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# URBAN PLANNING AND THE ENVIRONMENTAL DIMENSION: TOWARD THE SUSTAINABLE NEIGHBORHOOD

*Emily Jones*

*This paper reflects on the idea of the environmentally sustainable neighborhood and situates it within the broader scientific and technical debate on how environmental concerns are reshaping contemporary urban planning. It links this discussion to the pressing and unresolved challenge of urban peripheries—an issue that has become increasingly urgent and can no longer be deferred when upgrading existing cities. In the context of growing sustainability demands, environmental performance is presented as a prerequisite for effective interventions in the compact city. The planning logic of these peripheral areas—dominant in scale within many Italian settlements developed during the post–World War II period—remains deeply influenced by the research and principles of the modern architectural and planning movements, which assigned the neighborhood a central role in urban form and organization. Building on this legacy, the paper outlines and discusses key characteristics that sustainable neighborhoods should embody to guide redevelopment strategies for existing urban fabrics as well as plans for reconstruction or new development from scratch.*

*Index Terms* — urban planning, urban sustainability, metropolitan area, town, quarter, up-grading

## TOWN PLANNING AND THE ENVIRONMENTAL DIMENSION

The economic model that took shape with industrialization has profoundly altered ecological balances and accelerated large-scale environmental change. Air and water pollution, deforestation, desertification, coastal erosion, and the expansion of settlements and infrastructures all contribute to systemic risks that are also visible at the scale of urban planning. In response, urban and regional planning have progressively revised their conceptual foundations, placing environmental considerations at the core of territorial regulation.

Cities concentrate a substantial share of the world's population (about half globally and a much higher proportion in Europe), and demographic trajectories indicate that urbanization will continue to intensify. Urban areas consume vast quantities of resources while generating equally large volumes of waste [1]. Their ecological footprint therefore extends far beyond municipal boundaries, influencing regional, national, and even planetary systems. For this reason, the pursuit of sustainable development and environmental justice must be addressed decisively within cities.

Energy policy is central to this transition. It requires coordinated action at multiple scales: top-down strategies such as national energy planning and regulatory frameworks, and bottom-up measures grounded in local best practices and monitoring of building energy use. The enforcement of energy certification requirements for buildings (e.g., Directive 2002/91/CE) reflects this shift, enabling incremental reductions in the impacts produced by both small and large settlement units. Although urban areas occupy a very small fraction of the Earth's surface, they account for a disproportionately large share of anthropogenic carbon emissions [2, 3, 4]. Consequently, planning logics rooted solely in classical economism are increasingly insufficient; the search for alternative settlement models and environmentally robust planning paradigms has become necessary.

Parallel to this evolution, economic theory and practice have begun to reassess long-standing assumptions, as evidenced by the emergence of ethical finance, expanded debate on environmental damage valuation, and the growth of the third sector (non-profit and social-utility organizations). These developments, while uneven, signal a broader reorientation toward models that better integrate social responsibility and ecological limits.

Recognizing sustainability as the combined outcome of economic, social, and environmental dimensions—and the complex feedbacks between them—this discussion emphasizes the environmental component as a key driver for redefining spatial planning approaches [5]. A practical implication of this shift concerns the choice of scale. Much of the postwar residential stock in Italy was produced through modernist planning logics that decomposed settlement structure into increasingly small functional units and then reassembled them into larger urban aggregates. Within this framework, the neighborhood (quarter) scale can be interpreted as a critical interface: it lies between the largest architectural unit and the smallest meaningful urban unit, while also exhibiting internal complexity. Investigating environmental sustainability at this scale can therefore align planning interventions with the "genetic code" of urban parts and increase the likelihood of successful implementation [6, 7, 8, 9, 10].

## IDENTIFYING ENVIRONMENTAL SUSTAINABILITY CRITERIA: A METHOD SUGGESTION

A practical way to define what makes a neighborhood environmentally more sustainable is to examine realized projects and extract the features that recur across successful cases. This approach assumes that operational practice often embodies a productive synthesis between scientific research and the concrete questions posed to territorial planners. Accordingly, a set of European neighborhoods representative of typical and/or paradigmatic sustainability models were selected and analyzed to identify criteria that are not overly dependent on local specificities.

*Analytical Grid and Comparative Reading*

After selecting the cases, each neighborhood was examined using a structured “analysis card” (reading grid) to enable both case-by-case description and cross-case comparison. The grid is organized into three components:

1. Key contextual data (location, year, designer/planner, size, population, etc.);
2. Description of the neighborhood’s spatial and functional characteristics;
3. Sustainability criteria implemented in planning, design, and construction.

Filling the cards clarified which sustainability features were actually adopted and how they were operationalized. A comparative reading then highlighted a set of recurring features with limited dependence on the individual context.

*Recurring Sustainability Features*

Across the analyzed neighborhoods, the most recurrent sustainability features include: compact settlement form; high residential density without excessive building height; preference for line and open-court typologies; functional mix (housing, productive uses, tertiary activities); adequate service provision; high-quality open spaces; attention to vulnerable users; protection and provision of green/open areas; reduced reliance on private cars; efficient public transport; prioritization of walking and cycling; energy-consumption control; integration of renewable sources (solar, photovoltaic, wind); low-consumption buildings; eco-compatible materials; rational management of natural resources (water, soil); reduced air/noise/soil/water pollution; reduced waste generation; increased waste separation; and maximized recycling.

To structure these elements, they can be grouped into four macrocategories:

- **Morphological and functional organization;**
- **Emission control;**
- **Waste-cycle management;**
- **Energy consumption and production.**

**Morphological and Functional Organization**

This category concerns the integrated configuration of buildings and open spaces (public and private), including the technical attributes that shape ventilation, runoff, solar exposure, mobility, orientation, and building energy performance. Because environmental performance is strongly influenced by overall arrangement, morphological organization also affects aesthetic quality and residents’ satisfaction [11]. A compact urban form is emphasized as an alternative to sprawl: it limits excessive land consumption, improves access to services, supports local economic vitality, and reinforces street identity by enabling the coexistence of slow mobility, vehicles, and everyday activities in a coherent urban mix. Residential density can be achieved either through high-rise buildings or through block-based fabrics; the latter is favored due to improved conviviality, security, manageability, and potential sustainability. “Solar block” configurations (staggered blocks) are highlighted for their ability to support microclimatic performance by aligning roads and public spaces with seasonal ventilation patterns and by separating or integrating pedestrian networks in ways that strengthen accessibility and comfort [12].

In addition, clear functional legibility (easily readable edges and role differentiation), building typologies with moderate height (typically two to four stories), and open-court fabrics are described as supportive of sustainable neighborhood performance. Well-designed public spaces should be accessible (often within a walkable radius), attract social activity, and build a sense of belonging. Green areas should form ecological belts that protect valuable environments and improve microclimate through shading, cooling, humidification, and winter ventilation, while also mitigating air and noise pollution. Finally, functional mix is recommended, ideally integrating residential and productive activities within the same urban fabric, and sometimes within the same building.

### Emission Control

Environmentally sustainable neighborhoods should include protected areas for social interaction and play, located away from heavily trafficked roads and not enclosed by tall buildings that block ventilation. In traffic-intensive areas, vegetation barriers can reduce noise, separate pedestrian and vehicular networks, and contribute to air-quality improvement. Building projections may also reduce noise reverberation [13].

### Waste-Cycle Management

Sustainable neighborhoods aim to reduce per-capita waste generation, recognizing the linkage between consumption patterns and waste growth. High levels of waste separation are encouraged (with targets on the order of at least 30% in the source discussion), coupled with recycling strategies and on-site composting solutions that can produce usable compost and reduce reliance on landfills [14].

### Energy Consumption and Production

Energy performance remains one of the most challenging dimensions, as building operation accounts for a large share of total consumption. Reducing impacts requires interventions at both the building and neighborhood scales: optimizing solar gains, daylighting, and natural ventilation through spatial arrangement, and treating buildings as active energy systems. Commonly cited strategies include high-performance envelopes (e.g., ventilated double-skin glazing for thermal insulation), ventilation chimneys to support natural airflow, green roofs to expand urban greenery and moderate seasonal temperature swings, photovoltaics integrated into roofs and street furniture elements, and solar thermal panels for domestic hot water [15].

Overall, this method—grounded in comparative analysis of implemented European cases—provides a structured pathway for deriving actionable environmental sustainability criteria at the neighborhood scale, supporting both new development and the requalification of existing urban fabrics.

## CLOSING CONSIDERATIONS

Enhancing the sustainability of existing settlements through requalification requires planning approaches that prioritize well-founded technical decisions. Such choices should promote responsible use of resources and energy, reduce pollutant emissions, mitigate environmental risks, and improve the performance of both built forms and open spaces. Contexts where town-planning and environmental requalification can be implemented most effectively include urban peripheries, metropolitan fringes, and highly urbanized rural areas [16]. These settings often function as “non-places”—spaces marked by diffuse deterioration and limited service quality—but they are also precisely the territories seeking new planning paradigms through which they can acquire recognizability and autonomy, differentiating themselves from consolidated historic cores.

A productive strategy for these areas is to treat difference as an asset: rather than merely attempting to replicate the qualities of historic centers or compensating for perceived deficiencies, planning can build identity by valuing local resources and distinctive traces of place. In many peripheral and dispersed suburban landscapes, remnants of recent agricultural structures or protoindustrial systems remain visible. Instead of forcing continuity as a strict reproduction of these origins, requalification can reinterpret such traces as resources that enable new spatial configurations [17].

The renewed demand for environmental quality introduces new urban questions involving relational systems, spatial availability, and patterns of expansion. A key lever for achieving higher-quality urban outcomes is the integrated practice of urban design, architecture, and building planning, capable of identifying updated quality indicators on which spatial decisions can be based [18]. Technological innovation also plays an important role, particularly where it supports bio-architecture, sustainable construction, and eco-efficiency in building forms.

Evidence from neighborhood-scale sustainability initiatives suggests that the strongest “multiplier” effects emerge when building-level decisions are coordinated with broader town-planning choices. The neighborhood (quarter) scale is especially valuable because it enables a systems approach: it is large enough to capture interactions between buildings, public space, services, and mobility, yet contained enough to allow planning, implementation, management, and monitoring to be feasible. At this scale, it becomes more realistic to establish and oversee operational systems and performance controls (e.g., water and energy use, noise mitigation, waste separation, vegetation strategies for open spaces, and the involvement of residents and stakeholders), while also evaluating how these measures influence urban change within its cultural, social, and economic contexts.

Achieving these objectives demands both continuity with disciplinary foundations and, crucially, the integration of innovations that embed environmental knowledge within physical planning. In recent years, sustainability provisions have increasingly been introduced into building regulations as short-term, achievable measures. While useful, such rules are unlikely to generate substantial improvements unless they are embedded in coherent spatial planning frameworks: long-term logics at the city scale, and especially actionable, shorter-term logics at the neighborhood scale, where combined interventions can reinforce one another and create measurable cumulative gains [19].

The planning system has also been shaped by European requirements on Strategic Environmental Assessment (Directive 42/2001), incorporated into Italian regulations through environmental legislation that conditions the effectiveness of plans and programs on the verification of environmental compatibility. This constitutes another indicator of the growing environmental dimension of planning. However, in existing urban contexts, the weakness of indicator sets can limit effectiveness precisely where sustainability challenges are most acute.

As a reference model for environmentally improved settlement, the compact city has re-emerged as a dominant alternative to the dispersed-development model that characterized many recent decades. Sustainability imperatives have further contributed to the evolution of planning standards through the introduction of so-called environmental–urban standards. These standards both replace outdated prescriptions and support more appropriate calibration of settlement burdens and environmental supply. Among the key innovations are:

- parameters that express environmental carrying capacity, including redefinitions of conventional indices through the integration of soil-permeability measures and resource-consumption indicators;

- parameters that express planning (urban) carrying capacity, measured through mobility loads and infrastructure-system stress;
- a revised role for green belts, no longer primarily ornamental but functional, including ecological corridors that improve microclimate and overall quality of life;
- sizing of naturalistic equipment to mitigate noise impacts and to protect sensitive settlement typologies;
- typologies and procedures for reclaiming contaminated soils and polluted waters;
- improvement rules for sewerage and water-supply systems to increase environmental compatibility;
- defined availability levels and operational criteria for major conversion and redevelopment areas.

Where traditional plans often attempted to halt visible physical deterioration—sometimes treating decay as if it were detached from socioeconomic causes—a contemporary sustainability-oriented plan must instead be grounded in integrated procedures. This implies combining established planning analysis with cycle-based assessments, acknowledging limits to growth, treating settlements as living urban systems, valuing the self-determination of local communities, and orienting action toward urban quality.

In this framing, urban planning becomes part of a more complex and multi-layered planning process that addresses not only built elements but also the interactions between systems and environments, from the city to the wider anthropized territory. Intervention possibilities depend on the transformability of environments—their capacity to change—which can be understood as evolving or as restoring. In an "evolving" approach, interventions address altered balances and aim to activate corrective dynamics while recognizing that, in complex systems, cause–effect relationships are not always directly predictable. In a "restoring" approach, interventions seek to remove or counteract the direct and indirect causes of decline through landscape and environmental restoration.

Recent environmental rules push ecological standards to ambitious levels (for example, requiring substantial shares of private land to remain green), limit the proportion of impermeable public and private surfaces, and encourage the ecological compatibility of productive activities in agricultural zones. More broadly, the emerging axioms of physical planning shift away from an urban-centric, additive, quantity-driven notion of expansion—growth without development—toward integration between the built city and nature. Key objectives include reducing soil consumption and resource depletion, developing urban and territorial networks of parks and gardens, verifying and improving the water cycle, reclaiming and requalifying both historic and contemporary urban fabrics, and actively protecting and valorizing historical, architectural, landscape, and environmental resources as foundational components of quality-oriented planning.

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Emily Jones, School of Design, California State University Long Beach, Long Beach, CA 90840, United States; emily_jones@csulb.edu

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