Authority (EBA) was then studied, in which the main factors through which the three ESG categories are developed were identified, as illustrated in Table 1. This paper established a preliminary foundation for adapting ESG criteria based on economic perspectives to the urban planning discipline. Concurrently, exemplars of the deployment of ESG parameters in an urban setting were sought. Among the case studies analysed, four projects were selected for detailed examination: Masdar City (Abu Dhabi), Songdo International Business District (South Korea) and two Italian examples, the Manifattura Tabacchi in Florence and the MIND (Milan Innovation District). These projects provided a rich context for analysing the use of ESG parameters in urban transformations, elucidating their strengths and weaknesses.

In light of the findings yielded by the case studies, the table originally formulated by the EBA underwent a process of transformation and adaptation. This process entailed the incorporation of more precise and pertinent indicators at the urban level, including the quality of life for residents, accessibility to services, and community participation. Additionally, certain social and governance parameters were redefined to ensure consistency with the characteristics of cities and their sustainable development objectives. Ultimately, this process resulted in the creation of a summary table comparing the EBA’s original ESG factors with those adapted to urban planning. This comparison elucidated the alterations made, and the novel factors introduced, thereby establishing an operational framework for effectively applying ESG criteria in urban contexts.

3. ESG model and urban environment

In consequence of the growing success of the ESG approach and the increased awareness of environmental and social issues affecting our cities, especially in relation to the effects of climate change, there has been an attempt to transpose these principles from

finance to urban planning. This is intended to facilitate the application of criteria of sustainability, social responsibility and good governance to the planning and development of cities.

The advantage of this approach is that it employs a framework of quantifiable and consensus-based parameters, which provide the most objective means of assessing a city or urban plan's performance with respect to sustainability issues. This has twofold value for territories and urban contexts. Firstly, it enables the identification of the strengths and weaknesses of current policies, thereby providing a cognitive framework for understanding the current situation with respect to sustainability. Secondly, it encourages private investment due to the presence of areas with high sustainability criteria.

3.1 Critical Issues and Opportunities

To effectively apply ESG parameters in an urban context, it is insufficient to simply replace the object of investigation by substituting a city for a company. Not all the parameters used to evaluate companies can be directly transferred to the urban environment. Consequently, the adaptation and contextualization of indicators are essential for their meaningful application in urban settings.

The environmental category requires minimal adjustments. The indicators provided by the ESG analysis already permit a comprehensive evaluation of how cities address ecological concerns, including natural resource management, waste reduction, greenhouse gas emissions, and biodiversity conservation. However, expanding the scope of these indicators is advisable, particularly by incorporating a dedicated category for climate change—a factor that has often been overlooked or given superficial consideration.

About the social domain, it presents greater challenges. Many parameters focus on employee well-being and workplace aspects, which are not directly applicable to cities. In order to monitor aspects such as the quality of life of residents, the availability of essential services, social inclusion, community participation and accessibility to infrastructure and services, it is necessary to reconfigure these parameters from an urban perspective.

The governance dimension plays a pivotal role in ensuring that land transformation and management policies are developed transparently and accountably. An ESG analysis of urban projects can facilitate inclusive decision-making processes that engage a wide range of stakeholders, including citizens, businesses, non-governmental organisations and public administrations. While many business-related indicators can be adapted, certain parameters specific to the private sector must be excluded or reformulated for municipal application.

The integration of ESG criteria for the evaluation of territories is still in progress, and no universally accepted protocols have been identified thus far. In financial contexts, companies are assessed using precise, quantifiable metrics that allow for performance rankings and accurate evaluations. Urban planning, however, tends to rely on a more qualitative, generalized approach, where ESG parameters function more as guidelines

for sustainability rather than measurable benchmarks.

In this sense, the measurement of sustainability often relies on established certification protocols, such as LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method) and WELL Building Standard. While these protocols are effective, they are overly weighted toward environmental aspects and often focus on individual buildings rather than broader urban contexts. This has the consequence of undermining social inclusion, community participation in decision-making processes and administrative transparency, which are crucial aspects of the ESG dimension that are not reflected in the metrics of traditional environmental certifications.

3.2 Practical applications

The assessment of sustainability in an urban development plan is inextricably linked to both the disciplinary debate and spatial reconfigurations. This is reflected in urban regeneration projects and processes at the national and international levels.

At the international level, the following are worthy of note (Table 2):

- The Sondgo International Business District (IBD) in South Korea was constructed with the explicit intention of serving as a model for sustainable urban development. The city of Sondgo IBD is equipped with cutting-edge technology, which is designed to attract international companies and investors. Furthermore, the city boasts advanced infrastructure for waste management, mobility, and energy (Sondgo IBD, 2024).
- Masdar City (Abu Dhabi) was conceived as a zero-emission and environmentally friendly city, with ESG criteria serving as a guiding framework for both the design and resource management processes. Masdar City is an ambitious, internationally recognised project that exemplifies the pivotal role of ESG integration in sustainable and economically viable urban development (Masdar City, 2023).

The cases illustrate a focus on the ESG model and its potential integration, although

	Sondgo International Business District	**Masdar City**
Environmental	- Green Infrastructure green spaces to mitigate the effects of climate change - Waste Management advanced waste collection and recycling system - Energy Efficiency innovative heating and cooling systems	- Renewable Energy use of solar energy - Energy efficiency materials with low environmental impact - Water Management water reuse and minimising fresh water consumption - Sustainable mobility soft mobility and electric public transport
Social	- Quality of life high quality services - Connectivity advanced public transport and telecommunications systems	- Quality of life green spaces and services - Community social interaction - Social inclusion disability in particular
Governance	- Urban planning attention to community needs - Innovation research to address urban challenges	- Innovation research and development of new technologies - Transparency community involvement

Tab. 2 - International cases. Integration of ESG model with project strategies. Source: Authors' elaboration, 2024.

it should be noted that these are projects that have been developed from the ground up. In contrast, in Italy, where there is a high rate of disused building heritage, the integration of the ESG Model in urban transformations can stimulate debate about the potential for innovation in urban planning tools.

It is therefore pertinent to cite the Italian experiments of the MIND Milano Innovation District and Manifattura Tabacchi projects in Florence, in which sustainability performance is linked to the theme of housing quality. These projects have been selected in the Italian national context for their ability to integrate ESG criteria in large-scale planning, attracting the attention of the scientific community, as demonstrated by the recent conference on the topic within the 20th edition of UrbanpromoGreen (2).

The case of the Manifattura Tabacchi in Florence, which involved public and private actors, aimed to regenerate and enhance a disused industrial area. The historic buildings were functionally and energetically upgraded, and new community spaces were created to promote social cohesion. However, the Manifattura case in Florence focuses mainly on the regeneration of a disused industrial complex, whereas MIND focuses on the regeneration of a part of the city to become a new metropolitan centre.

The MIND project, developed by Arexpo in the Expo 2015 area, represents a comprehensive urban reconfiguration operation that engages in joint intervention in the MIND, Merlata Bloom Milano and UpTown urban areas through the establishment of innovative public-private partnerships. The urban vision has been informed by ESG criteria throughout the design and redevelopment phases. The underlying premise is that the project should function as a biotechnological district, facilitating convergence of companies, start-ups and business incubators. This choice thus demonstrates how the project transcends the boundaries of the district, aspiring to a central role at the local and regional levels (Bellini, 2023; Lendlease et al., 2022). Furthermore, the assessment does not solely focus on the economic and financial impact, but also aims to establish a zero-carbon district powered by renewable energy, with the objective of achieving carbon neutrality by 2040. This underscores the prioritisation of both the “environmental” and the “social”, “governance” criteria, thereby fostering both tangible and intangible relationships (Table 3). These considerations highlight three key performance indicators (KPIs) (3). (i) economic critical mass, that is to say, the productive capacity of a district; (ii) innovation capacity, that is to say, the ability of a district to generate innovative solutions, products or services of high quality and with a significant impact; (iii) diversity and inclusion, that is to say, the guarantee of equal opportunities and equal access to services for the entire community.

The aforementioned indicators, when considered in conjunction with the redesign of the urban area, serve as an exemplary testing ground for identifying the points of tangency between urban planning and ESG. The MIND project is closely integrated with the surrounding neighbourhood, with a particular emphasis on enhancing accessibility and intermodal options for urban travel. To this end, it proposes the

introduction of low-speed outdoor mobility in the vicinity of health facilities and sustainable indoor electric mobility. Furthermore, in alignment with the principles of the 15-minute city, the project aims to facilitate car-free mobility, thereby addressing the specific needs and vulnerabilities of the community, including those related to disability and air quality. Furthermore, the social aspect of MIND is underscored by the cutting-edge wayfinding (intelligent orientation) system, which is designed to surmount architectural impediments (Lendlease et al., 2022).

However, it is within the domain of governance that MIND demonstrates the greatest degree of innovation through the adoption of the 4P (public-private-people partnership) approach, namely collective governance. This approach enables a departure from market-oriented logic (classic public-private partnerships), moving from a focus on financial efficiency to a consideration of social value, with the objective of fostering a welfare economy ecosystem (Lendlease et al., 2022).

It is evident that the decisions made in the "governance/social" domain have implications for the "environmental" dimension, with the objective of achieving absolute zero carbon emissions by 2040. In order to achieve these goals, MIND is simultaneously working on sustainable buildings with LEED Platinum/WELL Gold certification. This will enable the district to benefit from LEED Cities and Communities GOLD certification. In addition, MIND is focusing on atmospheric emissions from mobility, adaptation and mitigation of climate change risks, as well as waste management. MIND aspires to serve as a pilot urban project, wherein the ecological transition proposals put forth by the European Commission can be tested and implemented. The neighbourhood has been designed in accordance with the standards set forth by the Energy Performance of Buildings Directive (EPBD), which mandates that all new construction be classified as nearly zero-emission buildings (nZEB) (Lendlease et al., 2022).

	MIND
Environmental	- Low-impact buildings (use of sustainable materials and renewable energy generation systems) - Sustainable mobility (cycling and walking areas and public transport infrastructure) - Water management (rainwater and wastewater management) - Green spaces (areas to create healthy urban environments)
Social	- Inclusion (universal accessibility and promotion of diversity) This process refers to the wayfinding project, which provides intelligent orientation to overcome architectural barriers, and the 2121 Programme, which facilitates job placement of prisoners in the Lombardy prison system. - Co-creation and co-production processes (see the Social Innovation Academy and MIND Skills Academy projects, which are oriented towards the promotion of networks and skills development). - Community (creation of a place for exchange and relations)
Governance	- Transparency and monitoring (creation of an integrated dashboard describing the KPIs adopted, the reference metrics and the calculation protocol) - Innovation (research and development of new technologies) - Collective governance (4Ps approach: public-private-people partnership)

Tab. 3 - Integration of ESG model with strategies and project actions in the MIND project. Source: Authors' elaboration, 2024

4. Results

A review of the scientific debate and the use of the ESG approach in experimental practices reveals that it is challenging to ascertain which quantitative factors have been employed, particularly with regard to governance. Although there is an evident orientation towards the sustainability principles of using the three ESG categories, no unambiguous use can be discerned. The failure to adopt standardised ESG parameters reflects a complex reality, which highlights the absence of a shared framework to uniformly apply to urban transformations, as well as the difficulty of applying unambiguous quantitative parameters to projects of a complex nature such as urban planning.

The aim is to integrate these principles in a coherent and systematic manner into urban planning, while maintaining the use of environmental certifications as support tools and developing methodologies to enhance the environmental, social and governance aspects of urban projects. It is intended that urban planning tools will be implemented with the notion of performance. The challenge is to establish an objective and comparable framework for generating value (Croci, 2024) (4). The aim is to utilise ESG criteria to achieve KPIs and develop projects that address climate, environmental and socio-economic challenges. The table 4 presents an initial proposal for the modification and integration of ESG parameters in relation to the urban planning framework, developed from the table provided by EBA.

EBA	Description	ESG in Urban planning	Description
		ENVIRONMENTAL	
Emissions	Total GHG emissions; Emissions of air pollutants; Emissions of water pollutants; Emissions of inorganic pollutants; Carbon footprint; Fossil fuel sectors; Reduction policies or initiatives on the use and production of fossil fuels; Compliance with Paris Agreement targets; Reduction policies or initiatives on emissions	**Emissions**	Total GHG emissions; Emissions of air pollutants; Emissions of water pollutants; Emissions of inorganic pollutants; Carbon footprint; Fossil fuel sectors; Reduction policies or initiatives on the use and production of fossil fuels; Compliance with Paris Agreement targets; Reduction policies or initiatives on emissions
Energy efficiency	Energy consumption intensity; Use of renewable sources of energy	**Energy efficiency**	Energy consumption intensity; Use of renewable sources of energy
Water usage	Water consumption intensity	**Water usage**	Water consumption intensity
Waste production	Production of hazardous waste; Reusability/Recyclability	**Waste production**	Production of dangerous waste; Reusability/ Recyclability
Biodiversity and ecosystems	Soil degradation; Biodiversity and Ecosystem services; High biodiversity value outside protected areas; Operations affecting IUCN Red; List species and/or national conservation list species	**Biodiversity and ecosystems**	Soil degradation; Biodiversity and Ecosystem services; High biodiversity value outside protected areas; Operations affecting IUCN Red; List species and/or national conservation list species
Environmental hazards	Heatwaves; Water scarcity; Floods; Coastal erosion; Wildfires	**Environmental hazards**	Heatwaves; Water scarcity; Floods; Coastal erosion; Wildfires
		Green Development	Nature-based solutions, circular economy, green infrastructure

Tab. 4.1 - Comparison of ESG factors from the EBA report and the integration of ESG factors in urban planning. Source: Authors' elaboration, 2024 (5).

Tab. 4.2 - Comparison of ESG factors from the EBA report and the integration of ESG factors in urban planning. Source: Authors' elaboration, 2024 (5).

SOCIAL			
Community/society	Relations with local communities (networks); Social impact of products and services	**Community/society**	Relations with local communities (networks); Social impact of products and services
Employee relationship/labour standards	Freedom of association and right to organise; Forced labour; Minimum age and child labour; Equal representation; Equal remuneration; Discrimination; Human capital management and employee relations (training and development opportunities); Workplace health and safety.	**Citizen relationship**	Community engagement
Customer relationships	Customer protection and product responsibility; Personal data security and privacy; Rights of customers to obtain information about ESG factors; Quality and innovation in customer relations.	**Social inclusion**	Creating inclusive communities, promoting citizen participation in decision-making
Human Rights	Contribution to human rights Projects	**Accessibility**	Intermodal public transport; sustainable mobility; Presence of high-quality secondary and high schools;
Poverty/famine	Contribution to poverty reduction	**Living quality**	Urban health and safety
		Equity	Reducing social and economic inequalities, promoting equity in access to services and opportunities
GOVERNANCE			
Ethical considerations	Integrity of conduct/conduct frameworks; Values and ethics; Bribery and corruption	**Ethical considerations**	Developing policies to promote social inclusion and overcome the main factors of segregation
Strategy and risk management	Strategy implementation, operational execution and monitoring; Internal controls and risk management policies and procedures	**Investment in technology sectors of the digital economy and services**	Presence of Digital twin; DSS Digital Support System
Inclusiveness	Discrimination	**Social inclusiveness**	Creating inclusive communities, promoting citizen participation in decision-making;
Transparency	Observance of disclosures of information rules and practices	**Reporting Systems**	Environmental classifications, digitisation assessments;
		Multi-level governance	Partnership relations with other municipalities at regional, national and international level; Inter- and intra-regional relations
		Collective governance	Public-private-people partnership
		Redevelopment of building heritage	Relatively high rates for building renovation
		Sustainable finance	Green bold to finance sustainable urban projects, compensation mechanisms to reduce the environmental footprint of urban projects
		Diversified market	Presence of large industrial enterprises and developed service sectors

5. Debate

The integration of ESG criteria into urban planning presents a significant challenge, yet it offers the potential to construct more sustainable, resilient, and inclusive cities. In order to achieve this, it is necessary to move beyond a simple assessment and to transform these principles into concrete actions. Such an undertaking will necessitate a multidisciplinary approach and a long-term vision. The preceding paragraphs illustrate the potential of ESG criteria in urban planning and territorial governance tools. Nevertheless, this potential will only be actualized if they are effectively implemented, striking a balance between sustainability and socio-economic development.

Recent initiatives undertaken by the European Union (EU) and national governments illustrate the capacity of ESG principles to inform not only the assessment of public projects, but also the shaping of financing strategies and the subsequent implementation and management phases. It is evident that the Urban Agenda, as promoted by UN-Habitat, and ESG criteria are concepts that are closely related and complementary. Both are aimed at promoting sustainable and inclusive urban development. The common goals of these concepts include the promotion of social inclusion, environmental protection and good governance, as well as the pursuit of stakeholder engagement and transparency in reporting progress.

The design and regeneration of public spaces must be guided by guidelines that consider both the role of spatial configuration and ESG factors in their provisions for sustainable urban development (Bocca, 2024). In this sense, ESG criteria, in relation to EU funding for the implementation of KETs (Key Enable Technologies), promote the definition of methodologies, frameworks and standards aimed at initiating urban regeneration processes and increasing their degree of sustainability.

Moreover, if sustainability certifications are predominantly at the building scale, it is essential to ensure that investments are profitable and attractive at the urban scale. This can be achieved by issuing Green Bonds to finance sustainable urban projects and by activating compensation mechanisms to reduce the environmental footprint of urban projects. The sustainability of a city is contingent upon a multitude of factors that extend beyond the individual building. These include mobility, waste management, land use and air quality. Consequently, it is possible to upgrade the building stock and to promote a culture of sustainability, as well as to activate sustainable urban regeneration processes. The resulting framework provides a dynamic understanding of processes and how they can act as enablers for city planning, beginning with urban design and urban transformation processes. It can be argued that the introduction of innovative financial instruments represents a crucial step towards the creation of more sustainable, resilient and liveable cities.

This necessitates a re-evaluation of conventional paradigms, with an emphasis on sustainability and well-being, in conjunction with existing urban planning regulations and practices. The aforementioned projects demonstrate that it is feasible to prioritize sustainability, but this necessitates a reassessment of the prevailing operational approach, commencing with territorial governance and the development and management of urban interventions. While the implementation of ESG criteria has thus far been confined to sustainability asses-

sments, the challenge is to integrate project actions that align with ESG criteria with urban planning and spatial governance tools.

Moreover, the principal mandatory ESG regulations are designed to pursue specific environmental, social and governance outcomes, as set forth in the Sustainable Finance Disclosure Regulation (SFDR) (7), as well as possible environmentally sustainable investments in other sectors (8). This necessitates an interdisciplinary competence on the part of the institution for the implementation of European directives, in order to: (i) reinforce the strategic dimension of plans by encouraging urban regeneration processes; (ii) overcome cascading planning in favour of a coherence criterion.

Furthermore, the involvement of stakeholders in the context of urban development necessitates the co-creation of solutions for the definition of sustainability objectives, with the objective of establishing a broader and more inclusive consensus around urban development projects. In order to increase transparency in decision-making, this approach requires the implementation of accessible and user-friendly data, economic reporting procedures and participatory decision-making processes.

The strategic planning of urban and territorial regeneration processes will be supported by the integration of urban, environmental and economic factors, facilitated by the use of advanced analytical tools. In accordance with this rationale, the notion of conformity is transcended to articulate novel forms of value in alignment with the principal European directives (9). In this regard, the utilisation of digital representations of the built environment can facilitate the monitoring of both the planned and actual built environment, due to the integration of data sets and the support of inter-port activities (Sinead, 2024). This necessitates the establishment of conditions conducive to "strategic urban agility" through the integration of a flexible approach into the regulatory, planning, design, and operational dimensions of urban regeneration processes (Dall'Orso, 2023; Sendra, Sennett, 2021). Although this is readily applicable in urban planning instruments such as the Sustainable Urban Mobility Plan (SUMP), the Sustainable Energy and Climate Action Plan (SEAP), the Urban Green Plan, and the Climate Change Adaptation Plan, the issue remains to be explored in the drafting of general urban plans and implementation plans.

The incorporation of ESG criteria presents a significant opportunity. The incorporation of these criteria into urban planning can facilitate the attraction of sustainable investments, enhance urban resilience, and advance more equitable and inclusive urban development. The incorporation of ESG criteria into urban planning processes would facilitate a multidisciplinary approach, enable the setting of quantifiable targets and promote coherence between different policies, thereby addressing climate challenges. Recent research has highlighted the complexity of the relationships between the phases of a project (planning, construction, life cycle) and its multidimensional impact (10). This scenario presents a challenge to those involved in urban regeneration (policy makers, investors, planners) to rethink their approaches (Cadamuro Morgante, Oppio, 2022).

6. Conclusions and research perspectives

The preceding section highlighted the difficulties associated with the application of ESG criteria in the context of urban planning and spatial governance instruments. The need for an innovative planning system that can facilitate sustainable and resilient urban regeneration requires a convergence of policies affecting land governance across sectors and institutions (Ricci, Mariano, 2022).

Furthermore, urban areas are undergoing a rapid digital transformation, which is enabling the development of innovative technologies and citizen services in novel ways. The integration of digital twin technology with ESG requirements represents a promising avenue for enhancing decision-making support in the implementation of new urban infrastructure (Kljaić et al., 2024). This is connected to the awareness of AI issues and, as a result, the capacity and procedures used to assess the impact of adopted environmental and social sustainability and regeneration policies. It is thus imperative to identify the material issues and metrics to measure them (Minkkinen, Niukkanen, Mantymaki, 2024). The aforementioned cases illustrate how the EU taxonomy and European sustainability reporting standards can serve as the basis for a consistent and granular collection of information. This information can be integrated into digital twins to serve as a multipurpose sustainability data platform (Dovolil, Svitek, 2024).

However, urban plans, which are often shaped by external intervention choices, may prove to be among the least effective factors in determining the configuration of spaces (Mascarucci, Bocca, 2024). This underscores the importance of studying how specific actions, evaluated through analytical tools such as ESG criteria, influence the processes of configuration of territorial and urban space.

The recent period has been characterised by the expansion of the green bond market and the potential for greenwashing. In this context, the measures set out in the PNRR (National Recovery and Resilience Plan) represent the principal operational framework for the advancement of ESG principles with a view to a gradual decarbonisation (net-zero). The challenge is to translate this approach from the corporate domain to the real estate sector, and indeed to the territorial scale, without compromising its effectiveness.

The integration of ESG principles can facilitate the overcoming of cascading planning, thereby strengthening the strategic dimension of urban plans in accordance with the principles of reuse, urban regeneration and sustainability. The objective is to establish new connections between ESG assessments and public value, thereby initiating monitoring and sustainable development processes for territories and cities. This entails identifying the synergies and trade-offs between the various dimensions of sustainability. This approach allows for the evaluation of investments in urban regeneration processes, social sustainability to be easily compared with EU requirements and directives, as well as risks. This would not only ensure efficiency, but also reduce risks and improve the standards of design processes.

In this regard, the proposed EU instruments, including green public procurement (13) and sustainable public-private partnerships, establish the integration of ESG parameters as a fundamental aspect of the implementation of urban projects and services. Consequent-

ly, the success of urban development hinges on the ability of local authorities to adopt a forward-thinking approach that encompasses the formation of novel collaborative partnerships. The incorporation of ESG criteria into the strategic dimension of urban planning instruments and the utilisation of the institution of urban compensation can facilitate greater flexibility in urban plans at each institutional level. This necessity is driven by both public policy objectives and market demands. The adoption of sustainable principles facilitates the exploration of numerous opportunities, including: (i) the reinforcement of the strategic dimension of urban plans (reuse, urban regeneration, land consumption) and (ii) the advancement of the urban planning function, which is not only capable of planning but also of assessing the impact of projects on the basis of environmental, territorial, economic and financial sustainability.

The effectiveness of the ESG system in urban regeneration projects depends on its ability to adapt to the specificities of each context. When applying these criteria to public administrations, a more structured approach based on indicators aligned with the EU taxonomy is needed to evaluate plans, programmes, policies and strategies. The future challenge is to identify performance criteria to trigger public-private partnerships aimed at initiating urban regeneration processes and designing innovative urban planning instruments. In this sense, the use of AI can help to identify and proactively address risks related to climate change, where ESG factors - according to algorithms and predictive models - promote sustainable finance and value creation objectives.

The concept of sustainable urban planning is not static; rather, it necessitates a flexible and adaptive approach that can respond to the challenges posed by climate change and the needs of local communities. Moreover, the incorporation of new financial instruments, in conjunction with environmental compensation mechanisms, represents a strategic lever for incentivising investment in sustainable urban regeneration projects. This comprehensive approach enables the interests of stakeholders and communities to be duly considered in relation to contemporary issues and incorporated into the project. The contribution posits that through a multi-actor, multi-disciplinary and multi-scalar approach, open spaces can be regenerated from present environmental resources and components as a driver for sustainable development. The integration of environmental, social and governance considerations into urban planning decision-making processes would facilitate the achievement of equitable, inclusive and environmentally friendly urban growth, thereby ensuring that cities can address climate challenges in an effective and supportive manner.

Endnotes

1. The term "stakeholder engagement" is defined as the systematic process of involving an organisation's key stakeholders on matters of relevance. For further details, please refer to the following source: Paravano, Locatelli, Trucco (2024).

2. For a comprehensive analysis of the two case studies, please consult the conference proceedings of the 20th edition of UrbanpromoGreen-Progetti per il paese, held on 7 November 2023 in Florence. The conference, entitled "ESG Criteria and Tools for Spatial Planning and Governance: Reflections on Experiences, Opportunities, Risks and Challenges," will feature in-depth discussions on the aforementioned case studies. In addition to presenting a number of case studies, the workshop examined the relationship between ESG criteria and urban planning tools at various scales. In particular, it analysed the potential

impact of the ESG approach on urban attractiveness, sustainability and inclusiveness. [https://urbanpromo.it/2023/eventi/esg-e-strumento-di-governo-del-territorio/].

3. A KPI (key performance indicator) is defined as a performance indicator for evaluating the success of a project or programme. KPIs provide a focus for strategic improvement on an analytical basis, thereby facilitating improved decision-making (Weilkiens et al., 2016; KPI, 2022).

4. For further details, please refer to the report by Croci E. (2024), 'Measuring ESG criteria at the urban scale', published by the Green Building Council Italia on 21 March 2024. [https://gbcitalia.org/wp-content/uploads/2024/03/GBCESGCroci.pdf#page=5.00]

5. The table presents a comparison between the ESG factors identified by the EBA and potential additional factors that could be included to enhance the applicability of these factors within the context of urban planning. The table was compiled by the authors using the following sources: EBA (2021); Guo and He (2024); Rossinsky (2024).

6. This section will examine the evolution of the sustainability rating system, from the initial versions of BREEAM, LEED and CASBEE, up to the most recent certifications, including CASBEE Urban Development, BREEAM Communities, LEED Neighbourhoods, Green Star Communities, LEED for Cities and LEED for Communities.

7. In this context, reference is made to EU Regulation 2019/2088, which establishes the regulatory framework for sustainability reporting in the funded services sector.

8. The Taxonomy EU Reg. 2020/852 is referenced, as it proposes a framework for defining an activity as genuinely eco-sustainable and for facilitating sustainable investment.

9. This document refers to the 2015 Paris Agreement, the European Nearly Zero Energy Building (NZEB) Directive, the 2010/31/EU Energy Performance Building Directive (EPBD), and the Green Deal ecological and energy transition framework.

10. The research project, entitled “ESG framework for sustainable urban regeneration”, was developed by the SUR Lab (Sustainable Urban Regeneration Lab, Bocconi University) under the scientific direction of Prof. Croci Edoardo. Further details may be found at https://surlab.unibocconi.eu/publications/sur-lab-position-paper-series

11. Bonds can be classified according to their nature. Green bonds are designed to finance projects with a positive impact on the environment. Sustainability bonds, meanwhile, are intended to improve education, health and gender equality. Sustainability-linked bonds represent an innovative tool for aligning financial interests with sustainability interests. Social bonds, in contrast, combine financial return with social return. Finally, transition bonds are designed to finance the transition to more sustainable, low-carbon practices (Bellini, 2023a).

12. For further discussion, see Donato L. (2022), 'The long march of ESG factors. Between regulation and the market', Bancaria, no. 3, pp. 35-46. [https://www.astrid-online.it/static/upload/04-d/04-donato_35_46.pdf]

13. Green Public Procurement (GPP) represents an instrument of environmental policy that is designed to foster the development of a market for products and services with a reduced environmental impact. This is achieved through the leverage of public demand, thereby contributing in a significant manner to the realisation of the objectives set out in major European strategies, such as the Resource Efficiency or Circular Economy strategies. [https://gpp.mite.gov.it/Home/CosaEGPP]

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