

Article

Ecosystem Services-Based City Ranking in Italy: A Tool to Enhance Sustainable Thinking in Regeneration Strategies

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Abstract: Multidimensional integrated indicators have become extremely popular for ranking territorial units and comparing them in terms of performance, development and quality of life. The concept of sustainability is not exempt from this global phenomenon. Recognizing the ecosystem services (ES) framework as a tool to drive urban and landscape regeneration toward sustainability, we propose a ranking based on ES multifunctionality. Adopting this approach allows for pursuing different goals on several time frames: to enhance the policy–science interface in the short term; to mainstream ES values in the governance of green transition in the medium term; and to improve sustainability performance in the long term. Based on a spatially explicit assessment of a relevant set of ES variables, we mapped the multiple ecosystem services landscape index (MESLI) and compared the results with the main Italian cities rankings, demonstrating how the ranking tool brings heterogeneous results with relevant differences in assessing territorial features. The conclusions highlight the potential of such a ranking in order to address sustainability thinking in regeneration processes.

Keywords: cities ranking; ecosystem services; sustainable regeneration; ecosystems multifunctionality; MESLI



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1. Introduction

Nowadays, decision-making appears to be greatly influenced by unstructured knowledge frameworks, aiming for rapid consensus rather than building a robust scientific evidence base [1]. Planning is not exempt from this mechanism [2], making use of ranked lists organized from “the best” to “the worst” to set operational priorities in urban management. An example of these unstructured knowledge frameworks is the “cities ranking”, a heterogeneous indicator system recognised for its strong potential to communicate with different target groups and to influence policies and investments [3]. Its potential to contribute to awareness-raising among citizens is acknowledged, in terms of widespread topics like sustainable development, resilience, well-being, quality of life and environmental quality [4,5], which are also increasingly at the core of urban regeneration strategies.

While many works explore the topic of urban regeneration by enhancing natural areas, we argue that the methodological framework of ecosystem services (ES) is a powerful [6,7] yet under-explored [8] tool that can support regeneration strategies, making explicit the link between the environmental performance of urban areas and the benefits that are directly experienced by citizens [9–11].

The ES approach is gaining an ever-increasing role in policy and legislative frameworks (mostly at the national and supra-national level). However, many authors [12–15] highlight the lack of a fully explicit use of ES assessments within the planning and decision-making processes.

A relevant contribution to increasing resilience [16] and tackling climate change [17] in the broader context of urban regeneration processes may come from ES [18]. Furthermore, the recent pandemic crisis suggests that quality of life and citizen well-being should be

central to urban policies [19,20], and a growing body of scientific works is focusing on ES-related benefits for citizens' health and well-being [21].

As pointed out by Longato et al., 2023 [22], the ES approach can support urban decision-making processes, not only in reducing urban pressures and socio-environmental challenges but also in identifying the design solution that maximises benefits, for example, when dealing with the priority selection of nature-based solutions (NBSs) [23].

If ES represent a tool to drive territorial development and urban regeneration toward sustainability [21], an ES city ranking may represent an expressive way to better place this thesis within urban planners' disciplinary debates and to convey the principles of sustainability and the benefits of a healthy urban environment, even to non-experts.

With this in mind, the purposes of this work are twofold:

1. to propose a ranking that is representative of the capacity of territorial systems to deliver multiple ES,
2. to compare our "ES city ranking" with more established quality-of-life rankings published in the Italian context.

Of course, we do consider ranking development, not as a purely "scientific" approach to measuring complex urban dynamics, but we do recognize its effective communicative mainstream capacity to drive and influence current practices in urban management [24], involving people in a transdisciplinary interpretation of local conditions, committing individuals, stakeholders and decision-makers to applied sustainability [25].

This paper is structured as follows: the next section illustrates and describes the main Italian city rankings selected to compare the performances of territorial units according to specific analytical purposes. In Section 3, we describe the methodology and the analytical stages applied to deliver the multifunctionality ES index: the MESLI [26].

Section 4 outlines the main findings, which are then discussed in Section 5 in light of a more extensive overview of the international literature. Section 6 offers conclusions on our ES-based ranking for improving sustainable regeneration practices, contributing to rebuilding the paradigm of how nature matters to people. ES ranking is proposed as a transdisciplinary concept that is useful in the short term to stimulate public debate on prioritizing ES integration in mainstream policies, in the medium term, to integrate ES values into governance of the green deal transition and, in the long term, to achieve sustainability reviewed in terms of the performance of natural and semi-natural systems against the anthropic use of the environment, thus contributing to the development of urban sustainability sciences.

2. Selected City Rankings in Italy

Yearly, several rankings are published that order territorial units according to different multidimensional criteria. They are placed crosswise with respect to different aspects of urban quality, ranging from the provision of services to the availability of infrastructure, from the assessment of wealth to environmental performance, from the dynamism of the world of labour to the perception of personal safety, and from demographic trends to the variety of cultural opportunities available. Their purpose is to compare different territorial contexts in order to identify elements of competitiveness or criticality and to provide useful insights regarding the definition of place-based policies, the design of local development strategies or the effectiveness evaluation of measures implemented in specific sectors.

The purpose of these classifications is to rank territorial units based on an index representative of both liveability and the performance of administrative capacity. These rankings were developed in the socio-economic context; however, over the years, they significantly evolved, moving from a purely economic measure to a multidimensional assessment.

We identify two main criteria for comparing several rankings proposed at the national level: a categorization based on the relevant features that each rank considers when assessing "quality of life" and the territorial scale at which the rankings are drawn up.

The oldest Italian nationwide rankings included only those variables related to the income and economic well-being of the population. Today, they consider well-being as

a multifaceted concept ranging from economic wealth to services provision, from environmental quality to demographic trends and from the assessment of criminality to the availability of recreational opportunities.

These classifications pursue the aim of identifying those components that contribute to the quality of life and are intended as a tool for comparing different territories rather than to deepen the meaning behind the quality of life. To this first category belong the rankings drawn up by Italia Oggi [27] and Il Sole 24 Ore [28], two important economic mastheads.

Equally well-established is the ranking compiled by Legambiente [29], a non-profit environmental organization, which annually draws up a list of Italian provincial capitals based on their degree of sustainability and environmental performance. Its purpose is to assess the extent to which the urban ecosystem is evolving in the direction outlined by the Sustainable Development Goals (SDGs) and, therefore, to evaluate the effectiveness of prescriptions and actions implemented by public administrations. For these reasons, we included Legambiente's ranking in the "Sustainability and environmental performance" category.

To these official and regularly published national rankings, we added a third category: the policy-derived rank related to the National Strategy for Inner Areas (SNAI) [30]. SNAI represents a national policy of development and territorial cohesion, aimed at tackling the marginalization and demographic decline occurring in remote areas. Its goal is to develop place-based multi-level governance models by adopting an integrated approach capable of addressing locally identified critical issues and enhancing natural and cultural heritage. To this end, SNAI classifies the areas of national territory based on accessibility to three main kinds of services: education, health and mobility. The strategy classifies all the Italian municipalities based on their role in providing these services. There are five classes identified: "ultra-remote", "remote", "intermediate", "beltway municipalities" and "poles". In order to obtain a ranking based on this classification, we calculated an indicator for each province that is equal to the ratio between "remote" and "ultra-remote" areas and the overall extent of the provincial territory.

Concerning the territorial scale at which the ranking evaluation is carried out, Italia Oggi and Il Sole 24 Ore rankings are computed on the provincial scale, which corresponds to NUTS level 3 according to Eurostat [31]. In the Supplementary Materials, we have provided a map representing all the Italian NUTS 3 municipalities. The urban ecosystem performance index is assessed at the urban scale for the provincial capitals, while the SNAI-derived index is assessed at the municipal scale. In Table 1, we summarize the main characteristics of the rankings considered.

Table 1. Summary of the main characteristics of the rankings considered.

Authors	Index	Link	Categories	Territorial Scale	Macro-Sectors Considered in the Cumulative Indicator
ITALIA OGGI	Quality of life	https://www.italiaoggi.it/qualita-vita (accessed on 6 June 2024)	Multidimensional; derived from a socio-economic category	Provincial	<ul style="list-style-type: none"> • Business and labour • Environment • Social security • Education, training and human capital • Population • Income and wealth • Crimes and security • Health system • Leisure
Legambiente	Urban ecosystem	https://ecosistemi.legambiente.it/il-progetto/ (accessed on 6 June 2024)	Sustainability and environmental performance	Urban	<ul style="list-style-type: none"> • Air • Water • Waste • Mobility • Urban environment • Energy

Table 1. Cont.

Authors	Index	Link	Categories	Territorial Scale	Macro-Sectors Considered in the Cumulative Indicator
Il SOLE 24ORE	Quality of life	https://lab24.ilsole24ore.com/qualita-della-vita/ (accessed on 6 June 2024)	Multidimensional; derived from a socio-economic category	Provincial	<ul style="list-style-type: none"> • Wealth and spending • Business and labour • Demographics and society • Environment and services • Justice and security • Culture and leisure
National Strategy for Inner Areas (SNAI)	Remoteness index	https://www.agenziacoesione.gov.it/strategia-nazionale-aree-interne/ (accessed on 6 June 2024)	Policy-derived	Municipal	-

To facilitate the comparison among the selected rankings, we considered the provinces as the territorial units of reference. For this reason, the Italia Oggi and Il Sole 24 Ore rankings were considered as originally provided, while the Legambiente ranking was considered as representative of the entire provincial territory.

The Sole 24 Ore's ranking is the most long-standing in Italy: in 2019, its 30th edition was published. Its stated purpose is to measure "the performance of the population, businesses and public institutions". To capture more aspects related to quality of life and its perception by citizens, on the occasion of its 30th anniversary, the number of indicators was increased from 42 to 90, although still divided into the traditional six thematic macro-categories: wealth and spending, business and labour, demographics and society, environment and services, justice and security and leisure.

The first group, "Wealth and spending", considers average salary and pension values and describes the real estate market. To these variables, household debt values, loan payments and the risk rate of financing credit were added. "Business and labour" illustrates the dynamism of the work environment, employment/unemployment rates and export value. This category was extended with the youth entrepreneurship index and the percentage of e-commerce companies. The "Demography and society" group describes the population pyramid, the composition of households and the ratio of the population over 65 with respect to residents of both school and working age. The "Environment and Services" class is rather heterogeneous as it includes indicators relating to social and health services (hospital out-migration, paediatricians per thousand inhabitants, general practitioners per thousand inhabitants and social expenditure for minors, the disabled and the elderly) and environmental parameters such as air quality, per capita water consumption and the percentage of sorted waste collection. To these was added a climate index describing, with 10 sub-indicators, certain climatic characteristics (e.g., solar insolation, extreme events, fog and heat waves). The "Justice and security" class includes statistics on the crimes committed and the efficiency of the administration of legal proceedings. The "Culture and leisure" category considers a set of indicators that are relevant in terms of tourist accommodation and opportunities to enjoy cultural and sports events.

The methodology considers all indicators with the same weight. For each of them, a value between 0 and 1000 is assigned to each Province. The final ranking is obtained by making an arithmetic average of the six macro-sector classifications.

The second ranking, carried out by Italia Oggi, pursues two objectives: firstly, to stimulate a debate on the actions to be implemented to promote welfare and, secondly, to inform public opinion about the gap between political guidelines at the national level and the effectiveness of local administrative action. For this reason, the methodology adopted over the course of the 21 editions was revised and supplemented, following the implementation of sector policies.

The structure of Italia Oggi's ranking is characterized by 9 dimensions (Business and Labour; Environment; Crimes and security; Social security; Education, training and

human capital; Population; Health system; Leisure; Income and wealth), divided into 16 sub-dimensions and 85 indicators. The first dimension, “Business and Labour”, describes the work environment in terms of employment rates, business opportunities and the dynamism of the entrepreneurial context. The “Environment” class includes indicators about air quality, the use of natural resources (water and energy), waste cycle efficiency and sustainable mobility. The “Crime and Security” group summarizes the main crime data, while the “Social Security” class refers to the frequency of fatal or disabling diseases, the frequency of fatal driving accidents and the mortality trend. “Education, training and human capital” provides a summary of the population’s literacy level and the acquired skill bases. The “Population” dimension tracks the demographic trend, whereas the “Health system” describes the healthcare system in terms of equipment and infrastructure. The “Leisure” dimension illustrates the provision of services in the sectors of tourism, accommodation, sport and culture. Finally, the “Income and Wealth” class refers specifically to economic development in terms of average wages and debt, patrimonial value, real estate value and purchasing power.

Compared to the first rank published by *Il Sole 24 Ore*, Italia Oggi considers an additional dimension: “Social Security”. The dimensions “Environment” and “Services” are, furthermore, considered separately.

The third rank, called “Urban ecosystem”, is drawn up by Legambiente on an annual basis, by computing statistical data collected on a national scale by both the National Statistics Institute (ISTAT) and in questionnaires designed for municipal administrations. Its aim is to sort Italian urban areas by considering the overall environmental performance. A total of 18 indicators, divided into 5 macro-sectors, are considered. The ranking for each indicator is compiled by linearly scaling the scores obtained by each provincial capital with respect to the city with the best score. The final ranking is obtained by assigning a score of 100 to the provincial capital that achieves, at the same time, the highest score for all 18 indicators. For all the other cities, the ranking is calculated by a linear process of scaling down. The indicators considered are classified into six main macro-sectors: air, water, waste, mobility, the urban environment and energy.

The first group, “Air”, includes quality indicators such as the concentration of particulate matter and ozone. The second group, “Water”, considers data on domestic water consumption, dispersion in the distribution system, purification capacity and water scarcity. The “Waste” macro-sector includes indicators significant for both the quantity of waste produced and the efficiency of the collection and treatment system (e.g., the percentage of sorted waste out of the total municipal waste produced or the percentage of inhabitants of the municipality served by home collection). The “Mobility” dimension contains indicators describing not only public transport efficiency, transport network safety and active mobility but also the attitude of citizens to car-sharing and bike-sharing. The “Urban environment” cluster illustrates the characteristics of urban green areas (e.g., the number of trees per 100 inhabitants and available urban green areas, expressed in $\text{m}^2/\text{inhabitant}$). Finally, the last macro-sector proposes a ranking based on the energy supply from renewable sources.

As previously mentioned, the last considered rank was derived from the National Strategy for Inner Areas. It stems from the need to address problems of marginalization that affect the less accessible areas of the Italian territory. Since World War II, in fact, a large part of the national territory experienced such phenomena as: (a) depopulation and demographic ageing; (b) a reduction in employment; (c) a quantitative and qualitative reduction in the local supply of public, private and collective services. This marginalization process, however, did not affect the inner areas uniformly: some initiated projects such as landfills, caves or large renewable energy plants that did not generate significant benefits for local communities. Others, on the other hand, developed projects to enhance environmental, cultural and landscape resources or successfully experimented with various forms of cooperation among the municipalities to provide some basic services. The identification of inner areas thus starts from a polycentric interpretation of the national territory, characterized

by a network of municipalities or aggregations of municipalities (service supply centres), around which areas with different levels of spatial remoteness are distributed.

This classification, therefore, does not derive from demands related to a comparative assessment of the quality of life. However, we interpret it as a measure of the overall level of social inclusion. The concept of remoteness thus reflects the lack of availability and poor accessibility of services. However, it is also relevant to the lack of governance skills of some local communities in triggering virtuous processes that are capable of limiting the effect of disadvantageous conditions. According to the time required to reach service centres, inner areas have been classified into intermediate ($20' < t < 40'$), remote ($40' < t < 75'$) and ultra-remote ($t > 75'$).

3. Multifunctionality in ES Assessment

The aim of the work is to propose a city ranking based on ES multifunctionality and then to compare it with annually published rankings for the Italian provinces. To pursue this aim, the methodological flowchart illustrated in Figure 1 below was developed.

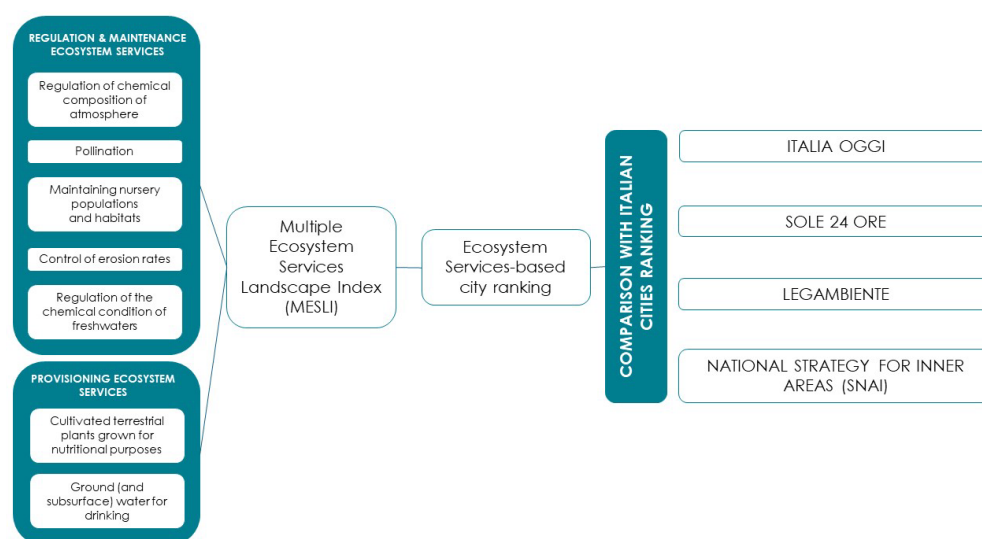


Figure 1. Research methodological framework.

From the ES perspective, the concept of “multifunctionality” has a broad definition that refers to the joint supply of multiple services, functions and benefits. Its role and how it should be interpreted markedly depend on the context, on the assessment scale and on the evaluation method.

For example, agricultural multifunctionality should be viewed as the ability of agroecosystems to deliver multiple benefits: food and fibre production as ES provisioning, regulating ES (including, for example, carbon sequestration and freshwater quality regulation) and cultural ES (e.g., preserving the rural landscape’s identity characteristics) [32,33].

From the planning perspective, assessing ES multifunctionality is an integrated approach to investigating land-use patterns and the interaction between ecosystems and anthropic components in terms of the multiple human benefits derived from nature [34]. Thus, ES multifunctionality does not constitute a planning aim but instead provides effective support when evaluating plan choices because:

1. It allows us to compare cost-efficient vs. spatial-efficient scenarios [35];
2. It expresses an efficiency measure in terms of multiple supplied functions per territorial unit [36];
3. It provides a cross-cutting and comprehensive assessment of the overall performance of the environmental components that constitute the objects of different sectoral policies.

If we refer to multifunctionality in terms of a synthetic index expressing the capacity to simultaneously provide several ES, the degree of multifunctionality depends on the

different spatial arrangements of ES being considered [37] and their mutual interactions (synergies or trade-offs) [38]. Such a methodological framework found several applications in planning practices. For example, as part of green infrastructure (GI) planning and management, ES multifunctionality represents a spatial criterion, together with “ecological connectivity” and “biodiversity conservation” [39,40]. This approach regards several, scales from urban [41–43], to metropolitan [44] and to wider regional scales [45,46].

Concerning planning processes at the municipal scale, the study by Salata et al. [47] references the need to “address sustainability” issues in parcel-based land use regulation. Specifically, as part of the LIFE SAM4CP project [48], three municipal administrations were involved in a participatory process aimed at defining land management strategies and identifying urban growth boundaries through an aggregated index of multiple ES.

Lastly, the concept of multifunctionality is mentioned in the Municipal Plan of the City of Pordenone (Italy), wherein a mechanism to compensate for the impacts of territorial transformations with mitigation actions and the enhancement of ES is being implemented [49,50].

In this work, we consider ES multifunctionality as a measure of the potential benefits that are provided to society and represent an ensemble of the contributions to human well-being that people derive from natural biophysical structures and processes [51], i.e., ES. As already pointed out by Juntti et al. [52], ES are already perceived as related to the quality of life and well-being in an urban environment. The capacity to supply multiple ES results in perceived benefits, for example, in relation to human health, social cohesion and the diversification of rural economic opportunities [53–55]. From a social-ecological perspective [56], assessing ES multifunctionality supports a comparison between different territorial units and produces a strong communicative representation, allowing citizens to perceive ES multifunctionality as a proxy of their quality of life. Therefore, we selected a meaningful indicator for ES multifunctionality that is considered consistent on various spatial scales [57]: the multiple ES landscape index (MESLI).

MESLI is a synthetic index based on the sum of the standardized ES indicators [58]. We use it to provide a comprehensive picture of the multiple ES provided on a national scale. Based on this index, we derived a territorial measure referring to the Provincial administrative borders, through which we arrange our ES-based ranking.

In the following section, the analytical process is described.

4. The Multiple ES Landscape Index (MESLI)

The MESLI index is a synthetic indicator relevant to the joint supply of several ES and significant for the environmental performance of different ecosystems [59,60]. It is, thus, both representative of the number of ES provided and their intensity [61].

Because ES biophysical assessment implies a comparison among non-comparable quantities, synthetic indices involve normalization of the dataset for each ES considered.

The MESLI index was calculated according to Formula (1):

$$\sum_{i=1}^n \frac{\text{Observed value}_i - \text{Low performance benchmark}_i}{\text{Target} - \text{Low performance benchmark}_i} \quad (1)$$

for ES, providing a positive contribution to the territorial performance and, according to Formula (2):

$$\sum_{i=1}^n \frac{\text{Low performance benchmark}_i - \text{Observed value}_i}{\text{Low performance benchmark}_i - \text{Target}} \quad (2)$$

if the biophysical value constitutes a measure of the failure to provide that specific ES.

According to the MESLI, all the ES layers were normalized in a 0–1 scale, following the “proximity-to-target” methodology, where the 0 value corresponds to the lowest performance benchmark and a value of 1 signifies ES target fulfilment, as defined in a policy goal, by biological thresholds or by expert evaluation. When the ES were not characterized by a well-defined target and a low-performance benchmark, and when further specific

data were not provided, the minimum (equal to 0) and the maximum (equal to 1) values were assigned to the minimum and the maximum biophysical assets assumed by the ES, considering a time series.

In our case, for each of the ES considered, Table 2 summarizes each section and class according to the CICES v5.1 classification [62], along with the references used as the target and the low-performance benchmark. For details on the methodologies and datasets used, we refer to previous works by the same authors [63–66].

Table 2. List of selected ES with their indicators and low- and high-performance benchmarks (Min. t.s., Max. t.s.: minimum and maximum values in the entire time series data).

Section	Class	Indicators	Methodology	Unit	Low-Performance Benchmarks	Target
Regulation & Maintenance	Regulation of chemical composition of atmosphere	Carbon Stock	InVEST model	Shades/Ha	0	Max t.s.
		CO ₂ Uptake	Equation by Clark et al. 2001 [25,26]	g/m ² /year	Min t.s.	Max t.s.
Regulation & Maintenance	Pollination	Pollination Abundance	InVEST model	Index (dimensionless)	0	1
		Pollination Supply	InVEST model	Index (dimensionless)	0	1
	Maintaining nursery populations and habitats	Habitat Quality	InVEST model	Index (dimensionless)	0	1
		Habitat Degradation	InVEST model	Index (dimensionless)	0	Max t.s.
Control of erosion rates	Erosion Rates	InVEST model	Shades/Ha	0	Max t.s.	
Regulation of the chemical condition of freshwaters	Effective Nutrient Retention	InVEST model	Index (dimensionless)	0	1	
Provisioning	Cultivated terrestrial plants grown for nutritional purposes	Crop Production	InVEST model	q/Ha	0	Max t.s.
	Ground (and subsurface) water for drinking	Water Yield	Equation by Budyko [67]	mm/year/Ha	0	Max t.s.

By its own definition, the MESLI index calculated for n ES ranges between 0 and n : the higher the value, the better the system performs in terms of multifunctionality.

For all the considered ES, Equation (1) was used, except for the “Erosion Rates”. Their biophysical value is indeed proportional to the rate of erosive phenomena and the loss of fertile soil; therefore, Equation (2) was computed for this ES.

The methodology provides a spatially continuous distribution of the MESLI index, resulting in a raster that keeps the resolution of the Corine land cover (100 m).

In order to carry out a comparison between the territorial performance measured with the MESLI and those emerging from the rankings, the data were aggregated considering the administrative boundaries of Italian provinces, considered as reference territorial units (NUTS3). To achieve this, we worked in the GIS environment through zonal statistics analysis; therefore, the mean value of data distribution was assigned to each province.

In the Supplementary Materials, we provide a table summarizing the ranking position assigned to each Italian province according to the MESLI average value.

5. Results

For the first results, we illustrate the spatial distribution of the MESLI index assessed for the entire Italian territory (Figure 2). As can be seen, it ranges between 0.6 and 5.8.

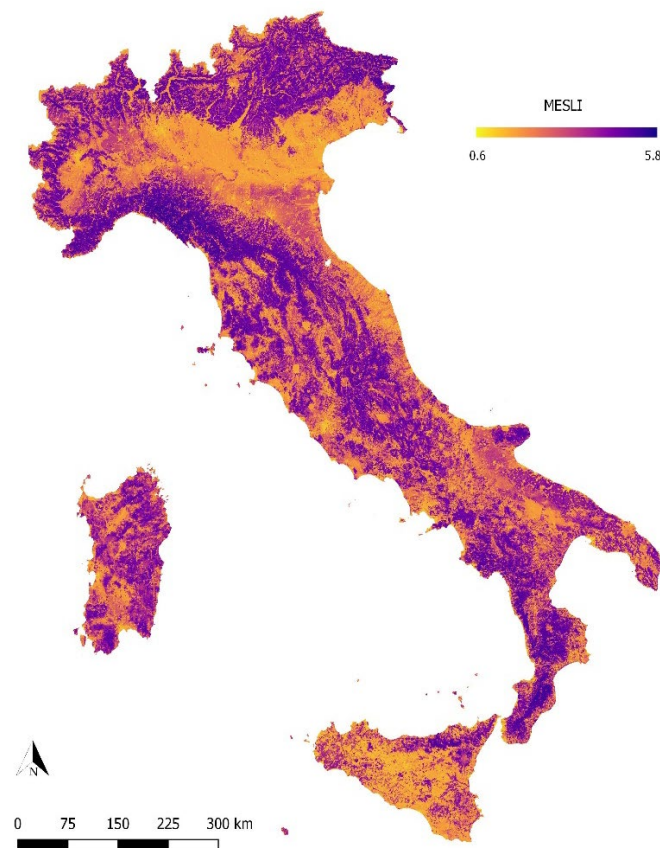


Figure 2. Spatial distribution of the MESLI index across the Italian territories.

The highest values are spatially distributed in the northeastern territorial district and along the Apennine Chain reliefs. High values are also observed in the provinces of Foggia and Messina, in the northeastern area of the Sicily region and in the eastern area of Sardinia Island. Conversely, the areas that express a lesser ecosystem multifunctionality correspond to that of the Po Valley, especially on the north side of the river, and to a large part of the Sicily region.

Considering the MESLI average value (Figure 3), a rather varied representation emerges. Very low average values spatially aggregate in the northern part of the Po Valley and in most of the provinces of the Sicily region. Conversely, the value of the Apennine chain emerges, with average values of ecosystem multifunctionality that vary from high to very high, with a few exceptions in the provinces of central and southern Italy.

This average value for each province was then used in order to list Italian NUTS 3 areas according to our ES-based ranking, providing a useful basis for comparison with the other selected rankings.

As previously described, the rankings arose with different purposes and, therefore, consider different dimensions (or macro-sectors). Because of the importance of geographical components, we find it useful to illustrate the results, starting with their spatial representation (Figure 4). To facilitate comparison, the Italian provinces have been classified on the basis of their ranking position: “high” if a province belongs to the first 36 positions, “medium” if it is included between 37 and 72, and “low” if belongs to the lower part of the distribution (from 72 to 107).

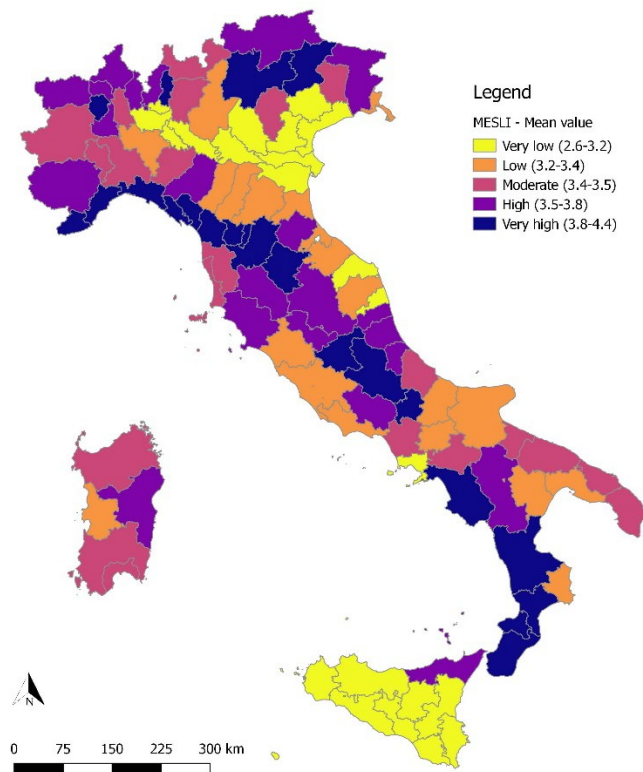


Figure 3. Average MESLI value per province.

From the comparisons, it is possible to identify areas that hold high positions in all the considered rankings (i.e., Trento and Bolzano). These are characterized not only by a significant presence of natural and semi-natural areas but also by effective systems of territorial governance that, while preserving the various environmental components, supported socio-economic development (*Italia Oggi* and *Sole 24 Ore*) and guaranteed accessibility to services, despite the presence of remote and ultra-remote areas (SNAI).

Conversely, some provinces of the Sicily region (Ragusa and Trapani) hold the lowest positions, including the SNAI ranking.

Further considerations arise when looking at the Po Valley (the provinces of Alessandria, Varese, Novara, Pavia, Milano, Lecco, Monza e Brianza, Lodi, Cremona, Mantova, Verona, Rovigo, Padova, Ferrara, Bologna, Modena, Reggio nell' Emilia, and Parma e Piacenza), which is characterized by a high degree of anthropization, namely, the widespread presence of relevant productive and industrial districts and the prevailing intensive agricultural contexts.

The degree of ecosystem multifunctionality (MESLI) varies from “low” to “medium”, while the *Sole 24 Ore* and *Italia Oggi*'s rankings express a level of well-being, quality of life and general development between high and medium. Conversely, there is greater spatial variability in the *Legambiente* index, which is more profoundly affected by environmental policies implemented at the local level. Even in this area, there is not a full correspondence between the percentage of areas defined as “remote” and “ultra-remote” and ecosystem multifunctionality, as measured through the MESLI.

Further reflections at the national level emerge from a comparison of the area (Figure 5) and population (Figure 6) percentages ranking “high” (dark red), “medium” (red), and “low” (light red) with respect to each classification.

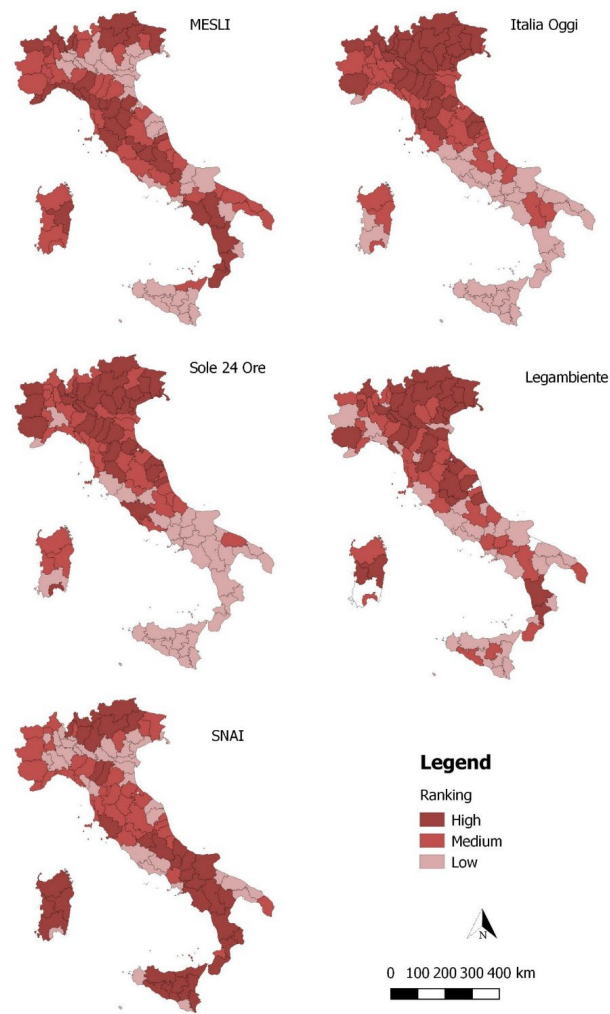


Figure 4. Comparison between the classifications of the Italian provinces, based on the study’s rankings.

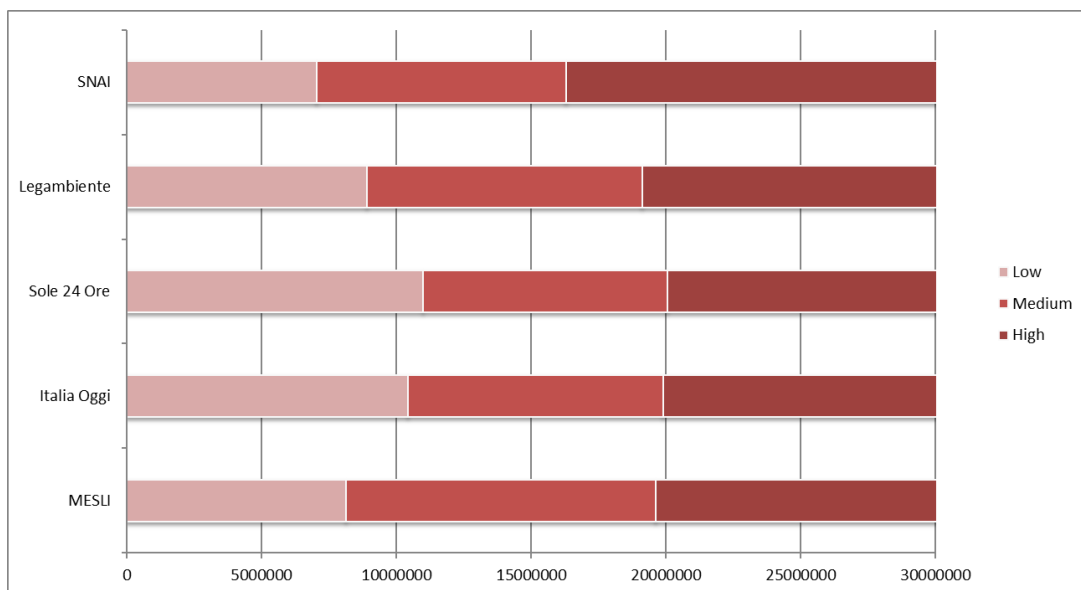


Figure 5. Area extent included in the three classes (low, medium and high) according to all the indicators considered.

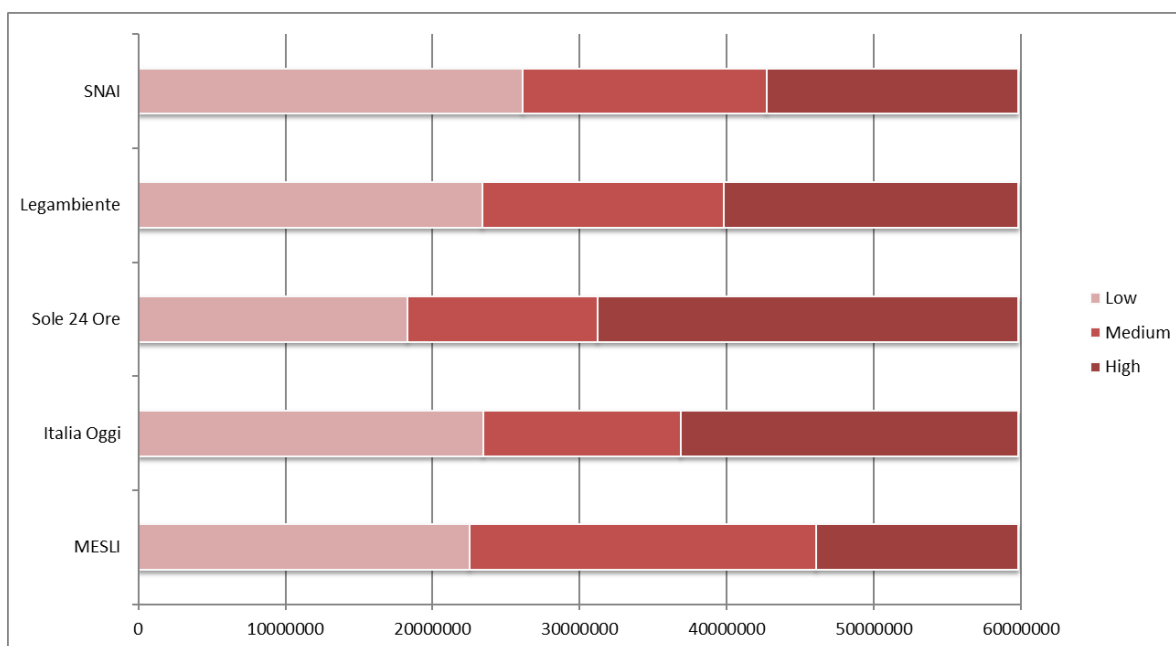


Figure 6. Population included in the three classes (low, medium and high) according to all the indicators considered.

On a territorial level, it transpires that the performances are very similar with regard to *Italia Oggi* and *Il Sole 24 Ore*. Concerning the highest class, even MESLI and *Legambiente* assign a good score to areas that are not much higher than the first two rankings. Conversely, SNAI-based classification is the one system that assigns a higher ranking to the largest percentage of land area.

In comparison, the demographic dimension (Figure 6) expresses greater variability among rankings. As can be seen, in fact, MESLI is the index that rewards the least populated provinces. About 14 million people, or 23% of the national population, reside in the provinces in the top 36 positions. The percentages of the population classified in the intermediate range (39% of the national population) and in the low range (38% of the national population) are, instead, comparable.

Not very dissimilar to this is the result of the division into classes according to SNAI. According to the percentages of remoteness and marginalization, 44% of the population resides in territories that are in the lower part of the ranking. The percentages of the population in the middle and upper parts of the ranking are comparable, these being 28% and 29%, respectively.

Conversely, the *Sole 24 Ore* classification gives considerable weight to population. In fact, the best-ranked provinces are inhabited by around 48% of the national population (over 28 million inhabitants).

The joint observation of Figures 5 and 6 confirms the target of the SNAI, which is focused on territories that are characterized by low population density and depopulation phenomena, which are also due to poor accessibility to services. The “high” class according to the SNAI corresponds, while including the same number of provinces, to a territory covering 46% of the national area.

Furthermore, to highlight how territorial differences are cached by each ranking while considering our ES-based ranking as reference, we provide diagrams in the Supplementary Materials that show the pairwise scatter distribution of all NUTS3 units.

6. Discussion

Acknowledging the increasing focus on city ranking to steer decision-making processes towards broadly shared solutions [68], our effort was aimed at paving the way for a bottom-up definition of ES-oriented regeneration processes by provoking society into recognizing

the ES value [69], thus driving greater societal demand towards effective sustainable territorial and urban management.

As outlined in the scientific literature, a nature-based regeneration strategy that is proactively planned has the potential to drive urban development by providing a framework for socio-economic growth and natural capital conservation [70].

The proposed comparison of different rankings highlights the multifaceted nature of the concepts of territorial performance and how it has evolved over time. Each ranking is, in fact, influenced primarily by the choice of macro-sectors that contribute positively or negatively to defining the concept of performance, first covering exclusively the economic dimension and, progressively, assuming a multidimensional nature, accounting for environmental and social issues.

This evolution, for example, led *Il Sole 24 Ore* to integrate into its city rankings the “Climate index”, which provides a way to monitor the territorial performance in relation to climate change, perceived as one of the most important challenges of the contemporary age. This shows a growing interest, even by non-experts, in the themes of sustainability, the value of natural components and the integration between human and environmental components.

Conversely, the extent to which these issues play a role in ranking evaluation is not sufficient when orienting regeneration processes towards sustainability. As highlighted by Gomez [71], in fact, the ambition to become not only the largest city but also the best in each of the described rankings (whatever the term “best” refers to) interferes with the dynamics of development and competitiveness characteristics that must take account of the carrying capacity of ecosystems.

The city ranking approach thus fits with the need to capture the concept of complexity in regeneration practices, pursuing different goals at different time frames:

1. In the short term: to enhance the policy-science interface by improving communication to stimulate public debate and foster co-design of regeneration policy objectives;
2. In the medium term: to integrate ES values into governance of green deal transition by promoting a culture of shared multi-level responsibility;
3. In the long term: to improve sustainability performance by integrating the ES framework into both territorial and urban governance processes.

The purposes of this approach are to provide a valid argument for comparing spatial units in terms of ecosystem multifunctionality as a benchmark of territorial performance and to propose our ES city ranking system as a tool to reinforce the co-producing knowledge process, involving several kinds of stakeholders in decision-making and regeneration policy design.

As discussed in the previous section, the MESLI ES ranking is not comparable with popular city rankings in Italy. This is to be expected, as evidenced by the fact that the input information is derived from a specific assessment of the eco-environmental territorial features prevailing on socio-economic ones. Through this approach, the “City Ranking” system becomes expressive of a relative performance-based assessment, where the relative position in the rank stimulates territorial competition according to sustainability issues and involves in this debate a greater diversity of people [72,73].

Concerning the Italian case study, it is encouraging to see that some territorial units (e.g., the Provinces of Trento and Bolzano) hold high positions, both in our MESLI ES ranking and in the traditional ones. Those areas may be considered nationally excellent for their level of quality of life. Therefore, our ecosystems-centred evaluation is consistent with those that are grounded on economic and social dimensions.

This allows us to propose our ES ranking as an alternative way to classify territorial units in Italy, highlighting different values and pushing ES thinking in urban management. Furthermore, we can affirm that multi-ecosystem performance is not in opposition to economic and social development [74]. Instead, it represents the complementary performance of a territorial system where a sustainability concept is applied over three dimensions: environmental, economic and social.

7. Conclusions

The ES methodological framework has proven to be really effective, leading to more informed planning decisions and dealing with several kinds of socio-environmental challenges [22,75]. Although it constitutes a well-established research strand in the scientific literature, the framework's full integration into decision-making, governance and policy design processes remains a tricky issue [76].

We affirm that their *operationalization* [77] requires further effort by the scientific community and that our ES-based city ranking system can be the spark that ignites public debate on the sustainability of urban regeneration strategies.

On the one hand, "City ranking" can become a useful tool to guide choices, to prioritize interventions and to legitimize public investment. On the other hand, their communication potential has succeeded in conveying topics such as urban sustainability, the settlements' adaptive capacity towards climate change and environmental justice within large segments of the population, with most being non-experts.

Our proposal for a ranking based on ecosystem multifunctionality, understood as the capacity to provide multiple services for citizens' health and well-being, is at the core of reflections on urban policies that look at environmental performance and quality of life as two sides of the same coin.

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