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Sustainability Assessments of Peri-Urban Areas: An Evaluation Model for the Territorialization of the Sustainable Development Goals

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Abstract: This research tests a sustainability assessment based on the 2030 Agenda's Sustainable Development Goals (SDGs) through a process of their territorialization and implementation. This process enables the development of a spatial decision support system (SDSS) that can be integrated with strategic environmental assessments in urban planning. The assessment takes place on the transversality of the sustainability concept, considering the three dimensions (environmental, social, and economic) in a single assessment through the spatial sustainability assessment model (SSAM) by integrating geographic information systems (GIS) and multicriteria analyses. Economic development, social equity, and ecological integrity represent the three common visions for rethinking peri-urban edges. The choice of key indicators is due to the possibilities for action of urban plans and the vision of SDG 11a, which aims to support 'positive economic, social, and environmental links among urban, peri-urban and rural areas by strengthening national and regional development planning'. In addition, they were selected to be representative of sustainable planning processes in the peri-urban area. In recognizing the limits of urban expansion processes, in the peri-urban area, it is necessary to promote a different growth based on agri-environmental values, the production of biodiversity reserves and corridors, new models of inhabiting open space, and the consolidation of civic and collective uses. The paper tests the assessment methodology in two urban plans of the Metropolitan City of Naples that address the development of the peri-urban area with different strategies. This provides insight into how to support decision-making processes so that economic development, social equity, and ecological integrity represent three common and integrated visions to enable development that is consistent with SDGs. The results show that it is possible to identify trade-offs among the three dimensions. In fact, where there are environmental subtractions necessary to accommodate peri-urban land-relation functions, these are offset by the social values of collective use and by the values of the current economy that aim to redistribute present resources.

Keywords: sustainability assessment; Sustainable Development Goals; 2030 Agenda; peri-urban fringe; multidimensional indicators; evaluation tools; sustainable development; spatial decision support system

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1. Introduction

The experimentation carried out in this paper is aimed at territorializing the 2030 Agenda for Sustainable Development, which was adopted by all United Nations member states in 2015, to support planning processes in peri-urban areas.

Territorialization is a process of implementing the goals and targets of the 2030 Agenda. It is aimed at analyzing and spatially explicating the multiple values and relationships of the spatial context within the community and the linking social, economic, and environmental aspects. This process makes it possible to develop a spatial decision support system (SDSS) that operates, in the context of this research, as a sustainability assessment model, as it enables the evaluation of urban planning forecasts in compliance with sustainable development goals (SDGs).

The sustainability assessment has been called the 'third generation' of impact assessment, following the environmental impact assessment (EIA) and strategic environmental assessment (SEA) [1,2]. It emerged simultaneously from different disciplinary fields, such as planning and natural resource management [3]. Although all environmental evaluation instruments have sustainable development issues as their underlying aim [4], the sustainability assessment has the specific purpose of orienting decision making toward the achievement of development goals in integrated dimensions [5]. In order to not make the assessment simply theoretical, it is necessary to build coherence between sustainability goals and the capacity for action or transformation of the instrument being assessed. By doing so, a direct relationship with the planning instrument is established, which makes it possible to identify key indicators for evaluation.

Sustainability is a cross-cutting concept that affects the environmental, economic, and social dimensions of a society. Today, a widely accepted definition of sustainable development is contained in *Our Common Future* (1987), better known as the *Brundtland Report*, of the World Commission on Environment and Development (WCED) of the United Nations Environment Program (UNEP). This paradigm constitutes the backbone of a debate that has been a priority since the 1970s with the *Limits to Growth* report of 1972 and had important continuations in *Carrying Capacity* by W.E. Rees (1992) or the *Millennium Ecosystem Assessment* (carried out between 2001 and 2005). The latter, assuming economic value as an impact gradient, described how ecological characteristics, functions, and processes, which directly or indirectly contribute to human wellbeing, have undergone such alterations that the world's economies are unable to compensate for the ecological debt. From the unraveling of a development model incapable of adapting to the scarcity of resources emerges the need for a notion of sustainability embedded in the link between the satisfaction of human needs and intergenerational responsibility that evolves with the analytical experimentation of tools and methods. This allows for continuous theoretical advances, guiding practices, experiments, or analytical models committed to repositioning society. It also guides the outcomes of generalized urbanization in new relationships of meaning that allow for an integrated development that does not consider nonhuman nature as external or the environment as a passive system of resources.

In this perspective, it is necessary to consider the city as an ecological process in which human and nonhuman entities mix and relate. This has led to the idea of 'urban assemblage' in the field of city studies; the city is no longer understood as a whole but as a multiplicity of components [6]. In particular, the notion of urban assemblage interprets space as a 'relational effect' rather than a 'structural context'; therefore, it is necessary to move from the space of the city to the multiple urban assemblages in which urban typologies are formed and reformed. The consequence of this is the redefinition of democracy toward participatory practices that could recognize and represent human and nonhuman entities as social actors [7], as well as the integration of 'expert knowledge' and 'common knowledge', which highlights different values and evaluation criteria in decision-making processes [8].

The operationalization of these concepts and the consequent territorialization of concrete actions take place within decision-making processes. From the urban assemblage perspective, the various actors involved in decision-making operate and decide under conditions of uncertainty, and the decisions themselves may be delayed due to various concomitant factors that are difficult to predict [9]. Multicriteria analyses turn out to be a useful approach to activate an effective decision-making process that is open to different forms of participation. Integration with geographical information systems (GISs) is particularly useful for sharing available information and using it in decision-making processes and to set objectives and evaluation criteria in advance. Therefore, the concept of sustainability, in its substantive meaning, persists in an unresolved tension in the perennial search for a balance between the prevalence of environmental needs and the demands of economic and social development. The debate has addressed the question of whether environmental protection and development are separate from each other in order to ascertain whether environmental protection is ancillary to development or, conversely, development is instrumental to environmental protection [10]. By claiming the lexical priority of ecological rationality over economic, social or political rationality, ecological values deemed inferior can come into play for a full value [11]. By balancing the domains of development, it is possible, by means of place-based approaches, to bring sustainability back to a relationship to be conceived in terms of dialectical unity, which cannot be defined singularly or categorically but must be determined on a case-by-case basis due to differing contexts [1].

In the specific case of the peri-urban context, it is possible to imagine a novel proposal for sustainability because this space is dependent on both urban and rural culture [12]. The peri-urban area can represent the ideal space on which to build a debate and experiment a balance between the multidimensional divarication of sustainability. This opportunity is provided by the rethinking of linear/reductionist functioning based on a perpetual growth paradigm in favor of the implementation of a coherent local landscape with potential for collective use, comprising the social value of open space, as well as ecological and productive enhancement [13,14]. The renunciation of the local, in order to modernize the context, has led to extensive regionalization processes that have meant a rejection of the world that one claims to inhabit [15]. In the geosocial issue also highlighted by the 2030 Agenda, spatial justice is certainly a key. Recovering proximity represents an opportunity for an alternative economic development, which seeks to start again from the present resources of agriculture and the economies of open spaces engaged in the attempt to combine social and economic wellbeing with quality of life [13,14].

Therefore, the peri-urban landscape can represent the context where solutions matter significantly for both people and nature [16]. Its regional connections, as well as the wide availability of open and public spaces connected to operational landscapes, not only support biodiversity but also provide cities with the essential ecosystem services they need [17] through a redefinition of space according to the co-construction of community densities, shortening supply chains, and recycling.

The 2030 Agenda is the interpretive lens of the sustainability assessment model. On the model of *Agenda 21* (1992) and the *Millennium Development Goals* (2002), it implements the search for a balance by means of cooperative, quantifiable, and comparable tools, to be understood in the concrete network of relationships among the different dimensions: environmental, social and economic. It addresses geosocial and intergenerational issues that confront the contrasts that have characterized modernity (i.e., nature as an 'infinite bounty' and the economic system as the 'horn of plenty' [11]). The 2030 Agenda is structured to have both a global, qualitative view of development issues through the 17 goals (SDGs) and a local, quantitative view through the 169 targets and the 244 indicators. SDGs represent a valid framework for implementing the assessment, by means of representative, comparable, and relevant indices and indicators to assess and monitor transformations in multidimensional terms, setting targets in time and space that are necessary to achieve the desired sustainability conditions.

The 2030 Agenda's indications imply a regeneration of the peri-urban fringe in ecological terms in a dialectical relationship between different density gradients and functions, within planning and development processes understood in the sensitivity of the contextual limits of territories. In fact, SDGs place biodiversity and urbanization in the same frame of reference. The former, in Goal 15, stated that, by 2020, ecosystem and biodiversity values should be integrated into national and local planning and development processes. The latter, in Goal 11, states that positive economic, social, and environmental linkages should be sustained between urban, peri-urban and rural areas by strengthening national and regional development planning.

This paper highlights a spatially explicit methodology for assessing sustainability through the lens of the 2030 Agenda by integrating multicriteria techniques.

The difficulty of experimentation is due to two issues. The first concerns the statistical approach of the assessment of targets and indicators in the 2030 Agenda, which is not always spatially explicit. The second difficulty is related to the need to identify indicators and values that can represent sustainability issues within the peculiarities of urban planning instruments and can thus answer 'How can I objectively know whether sustainability goals are being met or ignored?'

The main objective of the paper is to develop an assessment methodology that can help to make sustainability issues spatially explicit and quantified within environmental assessments aimed at peri-urban contexts, where there are strong pressures of urban sprawl. This is possible through the selection of key indicators that can both relate to the real possibilities of the actions of urban plans and summarize the complexity of SDGs. Moreover, the methodology and results are intended to contribute to the debate on the values for human activity to be compatible with the conditions for sustainable development. The methodology seeks to structure a replicable and implementable process. The results demonstrate the effectiveness of the implementation process between the 2030 Agenda and peri-urban territories, whereby greater expropriations of contextual values result in a greater distance from a condition of ideal sustainability. In fact, this condition is visible in the assessment in which the urban design includes a relational dimension of ecological and social values.

2. Materials and Methods

2.1. Study Area: The East Naples Peri-Urban Fringe

The peri-urban space appears as the dominant urban form and challenge of contemporary socio-spatial planning [18]. The focus on these areas is due to different levels of complexity transited by other disciplines and knowledge that have fertilized and flanked the urban question with the environmental question, as well as landscape integrity and ecological relations. Moreover, these areas represent landscapes in transition aimed to consolidate urban characteristics at the expense of agri-environmental values.

There are many definitions associated with the peri-urban context. The common characteristic of the many different types of space that are considered peri-urban is that they are transitional spaces with a certain mixture of urban and rural uses, resulting in a varied nature of the territory [19]. This degree of mixture is conditioned by the many overlapping and constantly changing variables (e.g., character, structure, thickness, prevalence of land use, way of occupying the space, and environmental processes), by the degree of belonging to the two reference sets (urban and rural), by the levels of gravitation (dependence/attraction) with respect to one or more centers, and by belonging to more or less structured metropolitan systems [20].

Nevertheless, there is a particularly strong difference between the peri-urban areas of developing countries and those of the developed nations of Europe. The former are characterized by poverty, environmental degradation, and informal settlements. The latter, to which this study refers, are characterized by low levels of mobility, economic performance, landscape integrity, and environmental quality [21].

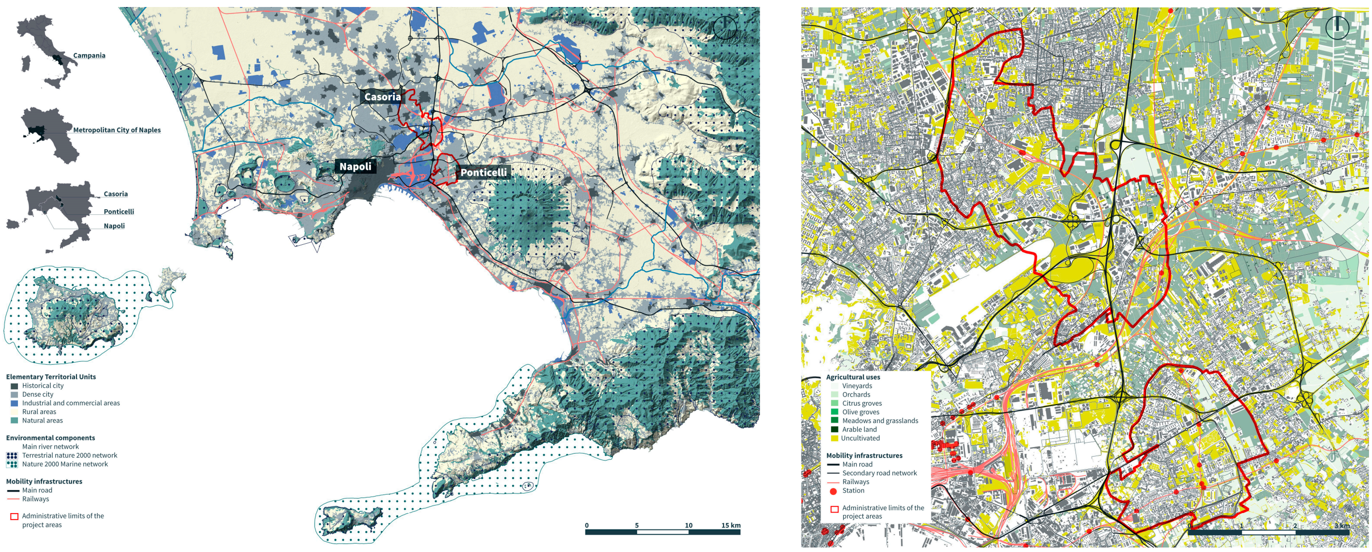
This second typology of peri-urban areas highlights the result of the multipolar organization particularly evident in large metropolitan areas where the residual space is set as a frontier for greater competitiveness to the urban area that no longer holds a single center [22]. They are the product of processes of regionalization of the urban in which these new urbanization strategies determine an extended spatial configuration in which not everything is 'urban' but everything is 'urban-driven' [23]. In pockets of what used to be considered the countryside, a disjointed, additive, stratified and light patchwork extends a 'constitutive outside' [24] influenced by successive structural adjustment programs, land expropriations, agro-industrial consolidation and ecological plunder [23]. These are processes of spoiling that accumulate the resources (agrarian, environmental, and social) and then the expropriation of the capacity to reproduce them to make way for service infrastructures [25].

This 'third territory' of difficult delimitation is placed halfway between urbanity and rurality [26], plays the role of a 'bridge-space' between density and rarefaction [27], and varies in size and nature according to the increase in urban pressures [28]. It is an indeterminate space, no longer considered nonurban, linked to dissipative logics or the functional decentralization of informality and waste of urban functioning.

The degradation of prime agricultural land, the deprivation of soil from tree density and the water pollution in peri-urban areas result from rapid urbanization which should be reread within the concept of ecological footprint [29] or planetary boundaries [30], aiming at recovering missed opportunities with respect to food self-sufficiency, shortening of supply chains, recycling of materials, soil consumption, and ecological connections of biodiversity corridors. The implications, therefore, call for 're-evaluating people–environment relationships' rather than focusing on resource extraction or land transitions.

The study area of the East Naples peri-urban fringe represents an urban–rural patchwork of mixed land uses in which a nonfunctioning agricultural matrix is still legible. Administrative boundaries, spaces and demarcations are no longer discrete, distinct or universal. It is an edge that develops at the fringe of the urban belt of the first ring consolidated around the cores of the historic city. It presents different functions and densities, and behaves as a transitional area in which the landscape is characterized by mobility infrastructure and its interstitial spaces, residential buildings, low-density settlements—planned and unplanned—and old rural cores interspersed with disused or declining production plates [13]. As the place where the urban expansion process unfolds, heterogeneous expectations and interests make urban planning processes complex. The controversies are amplified by the need to frame these processes in the paradigm of sustainable development. The agricultural palimpsest and the collective domain of related benefits (ecosystem, landscape, food, and economic services) are replaced by the accumulation and addition of uses necessary only for urban functioning through the strategic location of higher functions (e.g., landfills, shopping centers, logistics), or in the replication of unplanned settlements.

The two case studies concern two experiences carried out in the Naples Metropolitan Area: the urban plan of the municipality of Casoria and the urban recovery program of the Ponticelli neighborhood in Naples. They differ in terms of project scale, type of urban planning instrument and purpose of the plan/program (Figure 1). The differences also concern the variability of the peri-urban context. This helps to clarify the results of the evaluation model, as well as its implementations and applications.



(**a**) (**b**)

Figure 1. (**a**) Location of the two case studies in the Metropolitan Area of Naples; (**b**) case study comparison.

The peri-urban landscape of Casoria is characterized by a widespread eco-systemic, particle, and topological fragmentation and a high density of mobility infrastructure. It is subject to continuous pressure from unplanned settlements, expansions for production or logistics, and zones in which traditional agricultural management is put into crisis. Marginal agricultural areas are contrasted by numerous open spaces with dynamics of underuse and abandonment.

In Ponticelli, the condition of peri-urbanity is given by an edge condition between a dense urban system and the conurbation system of the coastal strip of the Metropolitan City of Naples, made up of interstices, residual agricultural uses, and large open spaces of public property, which are uncultivated and waiting new functions. The great residential areas of public housing policies have operated by leaving voids that are delimited by the infrastructural system. These voids are still potentially linked to a legible agricultural matrix (i.e., spaces with strong infrastructural pressures as well as uncertain spaces that have been left unrealized by the public housing policies that built this part of the city), with agricultural residues and numerous public properties.

2.1.1. The Municipal Urban Plan of Casoria

The municipality of Casoria is part of the first ring of municipalities that make up the Neapolitan urban fringe that stretches north and east of Naples. Table 1 shows the main demographic and spatial data obtained by the Municipality of Casoria and the Italian National Institute of Statistics (ISTAT).

Table 1. Territorial data for the municipality of Casoria.

Parameters	Data–Whole Municipality	Data–Peri-Urban Area (Case-Study)	Year	Source
Territorial area	12.1 km^2	3.7 km^2	2021	ISTAT
Population	74,394	1711	2021	ISTAT
Population density	6148.2/km^2	462.4/km^2	2021	ISTAT
Unemployment rate	29.4%	42.0%	2021	ISTAT
Sealed surface	7.8 km^2	2.3 km^2	2021	Municipality
Area sealed by mobility infrastructure	1.7 km^2	0.7 km^2	2021	Municipality
Public land area	1.0 km^2	0.6 km^2	2021	Municipality
Structural dependency index	51.2%	87.0%	2021	ISTAT
Private mobility index	5.2%	n/a	2021	ISTAT

The urban planning tool on which the evaluation model is tested is the municipal urban plan (MUP). This general urban planning tool is prepared by the municipal administration to outline strategic development choices, define public space management policies, identify structuring elements and territorial invariants, and protect the physical and environmental integrity of the territory by enhancing existing resources and their economic and social development. The choices made with these tools guarantee environmental quality and sustainability.

The guidelines dictated by the MUP, which are general in nature and of indefinite duration, are concretely implemented by operational planning. The programmatic operational plan (POP) envisaged by the MUP concerns the rural/peri-urban territorial unit characterized by the prevalence of rural territories with eco-systemic value, conditions of particle and topological fragmentation, low settlement density, phenomena of underutilization and abandonment, and the crossing of large network infrastructures. The MUP promotes the use of nonurbanized peri-urban contexts for social purposes, ecological reconnection, and environmental rebalancing. It aims to create public parks and public use with different naturalistic typologies, the possibility of enhancing agricultural production for social, educational and training purposes, and an increase in the supply of social and public housing, with zero soil consumption.

The POP implements the provisions of the MUP through the definition of a vast peri-urban park. This park, covering approximately three square kilometers (one-quarter of the entire municipality), is included in the metropolitan ecological network and is aimed at the restoration of ecological continuity, the enhancement of agricultural use, the civic use of public areas, and new community densities. In particular, the POP envisages the creation of social settlements in the park and the construction of a sustainable road network (including a park road, a bicycle path, and an equipped pedestrian path) which connects the area with the urbanised context. A further provision is the identification of minimum project units (MPUs) in which three levels of land use are identified: equipped green, productive green/productive forest, and mitigation green. The latter extends on the edges of MPUs and beyond in the public interstitial areas of infrastructures.

The Casoria MUP was adopted in 2022. Plan strategies and actions in the peri-urban context have not yet been implemented. Strategies regarding public areas need to find specific funding. In private areas, the plan offers possibilities for development (reforestation programs, bicycle paths, civic uses of space, volumetric incentives for the development of agricultural economies or equipped green space, and the socioenvironmental rebalancing of illegal settlements) that are made explicit in the values of the ex-post evaluation, and aimed at reconstructing new relationships (environmental, economic, and social) between the dense city and the peri-urban crown. The analyses here presented are not part of the official assessment tools of the plan, but they are intended to build a debate on the necessity of sustainability assessments (particularly 'spatial assessments') within the strategic environmental assessment based on agendas shared by the scientific community and the settled community.

2.1.2. The Urban Recovery Program of the Ponticelli Neighborhood in Naples

Ponticelli is a district on the eastern outskirts of the municipality of Naples. The urban evolution of the neighborhood is linked to national public housing policies and to the contingency and acceleration measures that arise in response to natural disasters or to the high housing tension and social hardship in the suburbs. Table 2 shows the main demographic and spatial data of Ponticelli district.

Table 2. Territorial data for the Ponticelli district.

Parameters	Data–Municipality of Naples	Data–Ponticelli District	Data–Peri-Urban Area	Year	Source
Territorial area	117.27 km^2	6.1 km^2	0.6 km^2	2021	ISTAT
Population	921,142	53,058	2551	2021	ISTAT
Population density	7854.9/km^2	8698.0/km^2	4251.6/km^2	2021	ISTAT
Unemployment rate	27.8%	49.3%	54.6%	2021	ISTAT
Sealed surface	74.2 km^2	4.3 km^2	0.3 km^2	2021	Municipality
Area sealed by mobility infrastructure	14.0 km^2	1.2 km^2	0.1 km^2	2021	Municipality
Public land area	n/a	2.1 km^2	0.5 km^2	2021	Municipality
Structural dependency index	54.7%	64.0%	39.7%	2021	ISTAT
Private mobility index	53.2%	n/a	n/a	2021	ISTAT

The urban planning instrument on which the evaluation model is tested is the urban recovery program (URP). It is a program with the status of an implementing urban plan, and its approval and public financing have the following basic requirements: (a) the building and urban redevelopment of public housing settlements, also in accordance with the urban planning instruments in force, (b) a systematic set of interventions organized on the basis of a unitary proposal, with different types of intervention (redevelopment and new construction) and the integrative characteristics of the functions (residential, public housing services, and production of goods and services)and (c) co-participation of public and private implementers and the related economic and organizational resources, with a minimum threshold of 25% private financing for ensuring the public financing of the project.

The Ponticelli URP has been designed to rethink the parts left unfinished by the rational design imposed by previous public housing programs. In fact, in the 1950s, the first public housing estates were grafted into Ponticelli as an expansion of the historic center of the city. The URP reinterprets the design of the suburbs in a contemporary key, confronting it with the rigid constraining system of the volcanic risk of Vesuvius (which, in some dangerous areas known as 'red zones', does not provide for residential development) and with the superordinate forecasts of the sustainable urban mobility plan (which envisages the passage of a bus rapid transit connecting with the city center). The URP envisages the construction of new social housing, areas of private residential expansion to balance the social mix, numerous public facilities, and a forest running through the central 'spine' of the neighborhood.

The Ponticelli URP is still in its preliminary stage. Its implementation depends on 75% public funding, as it acts on public land. Therefore, the assessment here proposed can represent a real decision support system for planners and public decision makers to use in the next stages for the real implementation of the plan.

2.2. Data Sources and Approach

For the comparison of the indicators, the evaluation was processed in a GIS environment on a hexagonal grid with 50 × 50 m spacing.

The use of regular polygons proves to be effective for representing the spatial variousness of the phenomena under investigation and is a suitable method for data generalisations, statistical mapping, and spatial evaluations [31]. Another peculiarity of regular-meshed grids is also inherent in the possibility of combining mapping units into new cells at a more detailed resolution, allowing the cumulative effects of state changes to be studied [32].

The analyses presented in this paper represent an instrument aimed at monitoring the implementation of strategies and actions and assessing how they achieve the goals of the two municipalities. The ex-ante evaluation represents the current state, while the ex-post scenario represents the maximum degree of achievement of the strategies and actions included in the two urban plans. Thus, the ex-post evaluation expresses in values and graphically (or spatially) the distance to the sustainability goals in a specific area of the territory.

For the assessment of the sustainability of the transformations, the indicators are built on the dual pre/post-plan scenario, which allows for a cognitive picture of the state of the environment and an assessment scenario of the achievement of targets.

In general, carrying out two different evaluations on dual pre/post-plan scenarios allows for a knowledge framework of the state of the environment and a scenario for monitoring the target achievement over time. In fact, the ex-ante scenario is intended as a tool for reconstructing the state of the environment to support decision making [33]. It addresses the issue of asset mapping, which indicates the process of documenting the tangible and intangible resources of a community, considering the assets that must be preserved and enhanced [34]. It allows the construction of a knowledge project capable of initiating a conscious and creative reflection aimed at overcoming the concepts acquired within the interpretative models of modern thought based on a paradigm of perpetual growth and a linear/reductionist functioning of decontextualization and resource extraction. Furthermore, it allows the urban design project to orientate its choices toward forms of sustainability and resilience inscribed within the urgencies of 2030 Agenda. These are understood not only as the capacity to adapt to the pushes of urban transformation and the degenerative forces of land rent, but above all as the injection of elasticity into urban policies to connect resources, actors, identities, and tensions in a nonrigid manner to reactivate functional chains, and to reanimate urban metabolisms.

Ex-post evaluation allows the identification of the impacts of transformations by determining the identification of criticality thresholds through the recognition of contextual limits, and by integrating the multidimensional aspects necessary to look at open and multifunctional margins in which different forms of life interact and develop sociality. The objectives of using multidimensional criteria and specific indicators are different from the mapping and evaluation of context attributes and values in ex-ante evaluations, as ex-post evaluation focuses on the actual impacts generated [35]. In particular, ex-post evaluation is used to verify that established objectives have been achieved, to determine whether there are intended or unintended consequences, and to evaluate the effectiveness of alternative approaches in the meantime [35,36].

The place-based approach makes it possible to support researchers and practitioners facing complex multidimensional issues with methodologies that can be replicated and implemented in the relevant case study variables. This approach is focused on addressing a problem on a local scale, meeting the needs of a particular context by tapping into local communities and resources [37,38], and enabling work on a nonabstract concept of sustainability. This approach also support the theoretical and practical framework, considering the unique characteristics of a given complex socioecological system by aiming to generate locally relevant knowledge and context-specific solutions to address sustainability problems [39,40].

2.3. First Phase: Identification of Evaluation Indicators

Sustainability cannot be measured directly [41] but through a process of implementation that considers the transversality of the concept (economic development, social equity, and ecological integrity) [42] and through metrics or indicators [43] as a composite of several directly measurable variables that enable the quantification of such multidimensional and complex phenomena [41,44].

Indicators and indices, which are derived from values (we measure what we care about) and which create values (we care about what we measure) [45], assume instrumental value not only with respect to the type of territory (place-based approach) but above all with respect to the type of urban planning instrument being evaluated. Their main characteristic is their ability to summarize, focus, and condense the enormous complexity of our dynamic environment into a manageable amount of meaningful information [46]. Furthermore, 'composite indicators' can be easier to interpret than trying to find a trend in many separate variables [47,48]. Therefore, in order to visualize phenomena, highlight trends, and simplify, quantify, analyze, and communicate the otherwise complex and complicated information related to sustainability, it is necessary to identify coherence between the goals and targets of the 2030 Agenda and the possibility that the urban plan will have an impact. This coherence gives rise to a relationship of direct or indirect dependence that helps the spatial dimension of the spatial assessment to select the most significant indicators for the peri-urban for the integration of the three dimensions and the explicit rendering of impacts.

The SDGs through which the urban planning project in the peri-urban area was proven to correspond to the sustainability assessment are 2, 8, 12, 11, 15 and 17. The targets of the SDGs were analyzed, and indicators were identified (Table 3). The indicators of the 2030 Agenda were not always 'spatializable'. Thus, in some cases, an adaptation was developed to express the theme of sustainability. The indicators that fully correspond to the global indicators proposed by the 2030 Agenda are illegal building rate, forest area index, soil sealing, and fragmentation of natural and agricultural territory.

Table 3. SDGs, targets and indicators.

Dimension of Sustainability	SDGs	Targets	Indicators
Social	11. Sustainable cities and communities	11.1 By 2030, ensure access for all to adequate, safe, and affordable housing and basic services, and upgrade slums	Social housing
		11.2 By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	Sustainable mobility
		11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries	Civic use of public properties
		11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	Illegal building rate
	11. Sustainable cities and communities 17. Partnerships for the goals	11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities 17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships	Civic cornerstones
Environmental	15. Life on land data	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	Forest area index
		15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	Soil sealing
			Ecosystem fragmentation
Economic	2. Zero hunger	2.4. By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality	Agri-environmental productions
	8. Decent work and economic growth	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small-, and medium-sized enterprises, including through access to financial services	
	12. Responsible consumption and production	12.2 By 2030, achieve the sustainable management and efficient use of natural resources	
	8. Decent work and economic growth	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production, and endeavor to decouple economic growth from environmental degradation, in accordance with the 10 year framework of programs on sustainable consumption and production, with developed countries taking the lead	Green equipped economies

2.4. Second Phase: Spatial Sustainability Assessment

All the evaluations were performed using the spatial sustainability assessment model (SSAM) [49,50], that was developed by the Regional Environmental Protection Agency of Umbria (an Italian Region) and the Environmental Laboratory, a research group within the Applied Economy Unit of the Department of Agricultural, Food, and Environmental Sciences (DSA3) of the University of Perugia (Italy). The SSAM is specifically developed for integrated spatial multicriteria analysis and combines multicriteria decision analysis (MCDA) with GIS, analyzing each sustainability dimension by means of the technique for order of preference by similarity to ideal solution (TOPSIS), and returning a global sustainability index by means of a weighted summation. The use of the geo-TOPSIS algorithm has already been successfully tested in other spatial classification contexts [51,52], as has the integration of GIS and multicriteria evaluation systems and methods.

MCDAs are part of decision support systems (DSSs); in their most general formulation, they can be considered as a set of systematic procedures that serve to generate, evaluate, and select alternative decisions on the basis of convergent criteria, which cannot be commensurate in a traditional way, and allow the combination of individual criteria into an overall assessment [53]. The multidimensionality of decision-making criteria, which must be considered in sustainability assessments, can be optimally handled by multicriteria procedures, through the peculiar introduction of different weighting systems, which vary according to the objectives and structure of the decision problem, and which basically serve to determine priorities of choice or action at various levels of complexity even in multidisciplinary approaches [54].

A GIS enables the construction of an interpretative knowledge framework of reality through spatial analysis models. It is part of geographic information science (GISci), which is the information that science has oriented toward the collection, modelling, management, visualization, and interpretation of geographic information, consolidated in the reflections on spatial dynamics and the need to read relationships and place measurable and shareable information in space [55]. Being an integrative disciplinary field, it combines multidisciplinary concepts, theories and techniques, enabling innovative synergies for a greater understanding of territories [56]. In particular, QGIS (version 3.16.14), an open-source software flexible to experimental implementations of academic research through the integration of specific plug-ins or tools, was used for the entire project.

The TOPSIS is an MCDA method [57–59] and uses, as a basic concept, that the preferred option should have—in Euclidean space—the 'shortest distance' to the 'ideal solution' and the 'greatest distance' to the 'nonideal solution'. The Euclidean distance criterion is then used to assess the relative closeness of the different alternative proposals to the final solution, and the final order of option preferences is obtained by confronting these relative distances [60]. This method is particularly useful for research as it can be used to verify the achievement of the 2030 Agenda's targets.

MCDAs integrated with GIS enable the development of spatial decision support systems (SDSSs) by combining geographical data with contextual statistical measures analyzed by means of preferences and value judgements. This allows both the effective communication of assessment results to planners and decision makers, and the construction of spatial assessments necessary to understand the impacts of urban planning on the territory.

In the SSAM, the MCDA model is activated within the GIS software (QGIS 3.16.14) and, therefore, uses the same interface and database. The interface of the SSAM provides a series of successive screens, in which the user is guided through the initial data input, and subsequently through the execution of the multicriteria analyses [49]. The final product of the processing is represented by numerical and tabular outputs, as well as graphical and cartographical outputs. These outputs represent the indices of environmental (*EnvIdeal*), economic (*EcoIdeal*) and social (*SocIdeal*) sustainability. The indicators of each dimension are aggregated by applying the TOPSIS, while the different dimensions are then aggregated by using the weighted summation to derive the overall sustainability index (*SustIdeal*) [46].

Furthermore, in addition to the separate calculation of the economic, environmental, and social indices, the SSAM presents a procedure that can retrace the steps that led to the final result, revealing which indicators and/or procedural steps had the greatest influence on the results obtained [49,50]. Figure 2 summarizes the methodological approach proposed in this research.

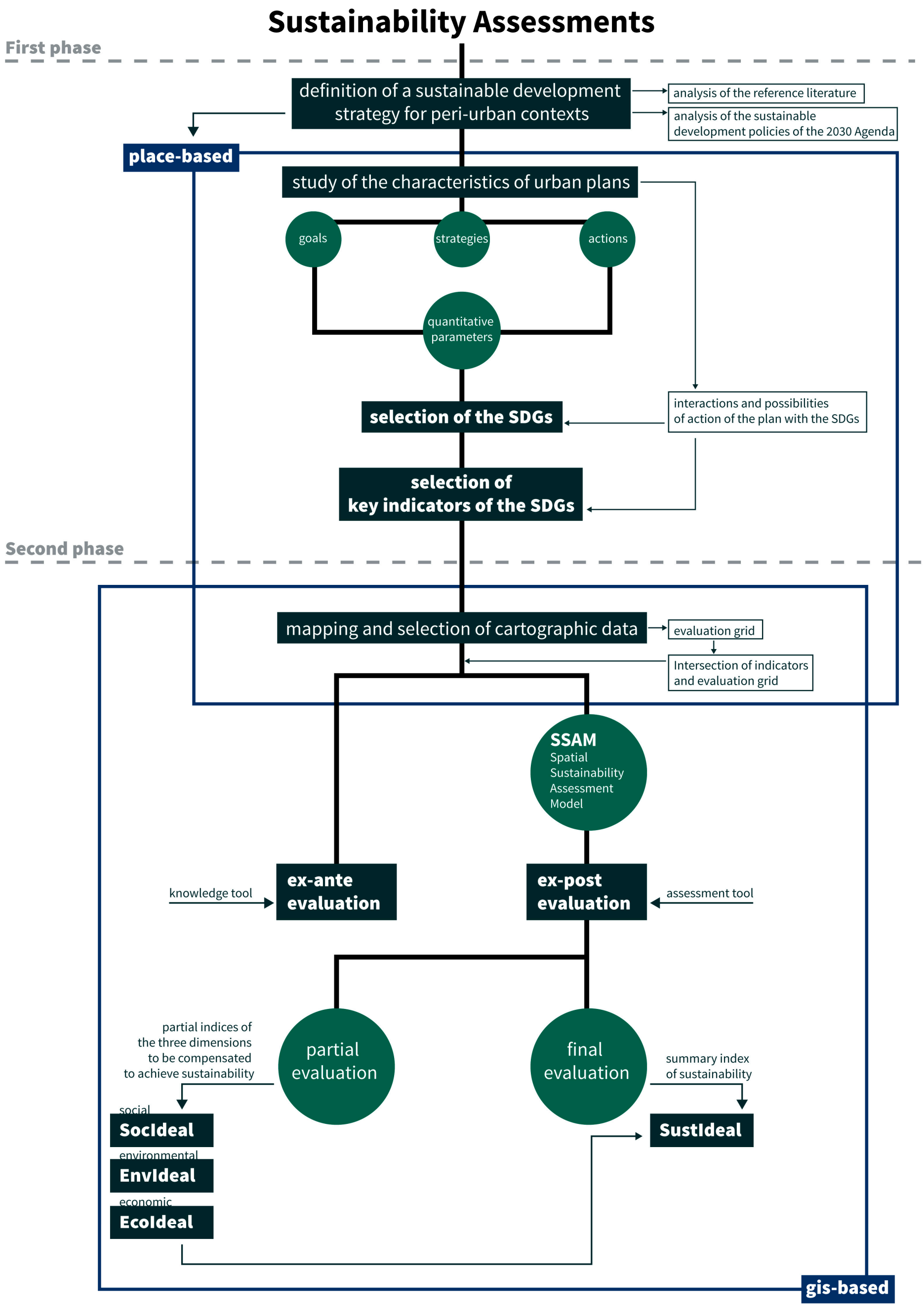


Figure 2. The proposed methodological approach.

3. Results

3.1. Results of the First Phase: Construction of Evaluation Indicators

3.1.1. Social Dimension

The social dimension was assessed in SDGs 11 and 17. The indicators used in the social assessment were as follows:

- social housing;
- sustainable mobility;

- civic use of public properties;
- illegal building rate;
- civic cornerstones.

Social settlements constitute a part of the new community developments in the peri-urban context. These measures identify various criteria, but the key indicator summarizing this condition of housing hardship is the ratio of evictions to resident households. The municipalities of Naples and Casoria have the highest indices among the Metropolitan Area, and this condition is also given by a high housing density.

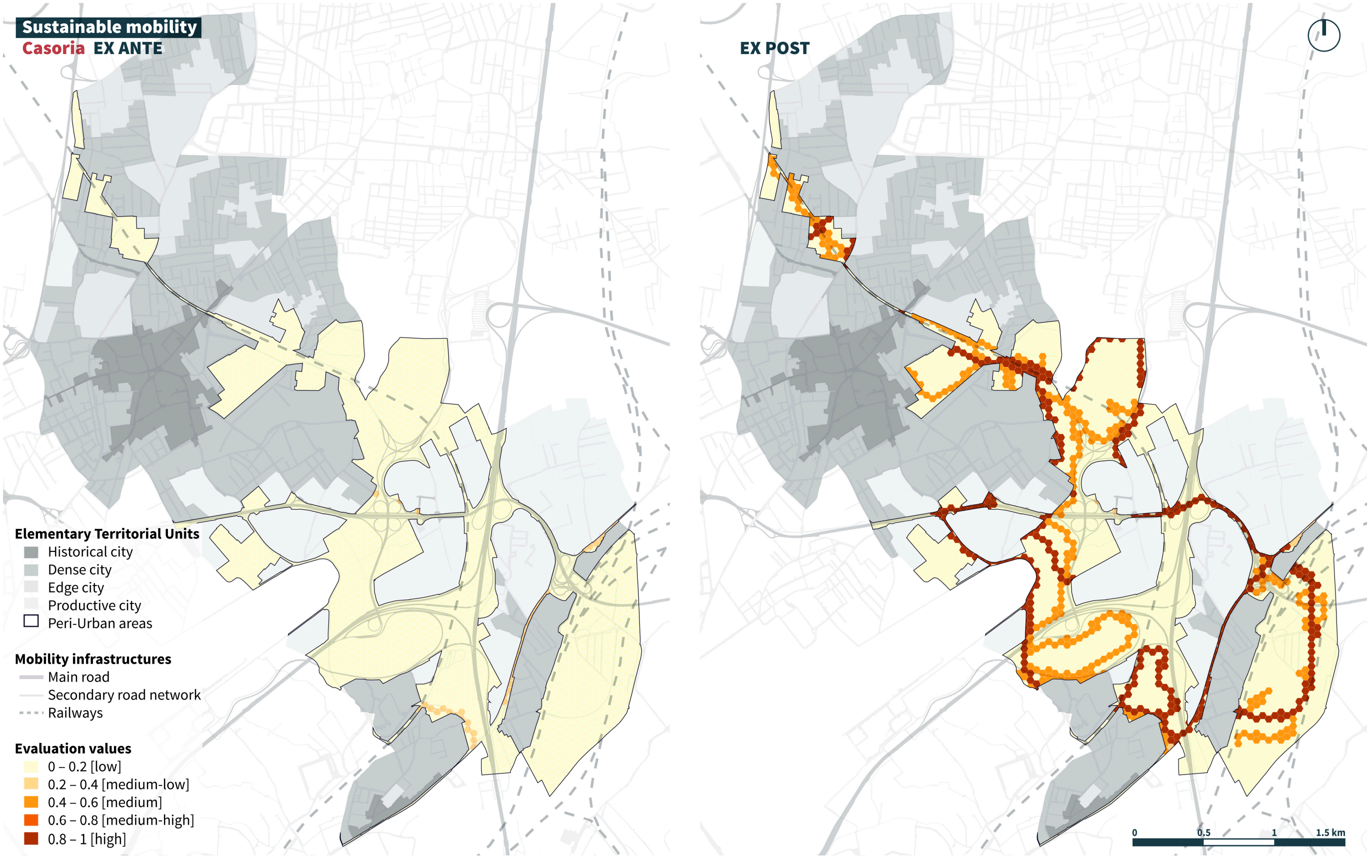
The 'social housing' indicator used in the evaluation is calculated as the land area covered by social public housing developments that have been conventionally built or subsidized by public funding (Figure 3).

Sustainable connections are the main device for building an open, shared city. They aim to ensure that transport systems meet the economic, social, and environmental needs of society while minimizing their negative repercussions on the economy, society and environment. In Italy, a strong criticality stems from road transport, which contributes 23% to total greenhouse gas emissions (of which about 60% is attributable to passenger cars), about 50% to nitrogen oxide emissions, and about 13% to particulate emissions [61]. It is also a precondition for people, regardless of economic capacity, to be able to travel across the territory and establish social relationships. Although the public transport sector is of undisputed value in this issue, urban planning generally has no direct bearing on the transport sector. Therefore, the assessment is primarily intended as a redesign of the relationship between infrastructures and urban/peri-urban spaces to encourage the spread of alternative mobility and minimize environmental impacts. The sustainable mobility index is calculated as the surface area covered by traversability elements (e.g., pavements, bicycle lanes, and equipped paths) or by devices for environmental–climatic comfort (e.g., planting of trees along streets). In the ex-ante evaluation, only existing devices were assessed, while project devices were also added in the ex-post evaluation. In particular, devices aggregating various forms of traversability or environmental comfort were given an aggregate weight. For example, 'parkways' were given the highest weight, as they comprise all elements (Figure 4).

The indicator 'civic use of public properties' identifies public facilities or facilities for public use in the territory. In target 17.17, private equipment for public use is also included in the evaluation in order to promote effective partnerships among public, public–private, and civil society actors. The indicator is calculated as the surface area covered by public equipment that is categorized into education, common interest, and equipped public spaces or private equipment for public use (Figure 5).

The 'illegal building rate' indicator concerns unplanned settlements, which represent land-use practices operated illegally and without a real right. The indicator is calculated in the ex-ante evaluation as the area covered by illegal settlements. In the ex-post evaluation, the capacity to accommodate tree density or public facilities is calculated. In the former case, the area free of infrastructures for mobility and buildings was identified by selecting the cells free of these two elements. A tree density ratio of one tree per 30 m^2 was then used. In the second case, only cells free of infrastructure, buildings, and appurtenances were selected and this area was used as an index. Both ratios were normalized on a 0–1 scale and their average was evaluated and subtracted from the ex-ante evaluation index. This makes it possible to assess the capacity of land to serve social purposes in such settlements. These parameters were used because the Casoria MUP envisages for the urban redevelopment of these areas the planting of at least 50% of the appurtenances and the identification of areas able to accommodate public facilities (Figure 6).

Figure 3. Social housing: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.



(**a**)

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Figure 4. Sustainable mobility: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

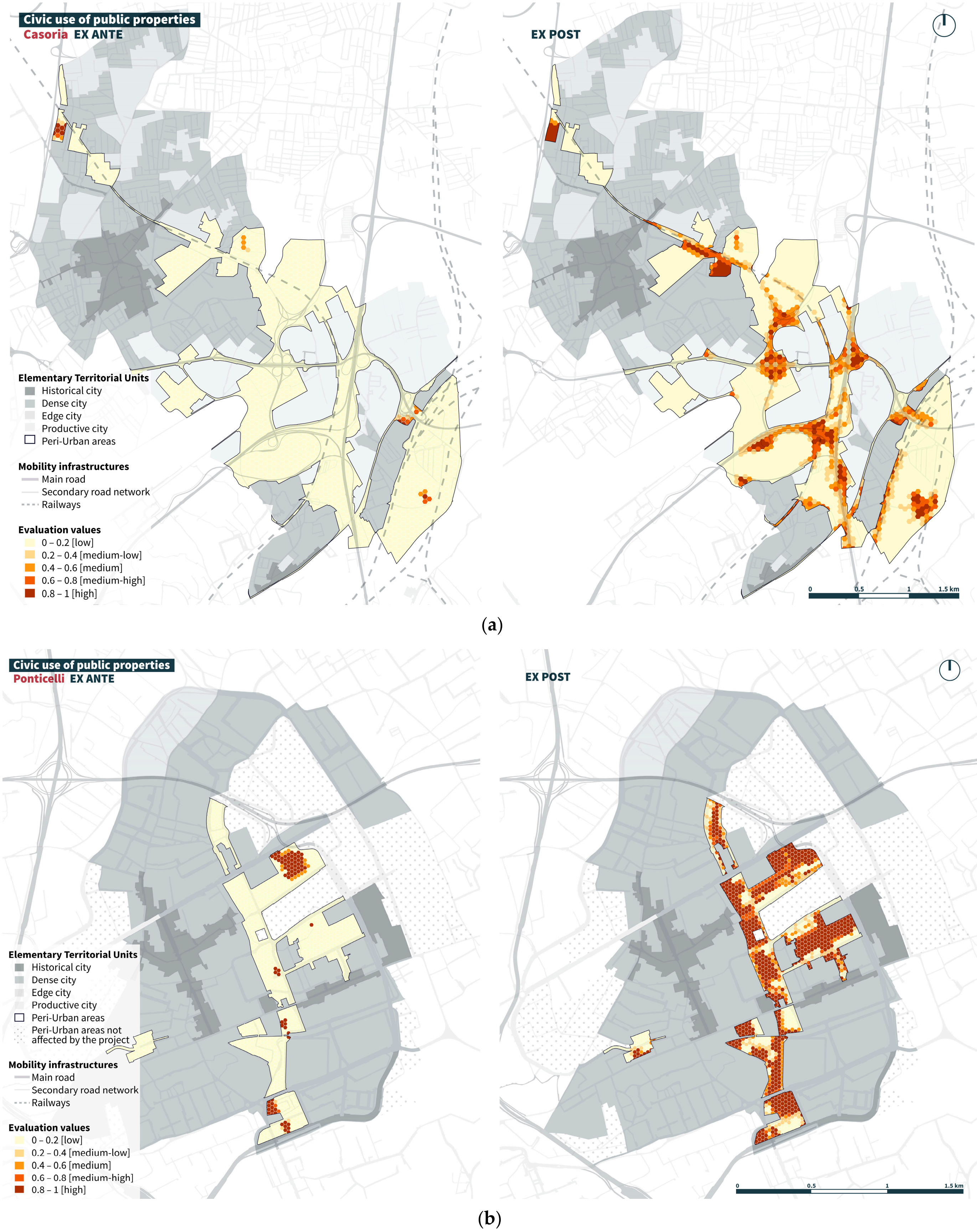


Figure 5. Civic use of public properties: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

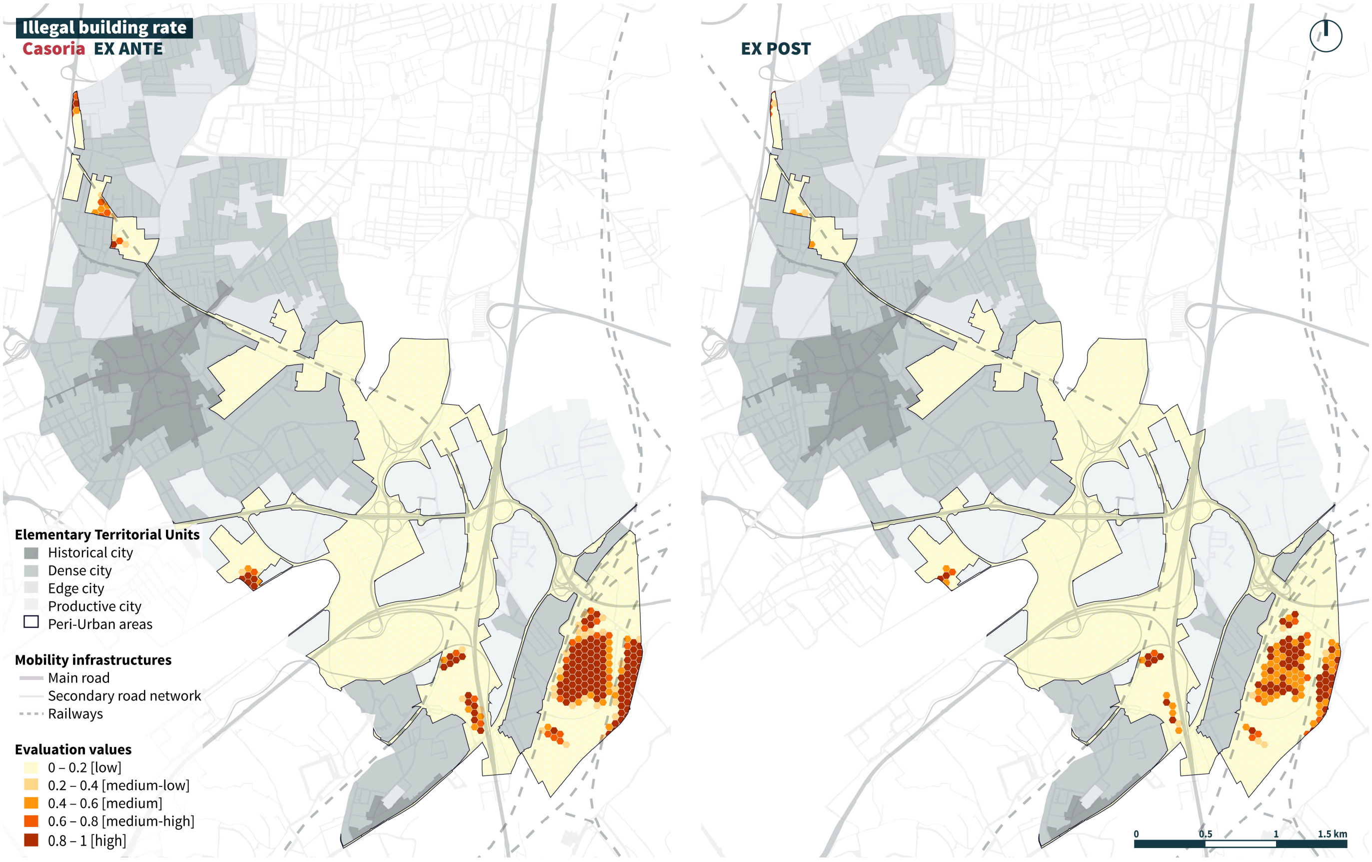


Figure 6. Illegal building rate: Casoria ex-ante and ex-post evaluation.

The last indicator of the social dimension is 'civic cornerstones'. This indicator represents a sustainable practice in land management as peri-urban areas are deregulated by large spaces and numerous uncultivated public properties with no real use. Their reactivation represents a practice of active territorialism in terms of care and management of uncultivated or unused and, therefore, inaccessible land. The experiences mapped in the ex-ante evaluation show how bottom-up regeneration practices have created multifunctional open spaces capable of combining the dimensions of utility and environmental quality [62]. These practices show the need for urban spaces not tied to the logic of consumption or profit and for a renewed right to the city. They also favor the ecological connectivity of the territory or public connection between parts of the territory. The indicator refers to the practices of the commons of a collaborative type and aimed at general interest objectives that go beyond even the most directly involved actors and transcend a logic of ownership [63]. The indicator is calculated as the public surface area covered by land use affected by social regenerative practices for public (public or public-use facilities and social agriculture) or ecological (forest) purposes. In the specific case of the Casoria plan, the mitigation green, productive green, and equipped green envisaged in the operational plan of the peri-urban park were evaluated ex-post on public properties (Figure 7).

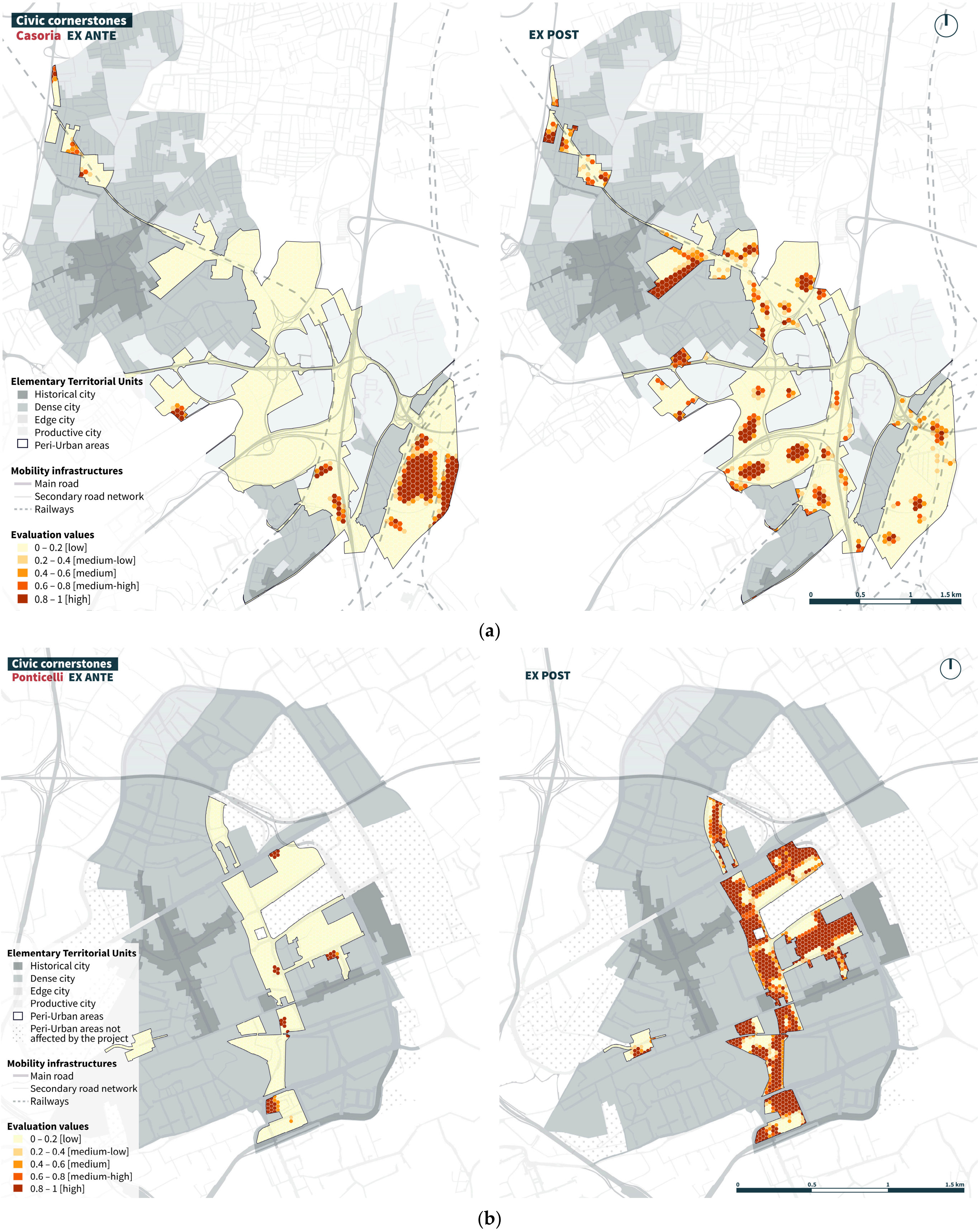


Figure 7. Civic cornerstones: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

3.1.2. Environmental Dimension

The environmental dimension was assessed according to SDGs 11 and 15. All indicators refer to the needs expressed in target 15.9 of the 2030 Agenda, which aims to integrate ecosystem and biodiversity values into national and local planning and development processes. The indicators and indices used in the assessment of the environmental dimension were as follows:

- soil sealing;
- forest area index;
- ecosystem fragmentation.

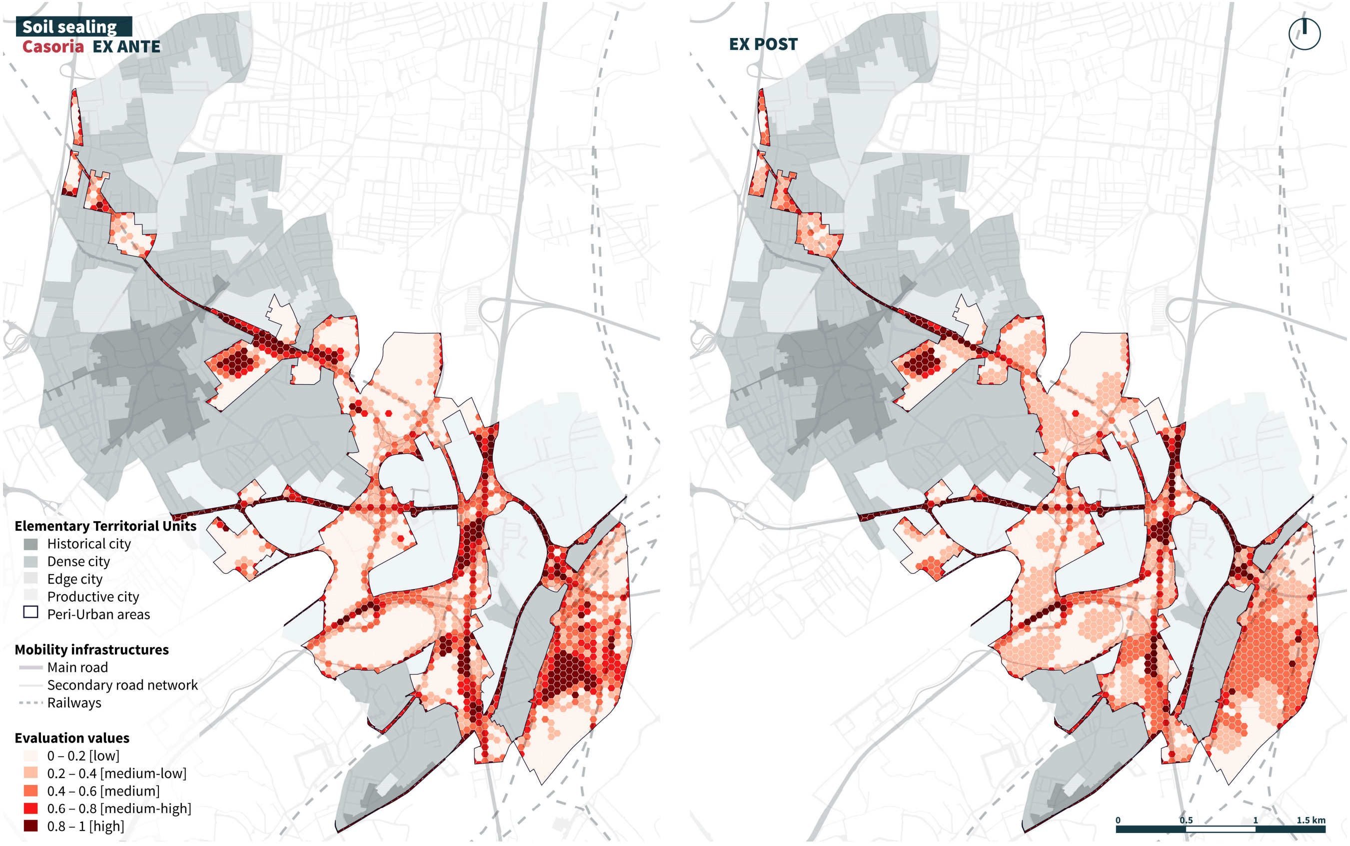
The indicator 'soil sealing' identifies the proportion of land area that is artificially covered by buildings, infrastructures and other permanent structures, which make the underlying soil totally or partially impervious to water, thereby preventing it from performing its vital functions. In particular, in the MUP/POP of Casoria, the ex-post assessment of the indicator is calculated on the basis of the plan's forecasts, which envisage the following de-impermeabilizations: in squatter settlements, 50% of the appurtenant areas are to be de-paved and planted with trees. All the mobility infrastructures in the peri-urban area are reclassified as agricultural service roads and made permeable, with the exception of ribbon infrastructures (e.g., motorways). Therefore, these de-impermeabilizations are subtracted. The plan provides for de-impermeabilizations concerning ecological islands and equipped green areas within the MPUs. For the latter, a maximum sealing of 30% of the area concerned was foreseen. This area was, therefore, added to the budget within the cell (Figure 8).

The 'forest area index' represents the proportion of land covered by forests and other wooded land, and describes the variations of the forest coverage over time. It is calculated on the basis of the reports of the National Inventory of Forests and Forest Carbon Sinks [64], which estimates an average tree density of forested areas in Italy of 1/20 m^2. In the ex-ante evaluation, the trees were then mapped in a GIS environment and counted for each grid cell. In the ex-post evaluation in all the grid cells falling within the areas identified by the plan as 'mitigation green', the maximum woodiness coefficient was associated according to the tree density ratio of 1/20 m^2, which equates to approximately 108 trees per cell.

The 'soil sealing' indicator index was subtracted from this density. In addition, the areas potentially free of infrastructure or construction identified by the soil sealing indicator index were also subject to the ex-post evaluation since the plan provides for 50% planting in these areas. Agrarian tree formations (citrus groves) were not taken into account in the ex-ante and ex-post evaluations because their contribution to regulating ecosystem services is unknown, whereas they make a real contribution to supplying ecosystem services [65] (Figure 9).

The 'ecosystem fragmentation' index represents the share of natural and agricultural land with high/very high fragmentation. Land fragmentation is the process of reducing the continuity of ecosystems, habitats and landscape units as a result of phenomena such as urban sprawl and the development of the infrastructure network, which lead to the transformation of patches (unconsumed areas without significant artificial elements that fragment them by interrupting their continuity) of large territories into smaller and more isolated parts of land.

The index on peri-urban territory was constructed through an adaptation of the index 'effective mesh density' (Seff) [66]. The index represents the density of the territorial patches (no. of meshes per 1000 km^2) calculated according to the method of the Seff index related to the probability that two points chosen at random in a given area are located in the same territorial particle. This method has been appropriately modified according to the 'cross-boundary connections procedure', which guarantees the continuity of territory beyond the limits of the reporting unit (1 km^2 cell). The Seff index measures the obstacle regarding movement starting from a point within the reporting unit due to the presence on the territory of so-called 'fragmenting elements' barriers. The choice of the most appropriate fragmenting elements is guided by the aims and objectives of the analysis.



(a)

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Figure 8. Soil sealing: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

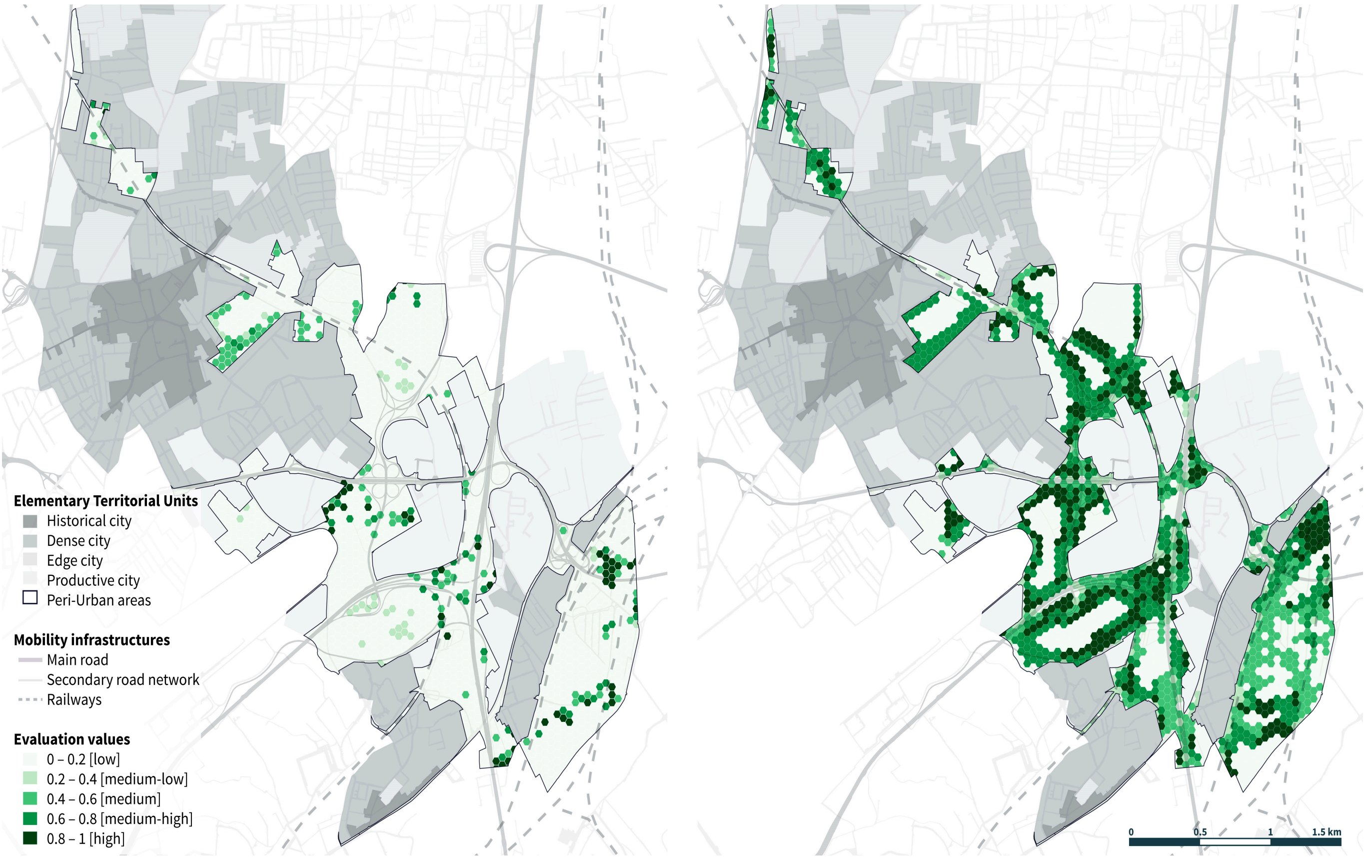

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Figure 9. Forest area index: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

The case study adaptation of the indicator of fragmentation was calculated with the open-source plug-in QGIS *FragScape* [67], developed by the National Research Institute for Agriculture, Food, and the Environment and the French Ministry of Ecological Transition. In the assessment, fragmenting elements are identified according to two criteria: spread of anthropogenic disturbance and constriction of parts. Diffusion of anthropogenic disturbance represents fragmentation caused by elements that do not allow connection between the parts, such as transport infrastructure. Constriction is represented by internal elements that do not allow movement, such as fences and overhead power grid infrastructures. In the ex-ante evaluation, the values were assessed for the determination of fragmentation buffers from the following thresholds:

- 15 m for urban roads;
- 7.5 m for the urban neighborhood road network;
- 5 m for fences and other infrastructure.

The ex-post evaluation assessed how well plan actions could mitigate fragmentation (Figure 10). The following measures were carried out according to the plan strategies:

- the cancellation of the buffer for fences, as both urban planning instruments provide that such works are not allowed in peri-urban areas;
- the cancellation of the buffer in areas where local roads are reclassified as agricultural service roads;
- the reduction in the buffer by 50% in areas characterized by public crossing routes;
- the reduction in the buffer by 50% in areas subject to mitigation through reforestation and, thus, ecological reconnection.

3.1.3. Economic Dimension

The economic dimension was assessed in SDGs 2, 8, and 12. The indicators of the economic dimension were as follows:

- agri-environmental productions;
- green-equipped economies.

The economic dimension is aimed at supporting the development of a coherent local landscape with the potential for collective use with a social value of open space (equipped green economies) and neighborhood economies (agri-environmental productions).

The ecological enhancement of the peri-urban area also passes through the recovery of agricultural productive capacity. In this perspective, proximity economies and short supply chains represent an opportunity for economic development based on existing resources and environmental sustainability, as well as the preservation of local agriculture and the agricultural landscape.

The 'agri-environmental productions' indicator is made up of the agricultural outlets provided in the MPUs of the Casoria MUP and the social gardens of the Ponticelli URP. In addition, these areas are able to offer woody forest products that support the ecosystem services category of supply. The index is calculated as the ratio of the area covered by the categories of productive green areas/productive forest (Figure 11).

'Green equipped economies' are the areas designated for green-equipped zones. These areas can represent small economies of scale respecting the environmental criteria of rural areas with low building indices (0.3 m^3/m^2) (Figure 12).

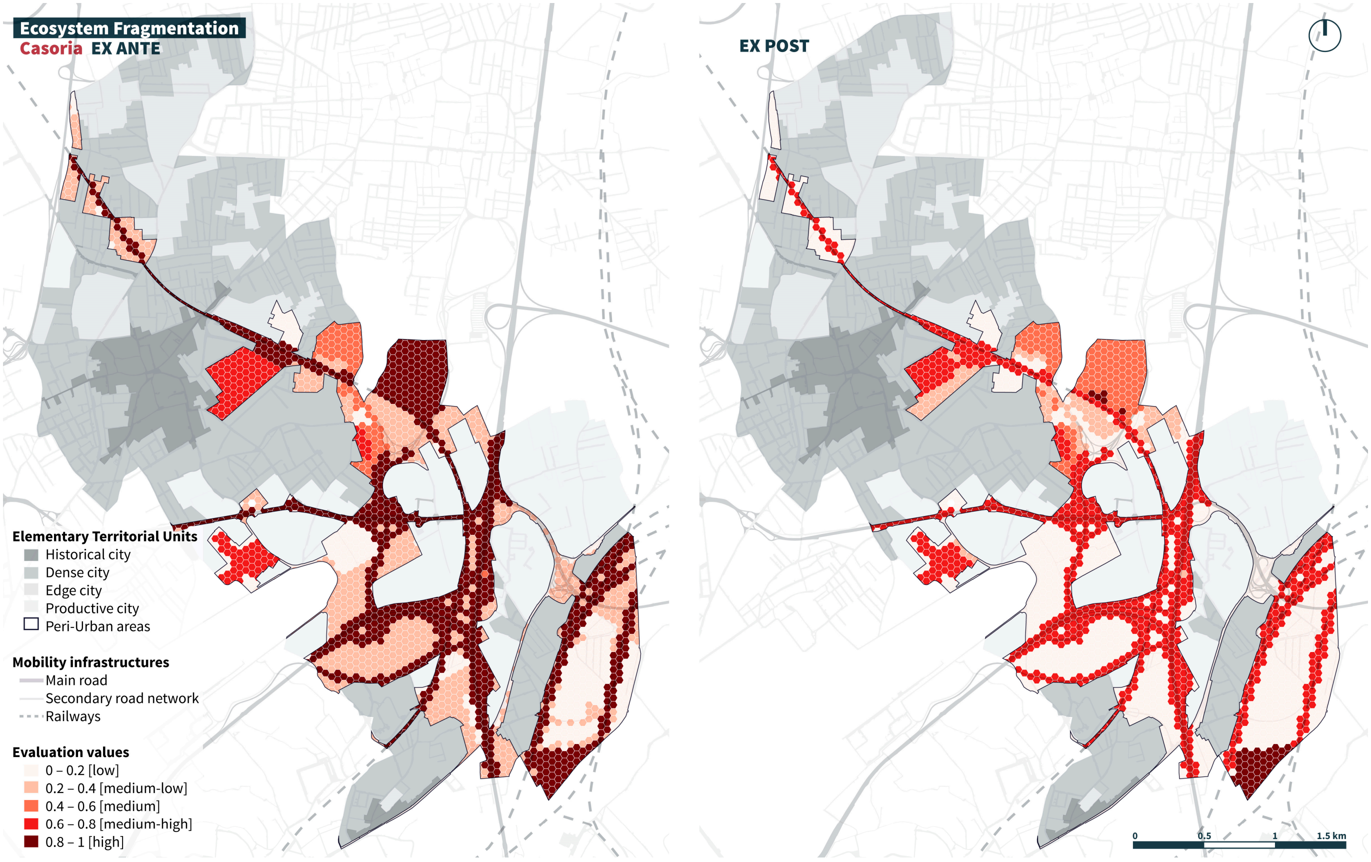

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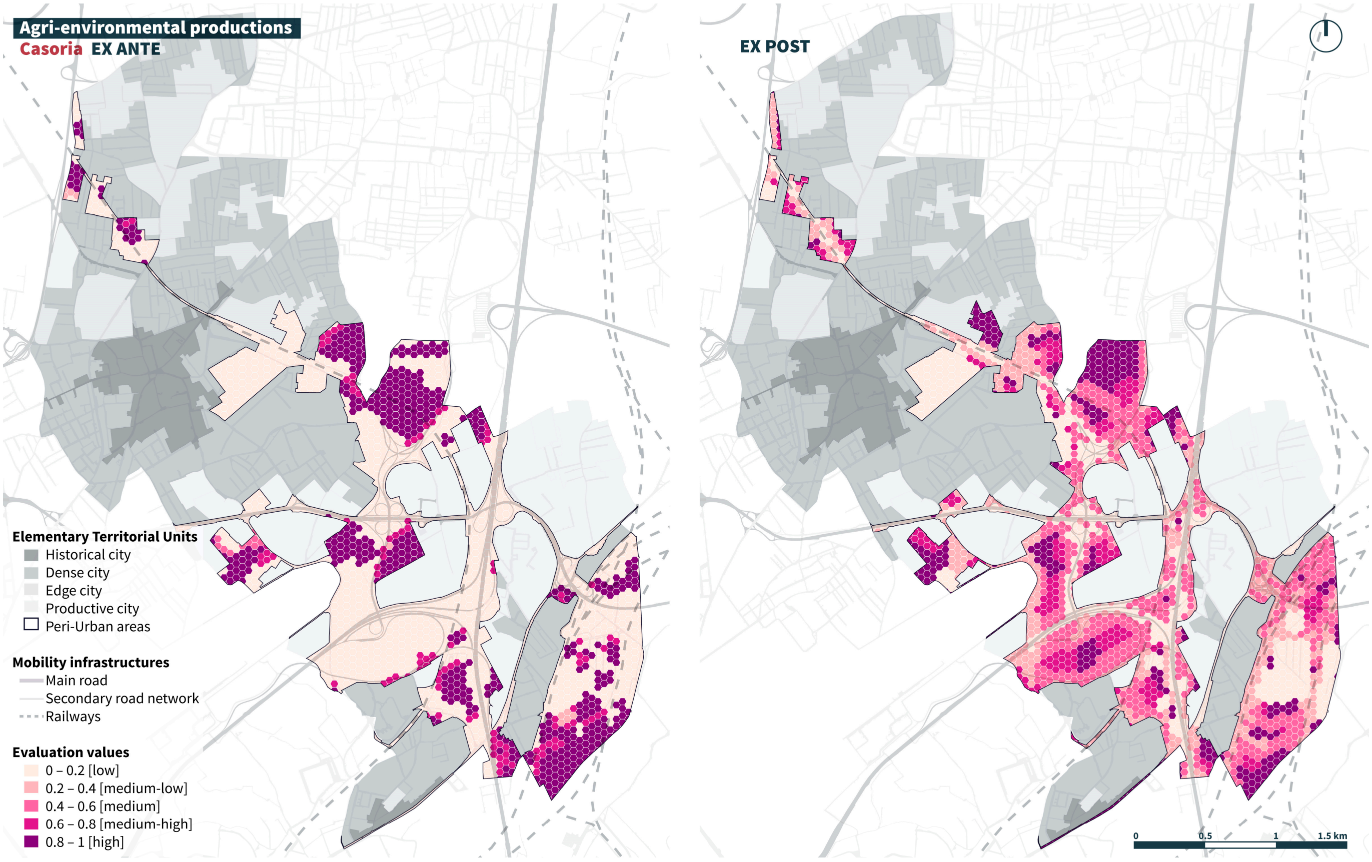
Figure 10. Ecosystem fragmentation: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.



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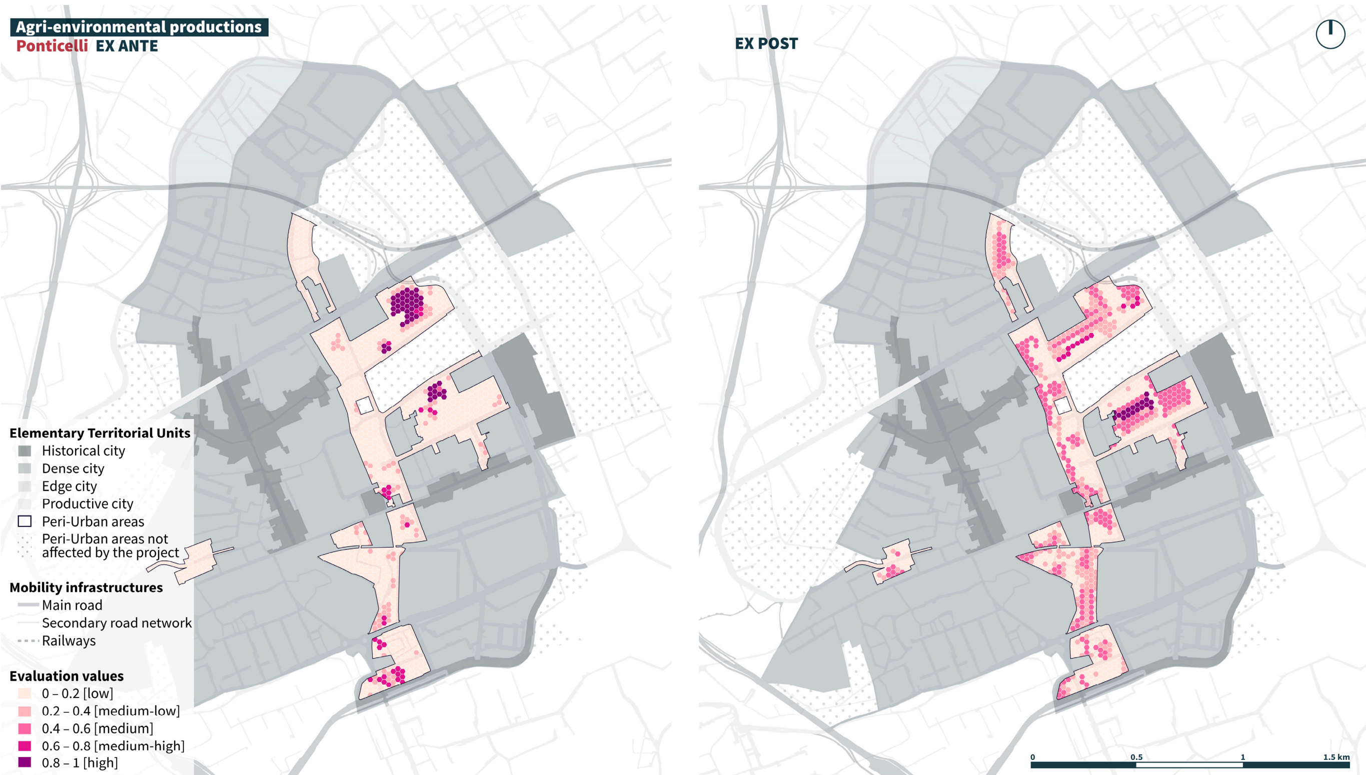

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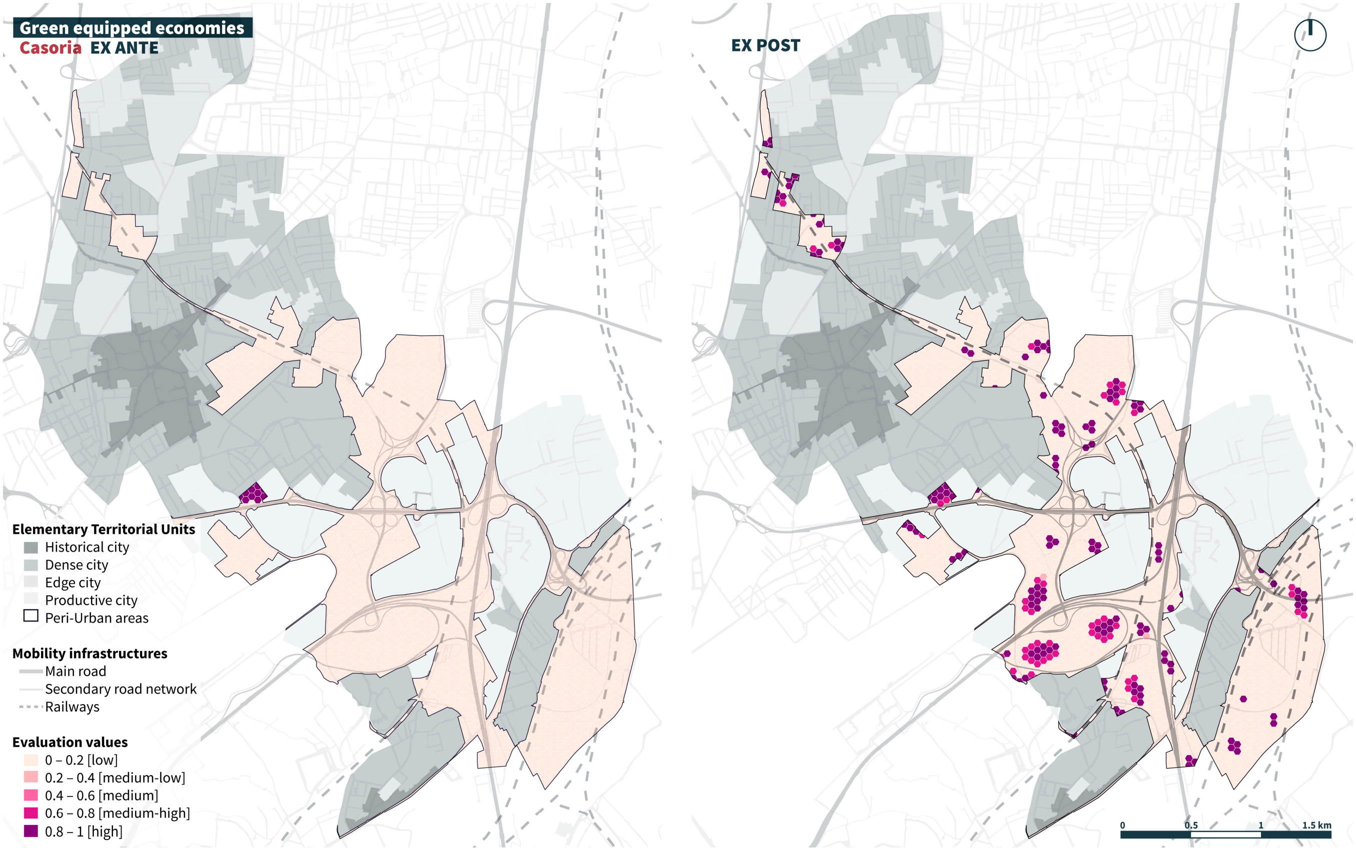
Figure 11. Agri-environmental production: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.



(**a**)

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Figure 12. Green equipped economies: (**a**) Casoria ex-ante and ex-post evaluation; (**b**) Ponticelli ex-ante and ex-post evaluation.

3.2. Results of the Second Phase: Dimension Assessment and Sustainability Index

All the assessments were conducted using the SSAM, a plugin developed within QGIS, which is a free and open-source GIS software, widely used in several fields and applications [49,50].

Due to the heterogeneity of the dimensions considered, it is not possible to achieve undifferentiated degrees of equilibrium. In addition to a synthetic spatial index, it is probably possible to consider thresholds for the peri-urban context and evaluate state changes. The analysis of the dimensions of the SDGs can be conducted using a spatial approach by means of the SSAM model, which enables the analysis of the relationships between the dimensions [49] (Figures 13 and 14).

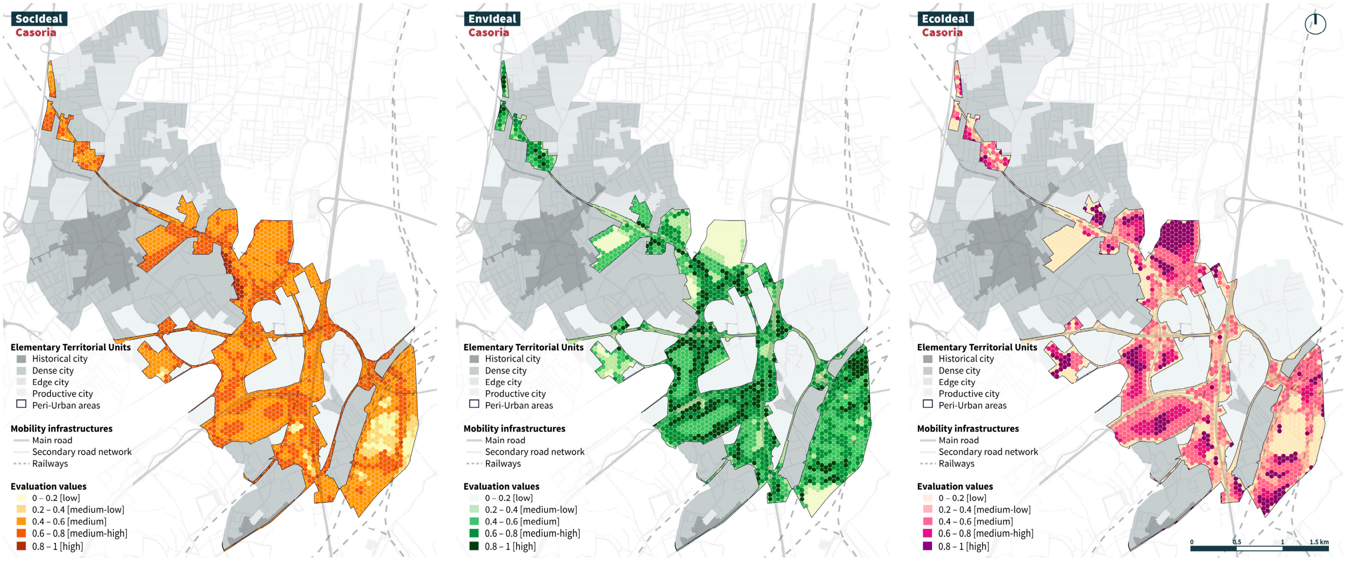

Figure 13. SSAM results for the Casoria municipal urban plan.

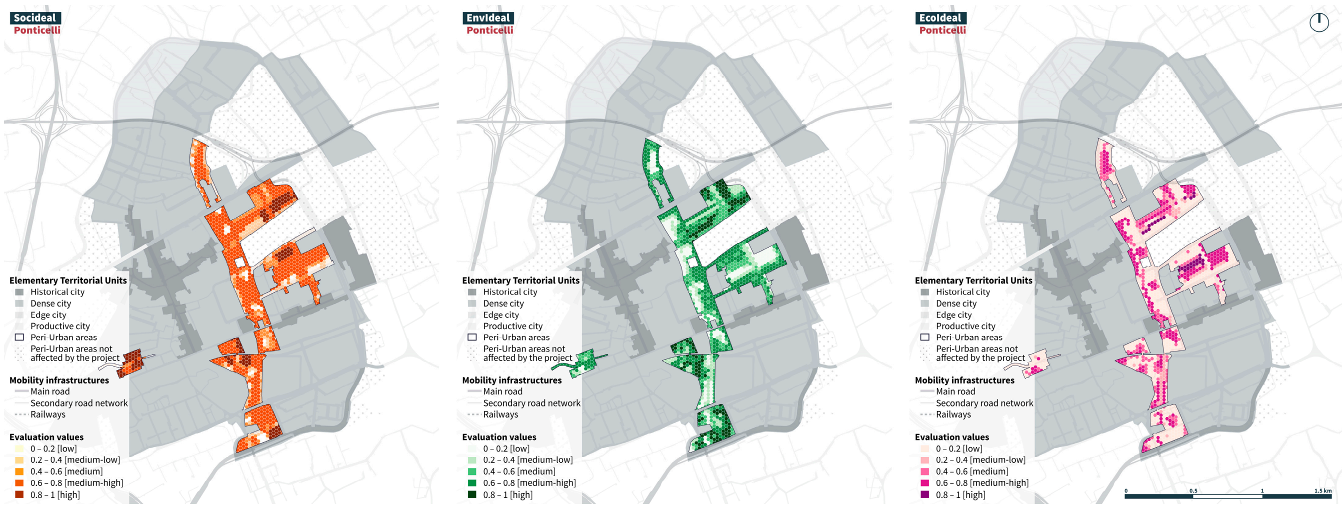

Figure 14. SSAM results for the Ponticelli urban recovery program.

The social dimension index shows a wide distribution of the average level of sustainability, with higher levels in public reactivation areas.

The environmental dimension index is the highest of the three. The plan actions are definitely sustainable from an environmental point of view as a large part of the grid shows medium–high levels. Despite identifying a high level of agricultural and ecosystem fragmentation in the partial assessments, the index demonstrates high ecological connectivity in the peri-urban area.

The economic dimension is affected by the decisive importance of the reactivation of agricultural activities in the peri-urban area.

The ideal sustainability index shows a large distribution of values from medium to high, as well as the decisive importance of wooded areas along infrastructures, thus succeeding in linking, through a redefinition of the peri-urban space, the three dimensions defining the construction of community densities, the shortening of supply chains and the production of reserves and biodiversity corridors (Figure 15).

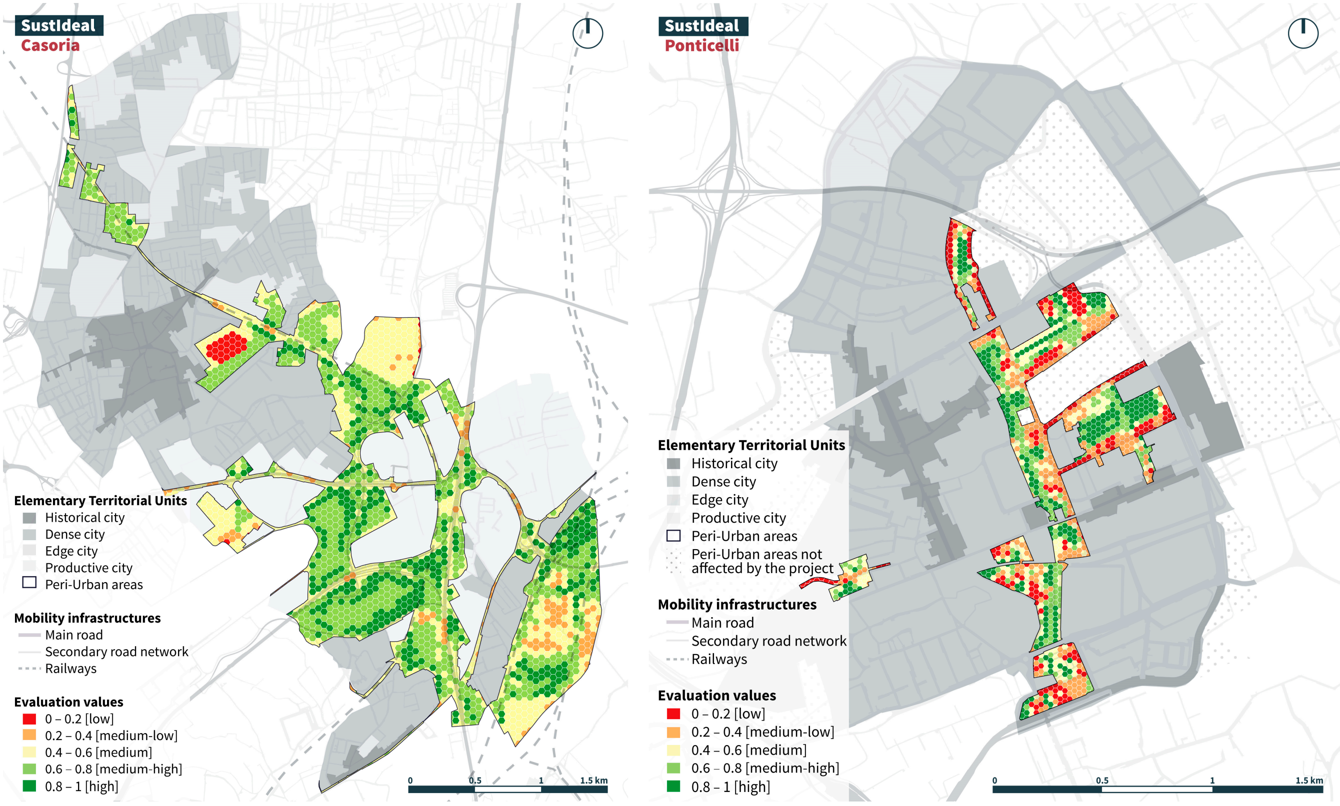

Figure 15. Idea sustainability index for Casoria and Ponticelli.

The synthesis evaluation makes it possible to ascertain whether the multidimensional integration is balanced.

The development strategies of the two plans are heterogeneous. Comparing them helps to highlight sustainable planning strategies for the peri-urban territory.

In Casoria, the peri-urban strategy is aimed at reconstituting an agroforestry landscape as a compensatory component of the city. Spatially, it is directly accessible through a system of paths provided by the plan and collective use, and it is guaranteed by an economy of open space that needs to be nurtured by real people. The fragmentation is compensated for by a reclassification of roads, from urban to rural ones, as well as by the provision of a system of fences that allows for the movement of wildlife.

In Ponticelli, the strong urban and settlement pressure resulting from its partial urban infrastructure allows for a mitigating result of the pressures. The results show that, as more strategies and actions are dictated on the economic and social component, more trade-offs can be identified. Building economic, social, and environmental links among urban, peri-urban, and rural areas cannot be limited to just a narrative, but must be spatially transformed into indices, parameters, subsidies or facilities. Infrastructures and urbanization works must be rethought to consider multiple species and enable multispecies habitability. Moreover, the assessment process could be implemented by the goals that address resources, energy, and consumption (SDGs 6, 7 and 12). This implementation would be necessary to verify whether new public settlements meet near-zero-energy building (NZEB) criteria and are aimed at urbanization that is not extractive of natural resources.

4. Conclusions

Environmental assessments, interpreted as instruments for the pursuit of sustainability, can support decision-making processes for peri-urban planning and programming.

Although the fringe represents significant critical issues, it can be seen as a key area for the regeneration of European cities by working on a different growth model from the one that generated them [13].

The territorialization of the 2030 Agenda in the peri-urban context brings out the need to rethink urbanization without postulating a constitutive outside [24] in which split spatiality is rethought to communicate the sense of an ecological and social relational dimension. The conflicting interests in these transitional landscapes must be supported by evaluations capable of opening a debate and questioning the hypertrophic city in order to imagine urbanizations not preordained to technological or economic laws but instead to collective political choices. In these political choices the form of urbanization should follow the differentiations of infrastructure solutions cultivated within holistic frames of territorial development through a balanced management of resources and attention to the ecological dimension [68]. The development of cities must be planned within its consolidated boundaries, considering that some areas are not sustainable options for relocating the waste of life support (e.g., landfills, logistics and production activities) because they are incompatible with the quality of the residential habitat or because the expansion models foresaw a sectionalization of space. Thinking of the margin as a constitutive exterior determines the construction of what Gilles Clément calls the 'backyards' that serve as another medium for displacement [69].

The use of GIS proved to be very useful for the territorialization of the 2030 Agenda and, thus, in the representation of sustainability indicators and indices. However, it must be considered that GIS, as well as multicriteria evaluation methods, must be used as a decision support system, and not as a tool capable of 'automatically' managing a large availability of spatial data. Therefore, the GIS must not be understood as a tool capable of providing 'automatic' solutions, but as support for public participation and decision-making processes, given the facility with which information and spatial analyses can be communicated.

In this perspective, the debate on 'critical GIS' fits in. It highlights the danger of an increasing role of expert knowledge within the decision-making processes with the advent of a sort of automation revolution that could have completely overhauled the geographical discipline. In fact, it has been pointed out that the risk of a 'hidden technocracy' [70] may be particularly evident when disposing tools capable of 'big' spatial information and analysis. In particular, Thatcher et al. pointed out that critical GIS 'can help us constructively engage not only mainstream GISci and the ever-proliferating intersections of computation with space and place, as well as critical human geography' [71].

Indeed, critical GIS can be understood as a tool to support social transformation by producing not only new cartographies but also new possibilities for change, taking into account the needs of the weaker, marginalized, or discriminated social classes [72]. Thus, a GIS can become a tool for analyzing spatial values, visualizing and proposing 'new spatialities' [73] in order to build fairer and more equitable cities, and reducing spatial inequalities within cities [74].

The use of a GIS in this research moves it in an important direction, with the development of indices and indicators based on the SDGs of the 2030 Agenda verifying the feasibility of these tools on a territorial level for the support of strategic environmental assessments, and therefore, stakeholder participation. These indices make the issues of the society of peri-urban territories spatially explicit. In addition, they attempt to overcome the growing criticality of aquiring data through replicable procedures. The choice of indicators or indices is based on adaptations of measures proposed in the national monitoring of ISTAT, which largely uses indices equivalent to the global indicators of the 2030 Agenda. The adaptations that were necessary in this experiment are justified by the place-based approach that the 2030 Agenda, by its very nature, cannot consider except in terms of compensation or trade-offs on indicators that are worse than the status quo, enabling collective use with a social value of open space and proximity as an opportunity for alternative economic development. Proximity and the local characteristics are certainly in the focus of contemporary urban design, but they also need to be reworked in the evaluation processes.

In the economic dimension, the services provided by agroforestry economies, which the 2030 Agenda deals with in terms of utilized agricultural area, are integrated and the concrete case of the economies of green spaces is evaluated.

In the environmental dimension, the woodiness coefficient can be associated with regulating ecosystem services (CO_2 sequestration, air purification, protection against erosion or hydrogeological disruptions, and increase in habitats for biodiversity) or with indicators of ecological value used in the green infrastructure of spatial policies. It, therefore, represents a synthetic indicator capable of fulfilling several functions.

In the social dimension, the 2030 Agenda does not take into account the civic use of public property. It is not possible to imagine a sustainable development that does not consider instances of regeneration from below, even if only with a view to saving public expenditure. Even unintentional practices of a collaborative type, aimed at objectives of general interest that go beyond even the most directly involved subjects and transcend a logic of a proprietary type [63], persist in the territories, with different and unqualified purposes, resulting in a shared project based on new ways of planning and managing regeneration processes from a quantitative point of view. These instances of a social character need to be studied within the evaluation and planning processes to make them transparent within the community in order to bring out the social aims of bottom-up processes. Furthermore, given the in-depth scale of the experimentation, it was deemed necessary to adapt the sustainable mobility index to the spatial context, evaluating the actual devices capable of fostering sustainable mobility for all social groups, as a form of spatial justice.

The territorialized model makes it possible both to explicate a physical dimension of the transformations and to highlight the new economic, social and environmental relationships between urban and peri-urban contexts. Moreover, a parallelism with the broad scientific literature of ecosystem services is possible [75]. Indeed, the three dimensions can represent 'regulating services' for the environmental dimension, 'provisioning services' for the economic dimension, and 'cultural services' for the social dimension [76].

This evaluation model is developed to associate spatial values that peri-urban areas are capable of expressing even at a potential level. The nonachievement of ideal sustainability is due to two conditions. The first shows that the peri-urban space is used for value expropriation purposes (e.g., to reiterate an urban development that is no longer sustainable, as in the case of private residences that are, however, necessary for the financing of the URP project) and for the creation of 'social mixing'. The second issue concerns the state of the place. In fact, by its nature, the peri-urban space is made up of extensive infrastructures and settlements for which planning tools can imagine restraining or compensatory measures but are not able to cancel their impacts.

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