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Comparative Review of Neighborhood Sustainability Assessment Tools

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Abstract: The paper aims to evaluate criteria for appraising the existing urban transformation projects in view of the social dimension of sustainability. Within the case study of the recovery project of "G. Prandina" barrack in Padua, north-east of Italy, the paper compares two different Italian rating systems to evaluate neighborhood sustainability: "GBC Quartieri" and "ITACA Scala Urbana". The GBC Quartieri rating system, with a point scheme, allots credits for neighborhood design features, and integrates the environment, infrastructures, and buildings for the creation of sustainable communities with a relationship net and a pre-existence connection. The "ITACA Scala Urbana" procedure consists of a multicriteria evaluation of the environmental sustainability and the compilation of a group of worksheets, one for each different internal performance indicator. The results show the main differences and analogies among the different tools, and this analysis confirms that new neighborhood protocols originating from building rating systems dedicate little space to social aspects and to the concept of inclusion, instead of the newly developed neighborhood protocols. Through this examination, the research can also conclude that the identification of common macro-areas is present, which highlights the different levels of importance given to the various features connected to social sustainability in neighborhood transformation.

Keywords: neighborhood sustainability assessment; GBC Quartieri; ITACA Scala Urbana; sustainability

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1. Introduction

When we think about cities in developed countries, especially European cities, we imagine a compact, mixed, social, and diversified city model, in which the city district centers constitute a neighborhood's identity.

This seems to be a result of globalization, [1] which not only refers to the economic dimension, but also to some political, cultural, and environmental ones [2]. In fact, the development of cities is often associated with social and economic problems, such as poverty and segregation, tensions between different groups, economic vulnerability, and ecological problems related to pollution, resource use, congestion, and spatial competition [3]. It is also connected with economic and cultural wealth, and dynamic development that can provide opportunities for technological, organizational, and social innovation. In this way, cities in today's developed countries have become industrial hubs, where most job opportunities are found along with a massive urbanization process. Today's developing countries are replicating these same dynamics, while experiencing massive rural exodus leading to an exponential growth of their cities [4]. We can observe the urgent call to attention by governments and planners regarding climate change, reducing greenhouse gas emissions, and keeping global warming within a safe trajectory, which is not being targeted or achieved [5]. According to United Nations forecasts [6], in 2050, most people will live in cities or urban centers, and the Directive 2010/31/CE shows that buildings consume 40% of energy in the European Union [7]. Therefore, it is increasingly vital to work towards a more sustainable urban environment and guarantee adequate public services that realize greener cities [8]. Indeed, there are new urban challenges to urban design and architecture commitments, structured on the three abiding principles of sustainability: climate change, accessibility to common goods, and increasing social inequalities [9]. Thus, globalization is undergoing major changes in some relevant dynamics related to wealth, ecological impact, and population, creating a driving force that addresses the geographical concentration of economic activity and population within cities, called agglomeration economies (and diseconomies) [10].

Understanding these changes is crucial in facing these challenges.

In particular, if we consider, on the one hand, the changes introduced by globalization, such as the concentration of the population, as well as the increasing signs of social, economic, and environmental problems due to the negative impacts of human activities, we need to understand what is happening to urban patterns on the other. Low density and scattered urban sprawl can create negative environmental, social, and economic impacts for cities and rural areas. Landscape metrics have been widely used for describing the spatial heterogeneity of land-use and urban morphological characteristics, but also to analyze land use dynamics, urban growth processes, and changing patterns [11,12].

A particular category of these spaces that lost their ability to be active parts of the city is represented by all spaces that are unfit for development, i.e., all vacant land, land pending development, and derelict land. These are spaces not designed, which have been left to be colonized by nature in a semi-wild way [13]. These represent an uncertain character of the city, sometimes subjected to security problems, sometimes voids in the middle of the surrounding built environment, as well as voids in their temporal dimension in periods between changes in land use. They can be vacant if redeveloped without treatment, where treatment includes any of the following: demolition, clearing of fixed structures or foundations, and levelling. Otherwise, they could be derelict land resulting from industrial growth and decline, changing zoning policies, or the abandonment of old transport networks and interchanges. As they are often found in prominent locations within urban areas, they can be perceived as a blight on the urban landscape, or as a wasted opportunity, especially in a densely populated town or city with little public space [14].

Sustainable development is an elusive concept with a large diversity of definitions [15,16]. Briefly summarized, sustainable development implies that society must strive to attain a balanced approach to socio-economic development based on a solid understanding of and respect for ecological systems. Urban development has emerged as a key topic within debates on sustainability, particularly as a source of problems when urban areas are not intelligently planned and developed. At the same time, sustainable urban transformation places a stronger emphasis on structural transformation processes, relating to both multidimensional and radical change, which can effectively direct urban development towards sustainability. Put simply, sustainable urban development is primarily about development in urban areas, while sustainable urban transformation is about the development or change of urban areas [17].

The sustainable regeneration of cities is, thus, a long-held aspiration [18]. Actions taken till now in the name of sustainability (and also of resilience) are many and varied, from water-efficient fittings [19] to mixed-use development [20], passing through urban safety, economic soil management, waste management, energy management, public and green spaces management, building management, and social participation and inclusion. One of the most interesting opportunities is represented by brownfield regeneration, especially when these parts of the city are located nearby or inside the city center. Brownfield is referred to the previously developed land, not in current use, which presents actual or suspected land contamination [21].

By regenerating these areas, it is possible to provide services to the surrounding districts, create new central places (centers and sub-centers), and improve the general quality of life, especially if located in the inner city. The limitation of this intervention is connected to the incapacity to understand the transformations' possible outcomes in the medium and long-term periods. In fact, society and engaged citizens become critical sources of change towards the new values. At the same time, our perceptions about achieving sustainable regeneration change over time—contexts change (e.g., climate change, peak oil), thinking advances, methods are tried and tested, and solutions work or fail. Sometimes, the goal itself evolves, as sustainable cities, 24 h cities, resilient cities, carbon dioxide neutral cities, and one-planet living have emerged successively over the past decade. The challenge here is how to incorporate changing priorities and thinking into what we do now, while ensuring, as best we can, that what we put in place now will have relevance in the future. Ecology, economy, infrastructure, community and social habits, and governance are only some of the topics in sustainable regeneration, and they represent a vast and tricky range of interconnections, actions, and reactions that a planner or a designer has to deal with. Within this complexity, in a project of urban regeneration, the idea of a system's ability to withstand shocks, or indeed disturbances of any magnitude, and to continue to operate in some recognizable form, even if system outputs may be degraded for a time, should be a winning idea. The key could be promoting the social responsibility of areas that are at risk of land degradation in many ways. This means that the revitalization of brownfields can be considered as a reinforcement of the social aspects of sustainable urban regeneration by improving quality of life, and promoting human health and occupants' well-being. This is possible by acquiring a successful development plan that limits the external shocks that can happen in the medium and long term. Therefore, the pattern of a society, and thus the whole involved community, including occupants, workers, visitors, and all relevant actors, can be profoundly changed by a brownfield regeneration if correct attention has been paid to user needs and expectations or to managing regeneration in sustainable ways. Understanding resident satisfaction in regenerated urban areas is a prerequisite for reducing the environmental impact of buildings, increasing sustainable quality, and creating healthy urban environments.

The success of urban sustainable regeneration can also compromise the sustainability and quality of life of an area or city through gentrification. In fact, as stated by Granger [22], gentrification results in a loss of diversity in a community or city, as residents are displaced through rent increases and changes in housing tenure. In this way, land prices in areas can compromise the very vitality of urban neighborhoods through a 'destruction of diversity' and a 'return to unnatural urban spaces' [23] that can destabilize the social fabric of a city. As such, housing can quickly become a commodity for investment as economic returns grow [24], creating further interest and investment from speculators and promoting the creation of barriers (lack of affordable housing) to living in a city.

Therefore, the relationship between society, economy, and territory needs to be analyzed in a new way that highlights the internal connections [25].

Nowadays, growing environmental issues lead to the creation of more resilient socio-ecological systems and urban areas [26], causing a new functionalist reductionism [27] in urban planning and design. New social requirements lead to an increasing number of indicators, standards, and certifications in professional practices [28].

In this context, the neighborhood sustainability assessment (NSA) tools are tools that evaluate and classify the performance of a given neighborhood against a set of criteria and topics, to assess the achievement of sustainability goals [29].

Contrary to standards and certifications, new forms of participation and social interaction are identified. Indeed, they can bring out practical knowledge with multiple interpretations of reality, expressing the ability to adapt to complexity and experimenting innovative solutions able to respond to instances in specific communities [28].

Furthermore, with regards to protocols, there is an opening towards more inclusive and adaptive approaches, incorporating new criteria, including human factors and social aspects. With the necessary introduction of participatory practices and institutional negotiations, the rating systems structures are positively changed, becoming less rigid and more procedural, adaptive, and inclusive [28]. However, this statement is not true for all types of protocols. Indeed, the rating systems of the main buildings are primarily based on the analysis of the environmental aspects, such as energy consumption and efficiency [30].

Consequently, these neighborhood protocols dedicate little space to social aspects and to the concept of inclusion [29]. Instead, the newly developed neighborhood protocols are participatory and open to social instances [28].

In this paper, the authors analyzed two different rating systems: GBC Quartieri and ITACA Scala Urbana. The first is a protocol developed by the Italian Green Building Council (GBC Italia) for requalification and development projects that promote the environmental sustainability of territory, infrastructure, equipment, and sustainable buildings. This rating system is a guideline for urban developments, and supports best practices of territorial analysis, areas chosen in relationship with the environmental preservation, promoting connections, relations between preexisting structures, the creation and the development of services, and social functions [31].

In Italy, an Italian interregional group in the Institute for Transparency of Contracts and Environmental Compatibility developed the "ITACA Scala Urbana". The purpose of this project is to envelope a complete, open, accessible, flexible, and contextualized instrument for the evaluation of neighborhood plans with performance indicators [32].

Here, following some previews works [33,34], the authors propose a comparative review of neighborhood sustainability assessment tools. A case study of an urban project, the recovery of "G. Prandina" barrack in Padua (Italy), is considered. The comparison helps to identify common macro-areas, the levels of importance given to the various evaluations, and the difficulties when applying the two neighborhood sustainability assessment tools.

2. Materials and Methods

The research aims to compare two different types of neighborhood protocols in order to understand their internal structure and participatory social instances. The proposed methodology has been taken up by previous studies and research applied to buildings rating systems [35–38].

The methodology begins with the internal analysis of the two protocols.

GBC Quartieri was developed in Italy, and it was created from other existing rating systems: LEED Neighborhood Development, LEED 2009 Italia New Construction, and Restoration, and GBC Home.

This is a voluntary, market-driven, and consensus-based tool that serves as a guideline and assessment mechanism. The purpose is to optimize the use of natural resources, promote regenerative and restorative strategies, maximize the positive and minimize the negative environmental and human health consequences of the building industry, and provide high-quality indoor environments for building occupants. All GBC and LEED rating systems are structured in prerequisites, the mandatory part, and credits, i.e., the part where points are awarded. Based on the number of points achieved, a project reaches a rating level: Certified (40–49), Silver (50–59), Gold (60–79), or Platinum (higher than 80).

GBC Quartieri is composed of three main categories: smart location and linkage, neighborhood pattern and design, and green infrastructure and buildings.

ITACA Scala Urbana was developed in 2016 by an interregional group in the Institute for Transparency of Contracts and Environmental Compatibility. This is a voluntary tool with the purpose of obtaining a concise judgment about the global performance of an urban establishment. The score is achieved from qualitative parameters, divided into ten areas: governance, urbanism aspects, urban landscape quality, architectural aspects, public spaces, urban metabolism, biodiversity, adjustment, accessibility/mobility, society and culture, and economy. The structure and number of parameters considered can change in function of the project scale and the subject matter. In this case, the ITACA protocol is analyzed in a neighborhood scale and project phase.

The two neighborhood protocols were compared in order to underline the main differences in the composition of the total score in relation to the sustainability. However, their internal structures are not defined in the same manner. By observing the aerograms in Figures 1 and 2, it is easy to notice the differences.

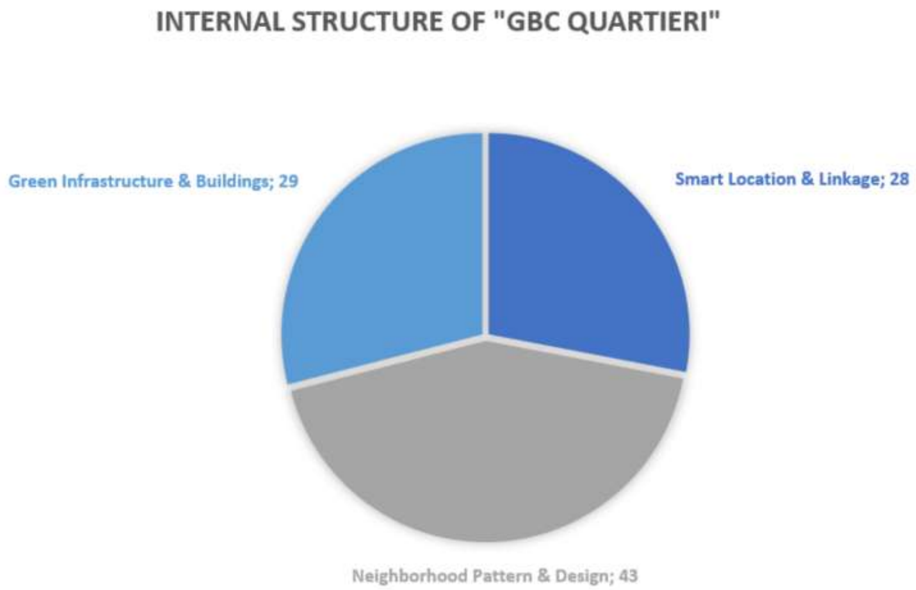

Figure 1. Aerogram of the internal distribution in GBC Quartieri distinguished between three different areas.

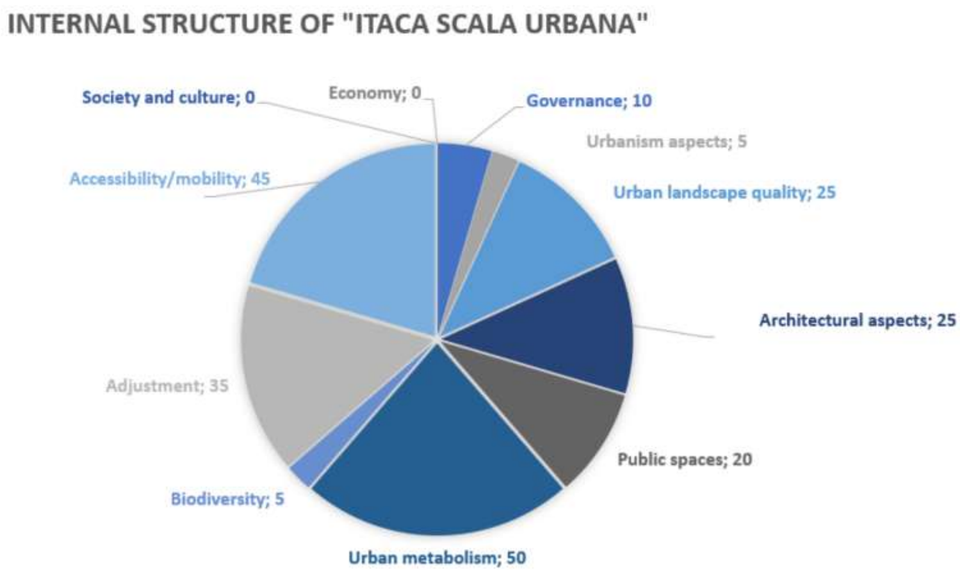

Figure 2. Aerogram of the internal distribution in ITACA Scala Urbana distinguished between the ten different areas. Two of them have zero parameters for this particular subject matter and application scale.

For this reason, it is necessary to analyze both protocols in detail and define new macro areas of sustainability aspects to create a new internal division in order to compare the rating systems and highlight the differences. Three different macro-areas were assigned to credits in GBC and sheets in ITACA (Tables 1 and 2): one is related to the energy and environment aspects, such as low energy consumption or CO_2 emission; another is related to the economic aspects, such as energy savings; and the last one is related to the social aspects, such as mixite or relationship with other parts of the city. Two new scores were also assigned to each macro area, calculated by summing the individual scores of each credit for GBC and each sheet for ITACA (Figures 3 and 4).

Table 1. Sustainability classification of prerequisites (red background) and credits (blue background) for GBC Quartieri; each principle of sustainability is defined using a qualitative assessment according to the macro-areas' energy, as well as environmental (EA), economic (E), or social (S) improvements.

GBC Quartieri			
Smart Location & Linkage			
Code	**Description**	**Points**	**Sustainability**
LCS_p1	Smart Location	X	EA
LCS_p2	Imperiled Species and Ecological Communities	X	EA
LCS_p3	Wetland and Water Body Conservation	X	EA
LCS_p4	Agricultural Land Conservation	X	S
LCS_p5	Floodplain Avoidance	X	EA
LCS_c1	Preferred Locations	10	EA
LCS_c2	Brownfield Remediation	2	EA
LCS_c3	Access to Quality Transit	7	EA
LCS_c4	Bicycle Facilities	2	EA
LCS_c5	Housing and Jobs Proximity	3	S
LCS_c6	Steep Slope Protection	1	EA
LCS_c7	Site Design for Habitat or Wetland and Water Body Conservation	1	EA
LCS_c8	Restoration of Habitat or Wetlands and Water Bodies	1	EA
LCS_c9	Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	1	EA
Neighborhood Pattern & Design			
Code	**Description**	**Points**	**Sustainability**
OPQ_p1	Walkable Streets	X	EA
OPQ_p2	Compact Development	X	S
OPQ_p3	Connected and Open Community	X	S
OPQ_c1	Walkable Streets	9	EA
OPQ_c2	Compact Development	6	S
OPQ_c3	Mixed-Use Neighborhoods	4	S
OPQ_c4	Housing Types and Affordability	7	S
OPQ_c5	Reduced Parking Footprint	1	EA
OPQ_c6	Connected and Open Community	2	S
OPQ_c7	Transit Facilities	1	EA
OPQ_c8	Transportation Demand Management	2	EA
OPQ_c9	Access to Civic & Public Space	1	S
OPQ_c10	Access to Recreation Facilities	1	S
OPQ_c11	Visitability and Universal Design	1	S
OPQ_c12	Community Outreach and Involvement	2	S
OPQ_c13	Local Food Production	1	S
OPQ_c14	Tree-Lined and Shaded Streetscapes	2	EA
OPQ_c15	Neighborhood Schools	1	S
OPQ_c16	Acustic environment	2	EA
Green Infrastructure & Buildings			
Code	**Description**	**Points**	**Sustainability**
IES_p1	Certified Green Building	X	EA / E
IES_p2	Minimum Building Energy Performance	X	EA / E
IES_p3	Indoor Water Use Reduction	X	EA / E
IES_p4	Construction Activity Pollution Prevention	X	EA / E
IES_c1	Certified Green Buildings	5	EA / E

Table 1. *Cont.*

IES_c2	Optimize Building Energy Performance	2	EA / E
IES_c3	Indoor Water Use Reduction	1	EA / E
IES_c4	Outdoor Water Use Reduction	1	EA / E
IES_c5	Building Reuse	1	EA
IES_c6	Historic Resource Preservation and Adaptive Reuse	1	S
IES_c7	Minimized Site Disturbance	1	EA
IES_c8	Rainwater Management	4	EA
IES_c9	Heat Island Reduction	1	EA
IES_c10	Solar Orientation	1	EA
IES_c11	Renewable Energy Production	3	EA / E
IES_c12	District Heating and Cooling	2	EA
IES_c13	Infrastructure Energy Efficiency	1	EA / E
IES_c14	Wastewater Management	2	EA
IES_c15	Recycled and Reused Infrastructure	1	EA
IES_c16	Solid Waste Management	1	EA
IES_c17	Light Pollution Reduction	1	EA

Table 2. Sustainability classification of parameters for ITACA Scala Urbana; each principle of sustainability is defined using a qualitative assessment according to the macro-areas' energy, as well as environmental (EA), economic (E), or social (S) improvements. Some lines are crossed out because we selected the neighborhood project phase. Two parameters on the composition of the project teams are not considered (blank). Crossed-out parameters are considered for a different type of project scale and subject matter.

ITACA Scala Urbana			
Code	**Description**	**Points**	**Sustainability**
1.01	Partecipation	5	S
1.02	Social construction management	5	S
~~2.01~~	~~Cadastal particel development and integration~~	~~5~~	~~S~~
~~2.02~~	~~Vicinity to the consolidated city~~	~~5~~	~~S~~
~~2.03~~	~~Land conservation~~	~~5~~	~~EA~~
2.04	Building conservation	5	S
2bis 01	Connected and open community	5	S
2bis 02	Relationship with rural areas	5	S
2bis 03	Reinforcement of urban role	5	S
2bis 04	Qualification of urban edges	5	E
2bis 05	Public spaces role	5	S
3.01	Project elaboration manner	5	
3.02	Project team qualification	5	
3.03	Management parameters	5	S
3.04	Research of contemporary architectural languages	5	S
3.05	Architectural work flexibility	5	S
4.01	Public spaces importance in the project	5	S
4.02	Lighting of pedestrian way	5	S
4.03	Crime prevention	5	S
4.04	Shaded streets and public areas - termal comfort	5	EA
5.01	Ground permeability	5	EA
5.02	Intensity of water treatment	5	EA

Table 2. *Cont.*

ITACA Scala Urbana			
Code	**Description**	**Points**	**Sustainability**
5.03	Management of wastewater	5	EA / E
5.04	Accessibility to waste sorting	5	EA
5.05	Light pollution	5	EA / E
~~5.06~~	~~Air quality monitoring~~	~~5~~	~~EA~~
5.07	Greenhouse gas intensity	5	EA
5.08	Acidify emissions intensity	5	EA
5.09	Photioxidant emissions intensity	5	EA
5.10	Primary energy for public lighting	5	EA / E
~~5.11~~	~~Local production of renewable energy~~	~~5~~	~~EA~~
~~6.01~~	~~Green spaces connectivity~~	~~5~~	~~S~~
6.02	Autoctone vegetation use	5	EA
~~6.03~~	~~Green spaces availability~~	~~5~~	~~S~~
~~7.01.1~~	~~Extraordinary maintenance of water pipes~~	~~5~~	~~EA~~
7.01.2	Reuse and reduction of rainwater in sewer	5	EA / E
7.01.3	Xerofite plants use	5	EA
7.02.1	Increase of trees in streets, squares and parking	5	EA
7.02.2	Intensification of natural urban ventilation	5	EA
7.02.3	External spaces termal comfort - Albedo	5	EA
7.03.1	Natural quality requalification - regreening	5	EA
~~7.03.2~~	~~Construction pressure reduction~~	~~5~~	~~S~~
7.03.3	Rainwater reduction in sewer	5	EA
~~7.03.4~~	~~Watercourse re-naturalization~~	~~5~~	~~EA~~
~~7.03.5~~	~~Tendential exposure risk population reduction~~	~~5~~	~~S~~
~~7.03.6~~	~~Damage in public open spaces reduction~~	~~5~~	~~S~~
8.01	Road network connectivity	5	S
8.02	Road network connectivity	5	S
8.03	Road network scale	5	S
8.04	Public transport accessibility	5	S
8.05	Safe cicle way availability	5	S
8.06	Matching of cicle and vehicular ways	5	S
8.07	Pedestrian way accessibility	5	S
~~8.07 bis~~	~~Pedestrian way accessibility~~	~~5~~	~~S~~
8.08	Share mobility accessibility	5	S
8.09	ICT accessibility	5	S
~~9.01~~	~~Main services proximity~~	~~5~~	~~S~~
~~9.02~~	~~Proximity to free time structures~~	~~5~~	~~S~~
~~9.03~~	~~Use Flexibility~~	~~5~~	~~S~~
~~9.04~~	~~Mixitè~~	~~5~~	~~S~~
~~9.05~~	~~Urban garden effect~~	~~5~~	~~EA~~
~~10.01~~	~~Economic accessibility of residential property~~	~~5~~	~~E~~
~~10.02~~	~~Residential rented accessibility~~	~~5~~	~~E~~
~~10.03~~	~~Composition and variety of residential offer~~	~~5~~	~~S~~
~~10.04~~	~~Employment potential~~	~~5~~	~~S~~

Therefore, the new scores were normalized and defined in Equation (1) in order to compare the two protocols and analyze the internal differences (Figure 5).

$$normalized\ score = \frac{\sum scores\ for\ single\ new\ area}{\sum\ scores\ of\ protocol} \times 100 \quad (1)$$

GBC Quartieri pays more attention to the energy and environmental aspects but offers less importance to social aspects than ITACA Scala Urbana. The economic aspects in both rating systems are hardly considered and are always connected to the energy aspects.

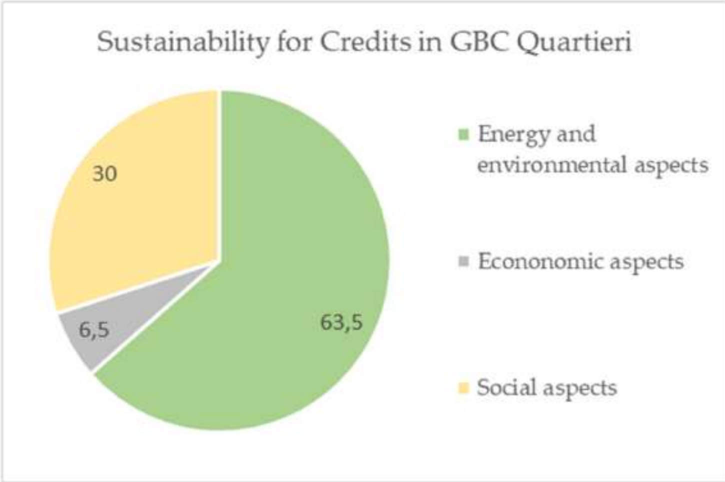

Figure 3. Chart of the credits distribution in GBC Quartieri distinguished between the three different macro areas of sustainability: energy and environmental (EA), economic (E), or social (S) aspects.

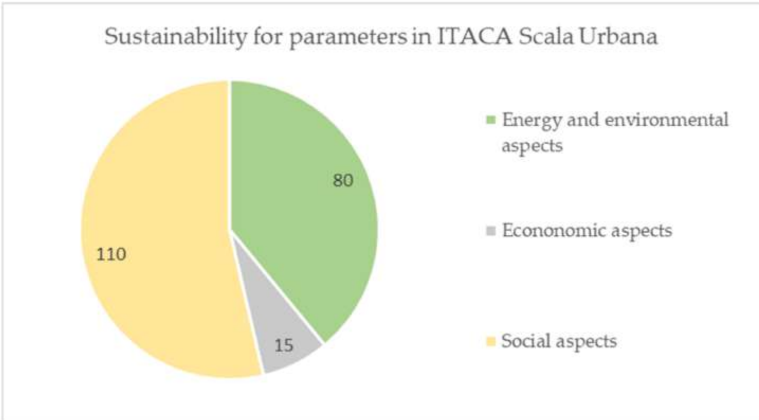

Figure 4. Chart of the credits distribution in ITACA Scala Urbana distinguished between the three different macro areas of sustainability: energy and environmental (EA), economic (E), or social (S) aspects.

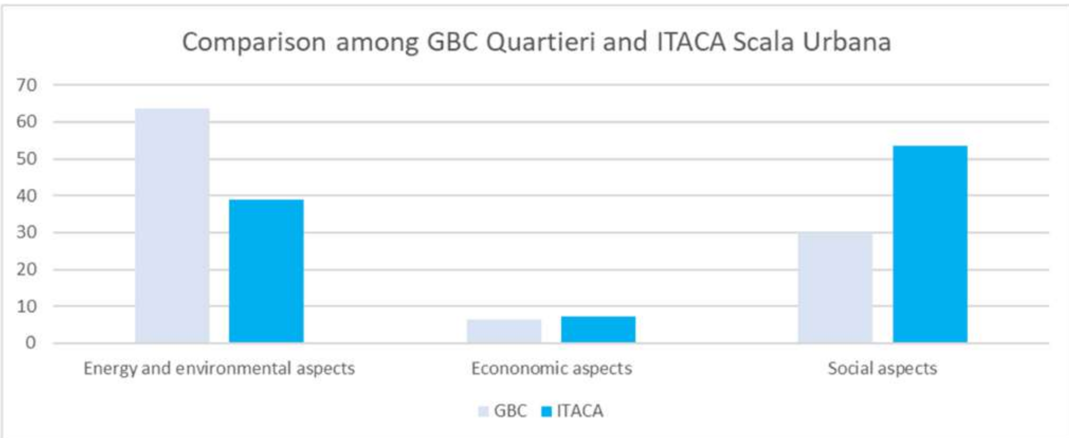

Figure 5. Histogram on the normalized sustainability performance of GBC Quartieri and ITACA Scala Urbana.

3. Case Study

To understand if there is a way to support the promotion of sustainable urban regeneration of vacant land or brownfield, this paper tries to apply two different Italian rating systems to evaluate neighborhood sustainability to a scenario of transformation of 'G. Prandina' barracks. The project is structured to be flexible, incorporating the uncertainty of the final solution into the decision-making process, strategic thinking about urban regeneration, and the assessment of it.

The case study is based on the recovery and regeneration project in the 'Giacomo Prandina' barracks, located near to the historic center of Padua, close to the sixteenth-century walls of the city. This site is bordered by Corso Milano to the north (the most important access road coming from Vicenza), Riviera San Benedetto to the west (the real edge to the city center because of the river Piovego), Via San Prosdocimo to the south (that is characterized by a similar building pattern of the block of interest), and, as already mentioned, by the city walls to the east (the barracks are divided by the wall only by a street).

The area enjoys a position of enormous importance as it is located in the immediate vicinity of several points of interest in the city. It is about 1.5 km from the station, 1 km from the town hall, and 2 km from Prato della Valle, making it easily accessible on foot, by bicycle, and by public transport systems.

The block is made up of degraded structures (the former barracks); unused structures, such as the Monastery of the Visitation; buildings in the process of being decommissioned, i.e., those now occupied by the barracks; and areas with temporary use as the open parking lot located on the position of the square of arms of the barracks.

In February 2019, the public administration illuminated the most interesting redevelopment use of the area through the activity of Agenda 21 [39]. The most important result was the identification of guidelines to support a call for proposals for the redevelopment of the site of the barracks 'Giacomo Prandina'. The design scenario was constructed to compare the two methods and to evaluate the sustainability of the regenerated area by considering some of the guidelines that emerged from the activity of Agenda 21, which are listed below.

- The enhancement of relations with the walls, with the green spaces and the water system, obtainable through the facilitation of connections between the parts. This may take place through new routes, but also through selective demolition of buildings or other buildings that will result incongruously.
- The recovery of the multifunctional vocation of the area, which will have to coexist with spaces of public greenery and urban agriculture, as well as with socio-cultural-recreational services.
- The recovery of the aggregative vocation of the area, pursued through the creation of an open space and accessible throughout the day.
- The protection of urban biodiversity through the creation of a park that contributes to the abatement of pollutants and to the functions of mitigation and adaptation to climate change and a green space equipped for socialization, sport, and leisure.
- The recovery of the original route of Via Niccolò Orsini through the southern limit of the barracks.
- The need to make mobility more sustainable by reducing private vehicle traffic in favor of cycling trips, as well as by introducing an articulated network of cycle paths and a parking exchanger basement located close to Porta Savonarola.

The result of the scenario design is proposed in Figure 6, and it was formulated by Matteo Fiorini and Alessandro Gasparin.

Figure 6. Scenario of transformation of 'G. Prandina' barracks. It is possible to see the new constructions (offices, oratory, museum, parking, library, cinema, and shopping centers), infrastructures, and public green areas.

Application of the two protocols to this scenario of transformation showed that the obtained results are very different: 67/100 for GBC Quartieri (Gold level) and 87/215 for ITACA Scala Urbana (Tables 3 and 4).

Table 3. Results of GBC Quartieri procedure for the "G. Prandina" barracks.

	Total Score	GBC G. Prandina
Smart Location & Linkage	28	25
Neighborhood Pattern & Design	43	21
Green Infrastructure & Buildings	29	21
	100	67

Table 4. Results of ITACA Scala Urbana procedure for the "G. Prandina" barracks.

	Total Score	ITACA G. Prandina
Governance	10	3
Urbanism aspects	5	3
Urban landscape quality	25	23
Architectural aspects	25	4
Public spaces	20	13
Urban metabolism	45	12
Biodiversity	5	3
Adjustment	35	5
Accessibility/mobility	45	21
Society and culture	0	0
Economy	0	0
	215	87

The difference is because the evaluation of ITACA can have a negative score and because a lot of performances do not satisfy credits/parameters in the same way.

4. Results

The GBC and ITACA methods for the neighborhood were compared to underline the main differences in their internal structure and to check who considers participatory social instances. Their scores are also normalized in order to compare the structure of the protocols and the results of the case study. The histogram in Figure 7 compares the rating systems and their application. The following points can be deduced:

- By employing ITACA, the scenario obtained the highest percentage of the reachable score in social aspects (51%), followed by economic aspects (47%) and energy and environmental aspects (26%).
- By using GBC, the project results are more efficient in economic aspects (85%), energy and environmental aspects (81%), and social aspects (33%).

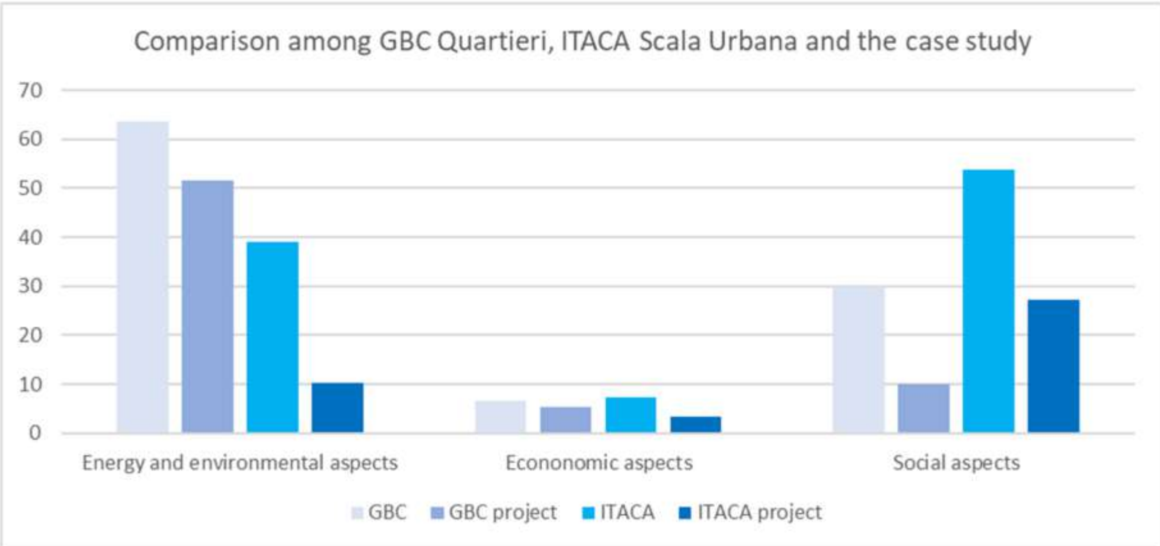

Figure 7. Comparison of the results of normalized sustainability parameters in GBC Quartieri and ITACA Scala Urbana.

It can be noted that the achieved scores for each macro-area have high variabilities. By applying the rating systems, a high and homogeneous amount of points in two new macro-areas was obtained; however, in social and economic aspects linked to ITACA, and economic and energy and environmental aspects linked to GBC. The percentage of the achievable points obtained was also very different: they ranged between 26% and 51% for ITACA and between 33% and 85% for GBC.

5. Discussion and Conclusions

This paper proposes a comparative study on the two neighborhood rating systems, GBC Quartieri and ITACA Scala Urbana.

The tools were first analyzed, and three common macro-areas (energy and environmental, economic, and social aspects) were identified in order to compare the two rating systems and normalize their score; this approach can also be used to compare other building environmental assessment tools. This approach allowed us to underline the main differences and analogies among the different tools and confirm that new neighborhood protocols originated from building rating systems that dedicate little space to social aspects and the concept of inclusion. Instead, the newly developed neighborhood protocols, such as ITACA Scala Urbana, are participatory and open to social instances. The comparative analysis also suggests that ITACA could be optimized by summarizing the parameters. Indeed, last year the Institute for Transparency of Contracts and Environmental Compatibility developed a brief rating system.

Successively, the same method and the protocols were applied to a scenario of transformation, achieving a very different score.

These results pose many questions on the coherence of the monitoring systems of sustainable development. It was a long and wading road; however, nowadays, the integration of evaluation methods, monitoring systems, and project development has received considerable attention. This is possible if researchers are able to propose key principles and evaluations for sustainable urban transformation. Furthermore, tracking progress towards goals is fundamental for effective strategies and actions, as well as assessment frameworks and ranking systems which help to indicate sustainable transformation. Additionally, constructive competition between cities and municipalities on sustainable development and climate change can potentially stimulate innovation and stronger political commitments. This also links to how cities can share experiences and improve global learning on sustainable urban transformation.

This paper has shown some of these limits applied to a real case study.

As previously described, the methodology has been proposed for GBC Quartieri and ITACA Scala Urbana. In the future, other rating systems can be considered, and Equation (1) can be used to compare the protocols and analyze additional internal differences.

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References

1. Hirst, P.; Thompson, G.; Bromley, S. *Globalization in Question*, 3rd ed.; John Wiley and Sons: New York, NY, USA, 2015.
2. Eriksen, T.H. *Globalization: The Key Concepts*, 2nd ed.; Berg: Oxford, NY, USA, 2014.
3. Legner, M.; Lilja, S. *Living Cities: An Anthology in Urban Environmental History*; FORMAS: Stockholm, Sweden, 2010.
4. Balsa-Barreiro, J.; Li, Y.; Morales, A.; Pentland, A. Globalization and the shifting centers of gravity of world's human dynamics: Implications for sustainability. *J. Clean. Prod.* **2019**, *239*, 117923. [CrossRef]
5. IEA. *World Energy Outlook*; IEA: Paris, France, 2011.
6. United Nations, Department of Economic and Social Affairs, Population Division. *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*; United Nations: New York, NY, USA, 2019. Available online: https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf (accessed on 27 December 2021).
7. European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. *A Roadmap for Moving to a Competitive Low Carbon Economy in 2050*; COM: Brussels, Belgium, 2011.
8. Saleem, H.A. Green Cities: Urban Growth and the Environment. *J. Am. Plan. Assoc.* **2008**, *74*, 143.
9. Secchi, B. *La Città dei Ricchi e la Città dei Poveri*; Laterza: Roma-Bari, Italy, 2013.
10. Richardson, H.W. Economies and Diseconomies of Agglomeration. In *Urban Agglomeration and Economic Growth*; Springer: Berlin/Heidelberg, Germany, 1995; pp. 123–155.
11. McCormick, K.; Anderberg, S.; Coenen, L.; Neij, L. Advancing sustainable urban transformation. *J. Clean. Prod.* **2013**, *50*, 1–11. [CrossRef]
12. Sapena, M.; Ruiz, L.A. Analysis of urban development by means of multi-temporal fragmentation metrics from LULC data. *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* **2015**, *XL-7/W3*, 1411–1418. [CrossRef]
13. Kowarik, I.; Korner, S. (Eds.) Wild Urban Woodlands. In *New Perspectives for Urban Forestry*; Springer: Berlin/Heidelberg, Germany, 2005.
14. Berger, A. *Drosscape: Wasting Land in Urban America*; Princeton Architectural Press: New York, NY, USA, 2007.
15. Baumgartner, R. Critical perspectives on sustainable development research and practice. *J. Clean. Prod.* **2011**, *19*, 783–786. [CrossRef]
16. Koglin, T. *Sustainable Development in General and Urban Context: Literature Review*; Lund University: Lund, Sweden, 2008.

17. Camagni, R. Sustainable urban development: Definition and reasons for a research programme. *Int. J. Environ. Pollut.* **1998**, *10*, 6–26. [CrossRef]
18. ODPM. *Securing the Future: Delivering UK Sustainable Development Strategy*; HMSO: London, UK, 2006.
19. Shirley-Smith, C.; Butler, D. Water management at BedZED: Some lessons. *Eng. Sustain.* **2008**, *161*, 113–122. [CrossRef]
20. Bramley, G.; Power, S. Urban form and social sustainability: The role of density and housing type. *Environ. Plan. B Plan. Des.* **2009**, *36*, 30–48. [CrossRef]
21. Alker, S.; Joy, V.; Roberts, P.; Smith, N. The Definition of Brownfield. *J. Environ. Plan. Manag.* **2000**, *43*, 49–69. [CrossRef]
22. Granger, R. What now for urban regeneration? *Proc. ICE Urban Des. Plan.* **2010**, *163*, 9–16. [CrossRef]
23. Jacobs, J. *The Death and Life of Great American Cities*; Random House: New York, NY, USA, 1961.
24. Harvey, D. The urban process under capitalism: A framework for analysis. *Int. J. Urban Reg. Res.* **1978**, *2*, 101–131. [CrossRef]
25. Harvey, D. *La Crisi Della Modernità*; Il Saggiatore: Milan, Italy, 1993.
26. Wilkinson, C.; Saarne, T.; Peterson, G.D.; Colding, J. Strategic spatial planning and the ecosystem services concept—An historical exploration. *Ecol. Soc.* **2013**, *18*, 37. [CrossRef]
27. Bianchetti, B. *Spazi Che Contano: Il Progetto Urbanistico in Epoca Neoliberale*; Donzelli Editore: Rome, Italy, 2016.
28. Attaianese, E.; Acierno, A. La progettazione ambientale per l'inclusione sociale: Il ruolo dei protocolli di certificazione ambientale. *TECHNE J. Technol. Archit. Environ.* **2017**, *14*, 76–87.
29. Sharifi, A.; Murayama, A. A critical review of seven selected neighborhood sustainability assessment tools. *Environ. Impact Assess. Rev.* **2013**, *38*, 73–87. [CrossRef]
30. Berardi, U. Sustainability assessments of buildings, communities, and cities. In *Assessing and Measuring Environmental Impact and Sustainability*; Kleme, J.J., Ed.; Elsevier: Amsterdam, The Netherlands, 2015; pp. 497–545.
31. Green Building Council Italia. Available online: https://www.gbcitalia.org/quartieri (accessed on 28 December 2021).
32. Protocollo Itaca Scala Urbana. Available online: https://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf (accessed on 28 December 2021).
33. Asdrubali, F.; Baldinelli, G.; Bianchi, F.; Sambuco, S. A comparison between environmental sustainability rating systems LEED and ITACA for residential buildings. *Build. Environ.* **2015**, *86*, 98–108. [CrossRef]
34. Asdrubali, F.; Baldinelli, G.; Bianchi, F.; Bisegna, F.; Evangelisti, L.; Gori, P.; Grazieschi, G. Comparison Among Different Green Buildings Assessment Tools: Application to a Case Study. *Build. Simul. Appl.* **2017**, *12*, 208. [CrossRef]
35. Suzer, O. A comparative review of environmental concern prioritization: LEED vs other major certification systems. *J. Environ. Manag.* **2015**, *154*, 266–283. [CrossRef] [PubMed]
36. Haapio, A.; Viitaniemi, P. A critical review of building environmental assessment tools. *Environ. Impact Assess. Rev.* **2008**, *28*, 469–482. [CrossRef]
37. Mazzola, E.; Mora, T.D.; Peron, F.; Romagnoni, P. An Integrated Energy and Environmental Audit Process for Historic Buildings. *Energies* **2019**, *12*, 3940. [CrossRef]
38. Roderick, Y.; Lim, H.; McEwan, D.; Wheatley, C.; Alonso, C. Comparison of energy performance assessment between LEED. BREEAM Green Star. In Proceedings of the Eleventh International IBPSA Conference, Citeseer, Glasgow, UK, 27–23 July 2009; pp. 27–230.
39. *Comune di Padova—Settore Ambiente e Territorio, Linee Guida Esito del Percorso Partecipato di Agenda 21 Riguardante l'area ex Caserma Prandina*; Comune di Padova: Padova, Italy, 2019.