

Article

Circular Economy and Resilience Thinking for Historic Urban Landscape Regeneration: The Case of Torre Annunziata, Naples

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Abstract: The landscape, as an archive of the traces of the history of man and nature, can be considered a holistic indicator of sustainable, inclusive, safe, resilient cities as set out in Agenda 2030 for Sustainable Development. The UNESCO Recommendations on Historic Urban Landscape (HUL) reflect it as a dynamic/evolving system that changes over time to meet social needs: it requires to be managed in a sustainable way, not only as a resource to be preserved. The beauty of the landscape is a common element in the development policies of many small-medium European and Italian cities. However, the state of abandonment and decay, the lack of investments, of often emigrated skills are the detractors. The circular economy model applied to the HUL leads to the ability to maximize the value of settlements, activating social, economic and environmental synergies. The research identifies the relationship among Circularity, Productivity and Resilience as an effective key to achieve the goals of Agenda 2030. The methodological approach tested on the case study of Torre Annunziata, Naples has reached a system of resilience performance indicators to express the complex nature of HUL and define a scenario of circular regeneration, based on the recreation of a virtuous circuit between physical, environmental, social, economic systems.

Keywords: circular urban regeneration; historic urban landscape; resilience performance indicators; collaborative economy

1. Introduction

Global and local risks (climate crisis, scarcity of resources, migratory emergency, weakening of the share capital, erosion of cultural capital and identity of places, etc.) make it urgent to identify operational tools that enhance the responsiveness of urban landscapes to disruptions and accelerate change towards local, regional and global sustainability and resilience.

The Agenda 2030 for Sustainable Development created and promoted by the UN for the next future [1] specifically direct one of the 16+1 strategic goals towards "making cities and human settlements inclusive, safe, resilient and sustainable" (SDGs 11). In particular, the goal number 11 highlights the need "to enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries" (11.3), "[...] to strengthen efforts to protect and safeguard the world's cultural and natural heritage" (11.4), "[...] to increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels" (11.B).

The landscape, as an archive of the traces of the history of man and nature [2–4], can be considered a holistic indicator of the sustainable, inclusive, safe, resilient city [5]. The perspective

of landscape offers an integrated, holistic, and systemic approach to analyze urban transformations toward sustainable development.

There is an empirical evidence that a poor and degraded landscape determines a loss of economic, social/ cultural, touristic attractiveness. The quality of the landscape has often been considered as a pre-condition for urban regeneration, capable of delivering different benefits (not only economic). This uniqueness of the landscape can become a catalyst for productive activities, especially creative/ innovative, if achieved with careful governance [5].

The Historic Urban Landscape, characterized by a high aesthetic quality, has been considered and managed as a great attractor. It is defined by the UNESCO Recommendations 2011 [4] as “[...] the result of a historic layering of cultural and natural values and attributes, extending beyond the notion of ‘historic center’ or ‘ensemble’ to include the broader urban context and its geographical setting” (point 8). The Recommendations on the Historic Urban Landscape, based on the relational principle among the physical forms of the urban contexts, “their spatial organization and connection, their natural features and settings, and their social, cultural and economic values” [4] (point 5), suggest the search for creative combinations of different forms of landscape to activate new urban dynamics. The EU Convention [2] and UNESCO Recommendations on HUL [4] reflect the landscape as a dynamic/ evolving system that changes over time to meet social needs: it requires to be managed wisely/ sustainably, not only as a resource to be preserved.

The quality of the landscape, understood as the beauty of both natural and man-made systems, is a common element in the local development policies of many small and medium Italian and European cities (less than 50,000 inhabitants) [6,7]. However, the contribution of this “beauty” to sustainable development is often hampered by the state of abandonment and degradation of the urban landscape, uncontrolled changes in urban density and growth, the lack of investment in the renovation and maintenance of buildings, and the lack of skills that are often emigrated. Moreover, this condition undermines the perception of places and values that communities attributed to it.

In order to preserve “the quality of the human environment, enhancing the productive and sustainable use of urban spaces, while recognizing their dynamic character, and promoting social and functional diversity” [4] (point 11), the Recommendations ask the different actors to support communities in their demand for development and change, while contributing to preserving the characteristics and values linked to their history, collective memory and environment. In particular, Academic, university institutions, centers of research are encouraged to develop aspects of HUL “to document the state of urban areas and their evolution, to facilitate the evaluation of proposals for change, and to improve protective and managerial skills and procedures” (point 26).

In relation to the requirements of the Recommendations, the paper, developed as part of the Projects of National Relevance (PRIN 2010–2011), identifies the relationships between the concepts of Circularity, Productivity and Resilience as an effective key to interpreting the phenomena that occur in the HUL to achieve the goals of Agenda 2030 of inclusive, safe, resilient and sustainable cities (Figure 1).

A circular city model can be interpreted as a long term process of coherent co-evolution between man and his living environment [8], whose values must be rediscovered and regenerated. Applied to HUL, it can be a helpful tool to maximize the value of settlements, activating social, economic and environmental synergies [9]. Productivity, intended in its broadest sense, not only economic, as the ratio between input and output of multiple types of resources, underlines in this context the ability of a circular economy model to activate new chains of value creation. The plurality of values recognized in the cultural heritage/ landscape contribute to multiplying the flows of benefits in a virtuous circuit. Finally, resilience as a dynamic concept, focused on how to persist and evolve with change [10,11], expresses in this context the regenerative capacity of HUL. In our research it is understood not only as an attribute but also as an approach to the themes of HUL. Resilience thinking [10,12] “can be viewed as a subset of sustainability science and has a strong focus on complex adaptive and truly intertwined social-ecological systems of people, communities, economies, societies,

and cultures interacting across spatial and temporal scales with ecosystems” [13]. It well interprets the multidimensional and dynamic nature of HUL and the need to respond to urban challenges through the balance between conservation and innovation, strengthening the relationships among physical/environmental, social and economic components. Resilience thinking seeks to understand the life cycles and complexity of systems (including the innovation systems) in order to better manage them, for system productivity and process circularity.



Figure 1. Conceptual framework for the regeneration of HUL (author’s elaboration).

On the basis of this theoretical model, the research proposes new tools to describe the systemic and complex nature of the HUL and, entrusting productive value to the complex system of resources generated by the landscape, promote and evaluate actions to make the organization of the city more efficient and less wasteful through processes of circularization.

The methodological process has been tested on the case study of the small-medium municipality of Torre Annunziata, Naples. The HUL of this port city is in fact characterized by the presence of world famous sights, such as the volcano Vesuvius, the excavations of Pompeii, the UNESCO World Heritage Site of the villa of Oplontis, by a peculiar historical productive vocation of the urban landscape and by an abandoned port that expresses a great potential within the Gulf of Naples. On the other hand, the urban landscape presents high rates of social distress and building degradation, showing minimum levels of resilience, sustainability, security and equality.

The research develops an operational approach through the case study aimed at interpreting and regenerating HUL and, at the same time, produces a methodological approach for possible replicability in homogeneous areas with similar problems.

The paper is organized in the following sections, after this introduction: first, a literature review on the HUL and the perspective of the circular economy model and resilience thinking; then, a brief presentation of the case study; a third section defines the materials and methods of the research; in the fourth section are presented and discussed the results of the experimentation on the case study of Torre Annunziata; finally the conclusions of this research effort and future steps for improving it.

2. Literature Review

Historic Urban Landscape, Circular Urban Regeneration Processes and Resilience Thinking

The role of landscapes as an archive of the traces of the history of man and nature and for the survival of local cultures is internationally recognized [2–4]. In these documents, interactions between man and nature are declared “cultural landscapes” or “cultural heritage”, as illustrative of the evolution

of human society and settlement over time, recognized unique and authentic. "Landscapes, whether of aesthetic value or not, provide the setting for our daily lives; they are familiar and the concept of landscape links people to nature, recognizing their interaction with the environment. The very notion of landscape is highly cultural, and it may seem redundant to speak of cultural landscapes; but the describing term 'cultural' has been added to express the human interaction with the environment and the presence of tangible and intangible cultural values in the landscape" [14]. The Charter of Krakow again reads: "Landscapes as cultural heritage result from and reflect a prolonged interaction in different societies between man, nature and the physical environment. They are testimony to the evolving relationship of communities, individuals and their environment. In this context their conservation, preservation and development focus on human and natural features, integrating material and intangible values" [15].

The European Landscape Convention [2] underlines the uniqueness of each landscape and its systemic and relational nature. It is "a specific part of territory as it is perceived by the populations, whose character derives from the action of natural and/or human factors and from their interrelations" [2] (art.1). Landscape in this sense is a collective creation whose forms of realization are not only a historical narrative but also a physiognomic expression of the identity peculiarities of a specific culture. For this reason, the landscape must be managed with this specificity in mind and must be recognised as a "social construction" [16]. By expressing the diversity of the cultural and natural heritage of each population, it represents its identity [2] (art. 5a). The UNESCO Recommendations recognise the complex and dynamic nature of the landscape system, that includes "not only the representation of the material culture of peoples, the so-called material heritage, but also the cultural and social practices and values, the economic processes and the dimensions of the intangible heritage as a vehicle for diversity and identity" [4]. The recognition by the community of the value of "heritage" of this landscape turns it into a resource that can improve the quality of life of populations, strengthening social cohesion and triggering processes of economic development [17].

The innovative contribution of the Recommendations is to identify in the "development" the opportunity to preserve the sedimented values, overcoming the traditional conflict between conservation and transformation [18]. The UNESCO Recommendations on HUL recognise that a high landscape quality can contribute to the increase of urban productivity. "The Historic Urban Landscape approach is aimed at preserving the quality of the human environment, enhancing the productive and sustainable use of urban spaces, while recognizing their dynamic character, and promoting social and functional diversity. It integrates the goals of urban heritage conservation and those of social and economic development" [4] (point 11). In this perspective, the Recommendations open the way to the definition of an "integrated" conservation strategy based on the principle of relationality [9]. Actions on the landscape must be based on a systemic vision and on a dynamic/ productive interpretation of the territory as an innovative aspect, as a process of use and creation of value (in terms of use values, social values, symbolic values, market values) [5]. The recognition of the dynamic/ productive nature of the landscape implies the ability to respond to the challenges posed by the changes taking place on a global scale with strategies that wisely integrate conservation with innovation, strengthening the relations between the physical/ environmental, social and economic components. The systemic logic of the HUL allows for a reinterpretation of the traditional economic model in a circular perspective that, creatively integrating conservation and development, promotes synergies between different agents/ institutions in a dynamic proactive way. In this context, the circular economy model leads to the ability to maximize the value of settlements, activating social, economic and environmental synergies [19].

In the context of the HUL, as result of historic layering, transition processes produce waste not only in terms of sub-system and component residues but also in terms of unsustainable pressures on the urban landscape [8]. Differently from the linear economy model, the circular paradigm can respond switching trade-offs between users' needs and design requirements accounting for our planet's needs [20]. It reduces wastes rebalancing pressures on urban landscape due to the climate change, users' and market's expectations changes, increasing age of the built environment.

The circular economy model is the condition for achieving most of the goals of Agenda 2030 and the New Urban Agenda [21]. The circular economy model is closely interdependent with the regeneration of the landscape. It renews its values through recovery actions and contributes to its quality by increasing the density of relationships, symbiosis and synergies that multiply the flows of benefits in a virtuous circuit [9]. This model can be implemented at different levels, diversifying actions and identifying relationships and synergies between different actors involved [22]. By placing the local cultural resources at the base of the objectives of resilience and sustainable development, the HUL perspective stimulates synergies and circular processes to obtain, through a process of mediation between the different forces in conflict, the greatest good for all the actors in terms of improving the quality of life, conditions of productive efficiency, sense of identity [9]. The HUL suggests a new unitary vision that encourages change, variability, diversity and also hybrid solutions, in order to improve overall systemic resilience [4].

In 2015 and for the first time, cultural heritage was recognized as playing a role in addressing global risks within the new international policy for disaster risk reduction, adopted during the Third United Nations World Conference Disaster Risk Reduction (WCDRR), at Sendai, Japan (Sendai Framework 2015–2030) [23]. The conference highlighted the effectiveness of cultural heritage in understanding disaster risks and strengthening governance, investing in resilience and preparing for response, recovery and reconstruction. Cultural heritage, both tangible and intangible, as the result of long periods of adaptation between man and his environment, incorporates useful elements to overcome potential risks. It can be a powerful catalyst for interacting with local populations, bringing them together and reinforcing the sense of belonging in the preventive and recovery phases; moreover, the protection of the cultural heritage can sustain a rapid recovery through the economy it can generate. The active role the community can play in the protection of its cultural heritage and in the enhancement of the resilience of the socio-urban system (phase of prevention, response, recovery and reconstruction) is precisely because it is the repository of local culture. This is the meaning of "heritage community", identified in 2005 by the Faro Convention [16]. It is composed by "people who value specific aspects of cultural heritage which they wish, within the framework of public action, to sustain and transmit to future generations" (art. 2b). In this way the social value of the cultural heritage is highlighted; it becomes the element that characterizes and holds together a community [24].

Resilience, in its development towards socio-ecological complex adaptive systems, has become not only a desirable state, but above all a dynamic vision [25], of adaptive and transformative actions, where the values that constitute the identity and authenticity of landscapes are strengthened and innovate [26]. The thought and practice of resilience can offer an innovative way to describe and understand the complex dynamic nature of the HUL, proposing creative and innovative solutions. "Resilience thinking seeks to understand the life cycles and complexity of systems (including the innovation systems) in order to better manage them, placing specific issues within a comprehensive context. Adaptation should be understood as a component of resilience—the ability of the system to change or assume different behavioural properties when reacting to the stimuli" [27].

With its flexibility, a resilience thinking-based approach provides a toolbox to improve innovation policy management and ensure that governance and regulatory systems can adjust and become more sustainable [27].

The main reference of the research was the City Resilience Framework, developed by the Rockefeller Foundation and Arup [28]. It, on the basis of the previous City Resilience Index [29], is a tool that should enable to convene around a common idea of "who and what make cities more resilient" [28]. Both the framework and the index are intended to facilitate a process of engagement with cities that generates new ideas and opportunities to involve new actors in civil society, government and business to make cities resilient. The City Resilience Framework provides tools through which the complexity of cities and the different factors that contribute to their resilience can be understood. It comprises 12 key goals (minimal human vulnerability; diverse livelihoods and employment; effective safeguards to human health and life; collective identity and community support; comprehensive

security and rule of law; sustainable economy; reduced exposure and fragility; effective provision of critical services; reliable communications and mobility; effective leadership and management; empowered stakeholders; integrated development planning) that describe the outcomes of a resilient city, complemented by seven qualities that “distinguish a resilient city from one that is simply livable, sustainable or prosperous” [28]:

- Reflectiveness, expressing the quality of the system to accept the inherent and ever-increasing uncertainty and change in today’s world;
- Robustness, which expresses the quality of a well-designed, built and managed system, so that it can withstand the impacts of hazardous events without significant damage or loss of functionality;
- Redundancy, expressing in a system “the presence of multiple ways to achieve a given need or fulfill a particular function”;
- Flexibility, as the capacity of the system to “change, evolve, adapt in response to changing circumstances”;
- Resourcefulness, instrumental to “a city’s ability to restore functionality of critical systems, potentially under severely constrained conditions”;
- Inclusiveness, emphasizing “the need for broad consultation and engagement of communities, including the most vulnerable groups”;
- Integration, expressing the need to exchange of information between systems to enable them “to function collectively and respond rapidly through shorter feedback loops throughout the city” [28].

By placing HUL perspective and the circular economy model at the base of the resilience qualities defined by Arup, the research aims to combine the systemic, evolutionary and productive nature of the landscape with the objectives of urban resilience and sustainability.

3. Case Study: The Productive Historic Urban Landscape of Torre Annunziata, Naples

The research develops a methodological process and new tools to describe the systemic and complex nature of the HUL and promote and evaluate actions to make the organization of the city more efficient and less wasteful through processes of circularization. The methodological process and new tools have been tested on the case study of the small-medium municipality of Torre Annunziata, Naples. It extends into the Gulf of Naples to an area of 7.33 square kilometers with a population density of 5961 inhabitants for square km. It is part of an area identified by the Ministry of Cultural Heritage and Activities and the Campania Region as Buffer Zone of Pompeii. It comprises the area surrounding the UNESCO sites of Pompeii, Oplontis and Herculaneum. The municipalities in this area have a high degree of complexity: on the one hand, landscapes of great beauty, a social capital with high-potential, an archaeological heritage of inestimable value, a production system with significant peculiarities (gardening, quality food and wine productions, pasta and coral industry, commercial and leisure shipbuilding); on the other hand, underused and degraded buildings, without adequate green spaces, unclean and unsafe public spaces, youth unemployment and crime, negative dynamics of associationism and volunteering.

The municipality of Torre Annunziata is an important example of a pattern that is generated and renewed, developing a productive propensity offered by its climatic and morphologic position, as well as by technological progress. The social-urban system of Torre Annunziata is in fact strongly characterized by its original manufacturing vocation and by a dense system of tangible and intangible relations between the physical/ environmental, social and economic components [30,31]. In particular, its historic center has a precise connotation resulting from the interaction between the environmental characteristics of the landscape and the manufacturing and residential production needs; it represents the expression of the changes over time due to the technological innovation in the manufacture of pasta. For centuries, the entire municipal economy has revolved around the synergies between places and resources: exposure to the sun and winds, the construction characteristics of the settlement are the factors that allowed production, increased by the presence of the port area for the import of wheat

from Russia and the export of dry pasta. Authors have interpreted this peculiar settlement system as Productive Urban Landscape: “complex and adaptive system, result over time of procedures and methods for the supply of resources, their processing and distribution of the finished product, where technological opportunities are connotative aspect” [31]. The post-war productive divestment and the residential re-use of the historical center have exposed the urban system to conditions of physical, social and economic vulnerability over time. The port area, a great potential within the Gulf of Naples, has also been abandoned and cut off from the city. Currently the municipality is in a state of social discomfort and physical degradation, generated by the processes of transition.

4. Materials and Methods

4.1. Operationalising the UNESCO Recommendations on the Historic Urban Landscape

In order to interpret the complexity of the historic urban landscape of Torre Annunziata, an interrelated system of indicators has been defined. According to the ninth paragraph of UNESCO Recommendations on HUL [4], the multi-scale indicators define the layers of which the landscape is composed.

The content of the landscape can be defined from the "hard" data:

- topography;
- geomorphology;
- hydrology;
- natural features;
- built environment (historical and contemporary);
- infrastructure (above and below ground);
- open spaces and gardens;
- land use (land use patterns);
- spatial organization.

To these, perceptual data are added (soft):

- perceptions;
- visual relationships;
- all the other elements of the urban structure.

It also includes:

- practices and social and cultural values;
- economic processes;
- intangible dimensions of heritage as related to diversity and identity.

The data are structured on three main dimensions that describe the general characteristics of the productive and historical urban landscape of Torre Annunziata, common to the municipalities of the Buffer Zone of Pompeii:

1. Physical/environmental dimension: the main criteria considered are related to environmental and geographical characteristics (including environmental risk data - geological, seismic, volcanic - physical size, and other data describing spatial aspects). The environmental quality of the territory affects its ability to retain and to attract individuals and companies. In fact, some environmental and geographical characteristics can affect the production guidelines and the activities of companies;
2. Social dimension: stands for indicators that describe the productive potential of the municipalities of the Buffer Zone, in order to assess their contribution to local economic growth (population density, unemployment, supply of employment and housing opportunities, etc.);

3. Economic dimension: groups together indicators that describe the economic and commercial vitality and attractiveness of the reference context (economic value of public and private property, real estate market, liveliness of the entrepreneurial system, etc.).

The indicators are based on publicly available information and data, which can be gathered through queries to the databases of the National Institute of Statistics (ISTAT), to the portal of the Revenue Agency, to the Ministry of Environment, but also to the local databases of the supra-municipal institutions and of the municipal and academic research studies and of the third sector. The collection of territorial data, although not limited to the assessment of individual sites, is a useful tool for the preliminary analysis.

The collection of data is supplemented by a fourth group of indicators that represent a scale of greater detail:

4. Productive dimension: is the set of indicators that describe the productive and manufacturing sectors prevailing in the municipalities.

The nature of the landscape system suggests a multidimensional approach, also in relation to socio-economic well-being [32]. The following synthetic criteria have been identified on the base of social data, not only quantitative data, inspired by the theory of adaptive systems [33]:

- demographic structure;
- workforce;
- education and human capital;
- civic commitment;
- collaborative resource management.

Economic data can be divided into two major categories: vivacity of the real estate market and economy of the enterprise system. The spatial variability of the criteria, determined by the spatial inhomogeneity of the development processes and by the existence of local factors, significantly affects the income, wealth, individual opportunities and development of the enterprises [34,35]. The main criteria are:

- Vivacity of the real estate market: this is the set of indicators of the real estate value of assets, such as the value per square meter, the percentage change, the NNT (Number of Normalized Transactions), the index of attractiveness and all available and comparable indicators on the areas;
- Economics of the entrepreneurial system: this is the second macro-category. It is made up of many factors linked not only to the vitality of the enterprise in the areas considered, but also to economic networks with external systems.

The detection of the physical/environmental dimension involves the search for elements that describe the ability of a system to maintain self-regeneration capacity (autopoiesis) or, on the contrary, factors of greater structural fragility. The available factors describing the physical/environmental dimension in relation to the productive system can be grouped in:

- security and land management;
- quality of the built environment;
- infrastructural services;
- energy and wastes;
- safeguard and green areas.

In addition, there are elements that belong to the productive dimension of HUL that describe its peculiarity:

- agricultural and floricultural sector;

- DOP (Protected Designation of Origin) and IGP (Protected Geographical Indication) productions;
- DOC (Controlled Designation of Origin) and IGT (Territorial Geographical Indication) productions;
- shipbuilding enterprise.

Multiscale analysis allows us to turn our attention to the specific context of Torre Annunziata and GIS tools support the construction of thematic maps for the definition of multidimensional systems. The Geographic Information System (GIS) allows to overlay the knowledge of spatial data [36] reducing the information (numerical indicators, open data, points of interest, etc.) in the complex and systemic territorial context. The integration of knowledge tools through GIS allows to build complex maps containing information on the quality of the environment and landscape [37].

On the basis of the identified indicators, the Social Discomfort Index (IDS) and the Building Discomfort Index (IDE), defined by the Prime Minister's Decree (DPCM) directives 10/15/2015 (Official Gazette n. 249 10/26/15) as the weighted average of the deviations of the indicator values by their respective national averages, allow an initial definition of the processes that take place on the territory. For research purposes, this data provides information to define the pressures and transition processes of physical/ environmental, social and economic systems and, at the same time, provides information about the "waste" to be reintegrated into the circular process of urban regeneration.

According to the directives of the DPCM, the indices, divided into census boxes, were calculated as follows:

$$IDS = 0.40 * (DIS (i) - DISNAZ) + 0.30 * (OCCNAZ - OCC (i)) + 0.15 * (GIOV (i) - GIOVNAZ) + 0.15 * (SCOLNAZ - SCOL (the))$$

where:

- DIS (i) = unemployment rate
- OCC (i) = employment rate
- GIOV (i) of juvenile concentration ratio =
- SCOL (i) = schooling rate

$$IDE = [(ERP + ERM)/Tot ER]/0.168$$

where:

- ERP = residential buildings of the degraded urban area in poor condition
- ERM = residential buildings of the degraded urban area in mediocre condition
- Tot ER = Total residential buildings of the degraded urban area

Subsequently, in order to identify the relationships between the indicators of the urban context and to observe what criteria can determine direct or indirect impacts, positive or negative, on the landscape, a correlation matrix has been elaborated. The correlation indicates a relationship between two variables, each value of the first corresponds to a linear relationship with the values of the second, i.e., the tendency of a variable to change depending on another, and not necessarily a cause-effect relationship [38].

The correlation matrix has a double objective: to identify the relationships between the indicators in the urban context; to allow the construction of scenarios, which take into account the effects of transformations not only on the criteria concerned, but also on those closely related.

The data collection of indicators at different spatial scales and at different time intervals allows to analyze the processes of transition and transformations of the socio-urban system over time, in order to define the possible drivers. These, together with the data processed through the correlative analysis, inform the potential evolutionary dimension of HUL.

4.2. Performance Indicators for a Circular Regeneration of the Historical Urban Landscape

The research proposes a system of performance indicators as a tool to guide and monitor the actions to be taken on HUL. They must be able to interpret the interrelationships between the values of HUL and define the actions of regeneration and management to make the organization of the city

“less wasteful” and more reactive and regenerative, through processes of circularization involving all dimensions (social, environmental, economic, cultural) of the urban landscape. In this perspective, it is possible to consider degraded and abandoned spaces and social distress no longer as a waste, but as an opportunity for experimentation and potential for the development of circular regeneration processes [39].

The seven qualities of resilience, as defined by the Rockefeller Foundation City Resilience Framework [28], represent in this research the seven classes of performance for a resilient and sustainable historical urban landscape. They have been made explicit by grouping the measurable descriptive indicators, previously elaborated (Section 4.1), first into resilience classes, then into classes of indicators, divided by physical-environmental, social, economic, productive dimensions.

Meetings between stakeholders of the social and entrepreneurial systems with the research group and the facilitators have supported the explication of the qualities of resilience for the circular urban regeneration of Torre Annunziata. The results of the correlation matrix, in which the relationships between the indicators in the context emerged, were useful for grouping the indicators into performance classes (Table 1).

Table 1. Articulation of the qualities of resilience in performance indicators of the productive urban landscape of Torre Annunziata, Naples (author's elaboration).

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources
REFLECTIVENESS	Programming and management of resources	Physical Environmental	Safeguard and Green Areas	Presence of protected areas	SIT (Territorial Informative System)
				Areas subject to regulatory constraints	
	Innovation capacity	Social	Civic commitment	Number of non-profit employees for 10.000 inhabitants	ISTAT (Italian National Institute of Statistics)
				Range of non-profit employees in the decade 2001-2011	
				Number of social cooperatives for 10.000 inhabitants (Campania Regional Law 2016)	
				Range of social cooperatives in the decade 2001-2011	
			Collaborative resource management	Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017
				Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT
				Number of partnerships between public sector, private sector and people represented by civil society (4P)	ISTAT data processing; survey of non-profit institutions
Landscape quality	Physical Environmental	Quality of the built environment	Index of building discomfort	ISTAT	
			Percentage of buildings in excellent or good state of conservation on the total of inhabited buildings		
	Economic	Safeguard and Green Areas	Vitality of the real estate market	Public green index	SIT
				Density of the urban fabric (sqm of built environment on the total)	
				Average residential real estate value	
			Real estate transactions (NNT)	OMI(Real estate Market Observatory)	
			Real Estate Market Intensity Index		

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources	
ROBUSTNESS	Security and Resource Management	Physical Environmental	Risk and landscape management	Population exposed to seismic risk	ISTAT	
				Population exposed to hydrogeological risk		
				Population exposed to volcanic risk		
			Infrastructure services	Planning tools (Regional Law 16/2004 and upgrades)	Web site	
				Motorway junctions	SIT	
				Distance from airports		
			Energy and waste	Railway stations	ISTAT	
				Provision of ICT resources		
				Approval of the Sustainable Energy Action Plan (SEAP)		Web site
				Annual municipal production of electricity from renewable sources (photovoltaic)		GSE (Energy Services Manager)
	Social	Collaborative resource management	Separate Waste Collection Index (2014)	ISPRA (Higher Institute for Environmental Safeguard and Research)		
			Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017		
			Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT		
			Number of partnerships between public sector, private sector and people represented by civil society (4P)	ISTAT data processing; survey of non-profit institutions		
			Physical Environmental	Safeguard and Green Areas	Presence of protected areas	SIT
				Consistency of the historical urban fabric	Areas subject to regulatory constraints	
			Cultural Identity	Social	Education and human capital	Percentage of buildings in excellent or good state of conservation on the total of inhabited buildings built before 1919
Schooling rate	ISTAT					
Civic commitment		Resident population with old and new system of degree + university degrees + non-academic tertiary degrees old and new regulations				
	Number of non-profit employees for 10.000 inhabitants	ISTAT				
Range of non-profit employees in the decade 2001-2011						
Number of social cooperatives for 10.000 inhabitants (Campania Regional Law 2016)						

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources	
				Range of social cooperatives in the decade 2001-2011		
			Collaborative resource management	Number of contractual agreements between public authority (regional, provincial or local) and higher education institutions	ISTAT: survey of non-profit institutions	
		Economic	Economy of the entrepreneurial system	Percentage of active companies	ISTAT	
				Percentage of employees		
				Entrepreneurial density		
				Entrepreneurial propensity		
				Average value of residential properties		
				Number of Normalized Real estate Transactions (NNT)		
				Real Estate Market Intensity Index (Ratio between NNT and the quantity of existing real estate units)		
		Productive	Agriculture and floriculture	Utilized Agricultural Area - SAU (ha)	MIBACT (Ministry of Cultural Heritage and Activities)	
				SAU - Floriculture		
				Number of farms		
				Percentage of floriculture companies		
			Products D.O.P. and I.G.P. (Reg. CE 510/06)		DOP products (Y/N)	MIBACT
					IGP products (Y/N)	
		Wines D.O.C. and I.G.T.		DOC products (Y/N)	MIBACT	
				IGT products (Y/N)		
		Shipbuilding industry		Nautical entrepreneurial (Y/N)	MIBACT	
				Nautical staff (Y/N)		

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources
REDUNDANCY	Diversification of resources	Physical Environmental	Safeguard and Green Areas	Presence of protected areas	SIT
				Areas subject to regulatory constraints	
				Public green index	
				Density of the urban fabric (sqm of built environment on the total)	
			Risk and landscape management	Population exposed to seismic risk	ISTAT
				Population exposed to hydrogeological risk	
				Population exposed to volcanic risk	
				Planning tools (Regional Law 16/2004 and upgrades)	
			Infrastructure services	Motorway junctions	SIT
				Distance from airports	
		Railway stations			
		Energy and waste	Provision of ICT resources	ISTAT	
			Approval of the Sustainable Energy Action Plan (SEAP)	Web site	
			Annual municipal production of electricity from renewable sources (photovoltaic)	GSE	
			Separate Waste Collection Index (2014)	ISPRA	
			Social	Schooling rate	ISTAT
				Resident population with old and new system of degree + university degrees + non-academic tertiary degrees old and new regulations	
		Economic	Vitality of the real estate market	Average residential real estate value	OMI
				Real estate transactions (NNT)	
				Real Estate Market Intensity Index	
Economy of the entrepreneurial system	Percentage of active companies		ISTAT		
	Percentage of employees				
	Entrepreneurial density				
	Entrepreneurial propensity				
	Average value of residential properties				
	Number of Normalized Real estate Transactions (NNT)				
	Real Estate Market Intensity Index (Ratio between NNT and the quantity of existing real estate units)				

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources
FLEXIBILITY	Diversification of infrastructure systems	Productive	Agriculture and floriculture	Utilized Agricultural Area - SAU (ha)	MIBACT
				SAU - Floriculture	
				Farms (n)	
				Percentage of floriculture companies	
			Products D.O.P. and I.G.P. (Reg. CE 510/06)	DOP products (Y/N)	MIBACT
				IGP products (Y/N)	
			Wines D.O.C. and I.G.T.	DOC products (Y/N)	MIBACT
				IGT products (Y/N)	
			Shipbuilding industry	Nautical entrepreneurial (Y/N)	MIBACT
				Nautical staff (Y/N)	
	Physical Environmental	Infrastructure services	Motorway junctions	SIT	
			Distance from airports		
			Railway stations		
			Provision of ICT resources		
	Modularity and decentralization of infrastructure and urban management	Physical Environmental	Safeguard and Green Areas	Presence of protected areas	SIT
Areas subject to regulatory constraints					
Infrastructure services			Motorway junctions	SIT	
			Distance from airports		
			Railway stations		
Energy and waste		Provision of ICT resources	Web site		
		Approval of the Sustainable Energy Action Plan (SEAP)			
		Annual municipal production of electricity from renewable sources (photovoltaic)			
Social		Collaborative resource management	Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017	
			Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT	
	Number of partnerships between public sector, private sector and people represented by civil society (4P)		ISTAT data processing; survey of non-profit institutions		

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources
	Innovation capacity	Social	Education and human capital	Schooling rate	ISTAT
				Resident population with old and new system of degree + university degrees + non-academic tertiary degrees old and new regulations	
			Collaborative resource management	Number of contractual agreements between heritage entrepreneurs and higher education institutions	ASIA (Statistical register of active enterprises)
			Number of contractual agreements between cultural heritage entrepreneurs and public authorities	ISTAT: survey of non-profit institutions; survey of public institutions	
		Economic	Research and development	Number of active R&S units	ISTAT
		Adaptability to new functions	Physical Environmental	Safeguard and Green Areas	Public green index
				Density of the urban fabric (sqm of built environment on the total)	
			Quality of the built environment	Percentage of empty dwellings over total	ISTAT
	Economic		Economy of the entrepreneurial system	Percentage of active companies	ISTAT
			Percentage of employees		
		Entrepreneurial density			
		Entrepreneurial propensity			
		Average value of residential properties			
		Number of Normalized Real estate Transactions (NNT)			
		Real Estate Market Intensity Index (ratio between NNT and the quantity of existing real estate units)			

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources
RESOURCEFULNESS	Availability of resources	Physical Environmental	Infrastructure services	Motorway junctions	SIT
				Distance from airports	
				Railway stations	
				Provision of ICT resources	
		Social	Demographic structure	Number of residents	ISTAT
				Percentage of resident immigrants	
				Population density (inhabitant/sq.km)	
				Average age of the population	
			Workforce	Youth concentration rate	ISTAT
				Percentage of labor force in total population Percentage of non-work force in total population Percentage of employees in the total workforce	
	Coordination in the management of resources	Physical Environmental	Risk and landscape management	Number of non-profit employees for 10.000 inhabitants	ISTAT
				Range of non-profit employees in the decade 2001-2011	
				Number of social cooperatives for 10.000 inhabitants (Campania Regional Law 2016)	
				Range of social cooperatives in the decade 2001-2011	
		Social	Collaborative resource management	Schooling rate	ISTAT
				Resident population with old and new system of degree + university degrees + non-academic tertiary degrees old and new regulations	
	Coordination in the management of resources	Physical Environmental	Risk and landscape management	Population exposed to seismic risk	ISTAT
				Population exposed to hydrogeological risk	
				Population exposed to volcanic risk	
				Planning tools (Regional Law 16/2004 and upgrades)	
Social		Collaborative resource management	Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017	
			Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT	
			Number of partnerships between public sector, private sector and people represented by civil society (4P)	ISTAT data processing: survey of non-profit institutions	

Table 1. Cont.

Quality of Resilience	Classes of Resilience	Dimensions	Classes of Indicators	Indicators	Sources	
INCLUSIVENESS	Sharing and commitment to choose	Social	Collaborative resource management	Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017	
				Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT	
			Civic commitment	Number of partnerships between public sector, private sector and people represented by civil society (4P)	ISTAT data processing; survey of non-profit institutions	
				Number of non-profit employees for 10.000 inhabitants	ISTAT	
				Range of non-profit employees in the decade 2001-2011		
				Number of social cooperatives for 10.000 inhabitants (Campania Regional Law 2016)		
Range of social cooperatives in the decade 2001-2011						
INTEGRATION	Network connectivity	Physical Environmental	Infrastructure services	Provision of ICT resources	ISTAT	
		Social	Collaborative resource management	Percentage of collaboration agreements between the municipality and the citizens on the total population	Labsus Report 2017	
				Number of non-profit-making operators which have concluded agreements or arrangements with institutions	ISTAT	
				Number of partnerships between public sector, private sector and people represented by civil society (4P)	ISTAT data processing; survey of non-profit institutions	
		Economic	Research and development	Number of active R&S units	ISTAT	
		Intermodality of transport systems	Physical Environmental	Infrastructure services	Motorway junctions	SIT
					Distance from airports	
					Railway stations	
Interscalar mode of functions	Social	Collaborative resource management	Number of contractual agreements between authorities at different levels (regional - local, provincial - local, provincial - local, etc.)	Website of Campania Region		

According to the City Resilience Framework, the Reflectiveness expresses the quality of a system to accept the inherent and ever-increasing uncertainty and change in today's world. To this end, a reflective cities "has mechanisms to continuously evolve and will modify standards or norms based on emerging evidence, rather than seeking permanent solutions based on the status quo" [28]. In our research, the Reflectiveness has been defined through groups of indicators that concern, in particular, the Programming and management of resources and the Innovation capacity related to the Civic commitment and the Collaborative resource management. The Robustness expresses the quality of a well-designed, built and managed system, so that it can withstand the impacts of hazardous events without significant damage or loss of functionality. In this meaning, the Robustness can be interpreted and defined by indicators that belong to the classes of Landscape quality, Security and Resource Management and Cultural Identity. These elements represent the complex system of factors, of a perceptive, morphological, relational, functional nature, through which the uniqueness of the landscape system is manifested. They must be rediscovered, reinterpreted and innovated to prefigure its evolving nature. In a long-term, circular strategic vision, it is essential to combine the attributes/performance of Robustness with those of Flexibility. The latter, intended as the capacity of the system to "change, evolve, adapt in response to changing circumstances", has an innovative factor by enhancing the capacity of HUL to regenerate its own identity. It can be interpreted through groups of indicators expressing the Modularity and decentralization of infrastructure and environmental management, the Innovation capacity of the system and the Adaptability to new functions. The latter is understood to be both the ability of the system to accommodate changes due to technological development or new market demands. Redundancy was defined as "the presence" - in a system - "of multiple ways to achieve a given need or fulfill a particular function". It has been expressed through indicators that articulate its ability for diversification to "accommodate disruption, extreme pressures or surges in demand", such as the classes of Diversification of resources, tangible and intangible, and Diversification of infrastructure systems. The Resourcefulness "implies that people and institutions are able to rapidly find different ways to achieve their goals or meet their needs during a shock or when under stress. [...] It is instrumental to a city's ability to restore functionality of critical systems, potentially under severely constrained conditions" [28]. In this study, the Resourcefulness was understood as the ability to address change through the coherence of the decision-making process and the systematization of resources at different scales, measurable through classes of indicators that describe the Availability of resources and the Coordination in their management. The Inclusiveness was understood as the ability to deal with change through Sharing and commitment to choose. This attribute highlights the strategic role of the community in the processes of protection, management and maintenance of HUL. Together with the quality of the Integration, it defines the importance of "exchanging information between systems, to enable them to function collectively and respond rapidly through shorter feedback loops throughout the city" [28]. Community participation, commitment and relations are an engine for improving social cohesion, the ability to respond to difficulties and the capacity for innovation. In the circular regenerative processes of HUL, in particular, the quality of Integration has been interpreted as Network connectivity, Intermodality of transport systems, Interscalar mode of functions. These classes of indicators also express the link between the increase in partnerships between the different actors and the quality of urban regeneration actions. It is also about the characteristics of infrastructure and public or open spaces, which stimulate relational activities, and, in particular in the Mediterranean area, tell of a priority value of use and social interaction. In this research, the landscape is a dimension that "unites" and allows the comparison between multiple identities, represented by traditions, skills and talents of the communities, mediating between different points of view, in a perspective of common interest [24].

5. Results and Discussion

This section discusses the results of the methodological approach and the tools developed and tested on the case of Torre Annunziata. The discussion focuses on the process of analysis and diagnosis

of the productive historic urban landscape of Torre Annunziata up to the phase of definition and evaluation of the scenarios of urban regeneration.

The first step was to analyze and describe the complex and multidimensional nature of the historic urban landscape of Torre Annunziata, through the system of descriptive indicators elaborated in the research (Section 4.1). The Social Discomfort Index (IDS) (Figure 2) and the Building Discomfort Index (IDE) (Figure 3) have allowed a first definition of the processes underway in the territory.

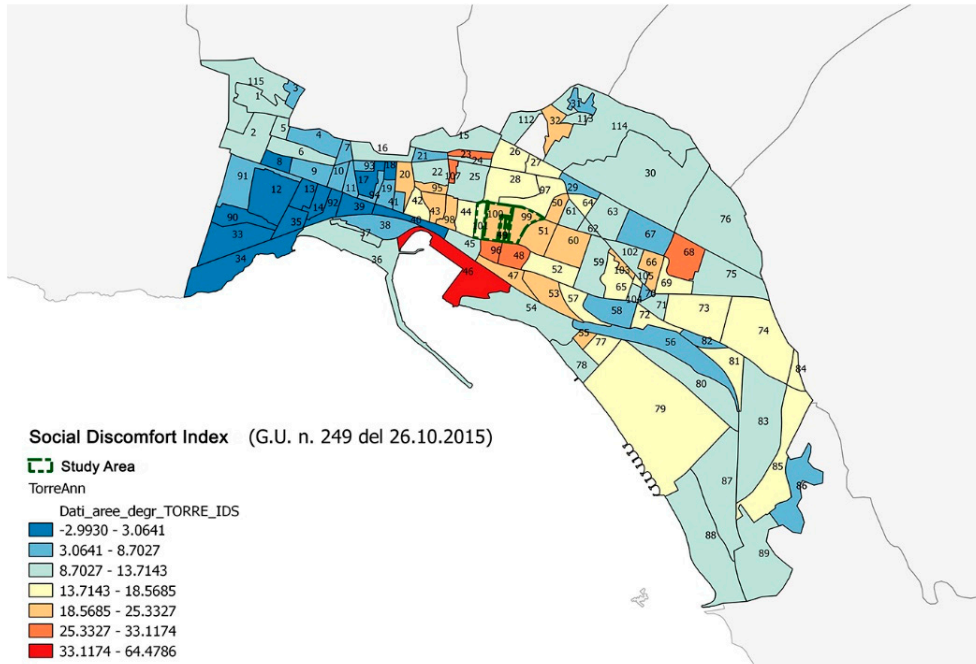


Figure 2. Municipality of Torre Annunziata: Social Discomfort Index (IDS).

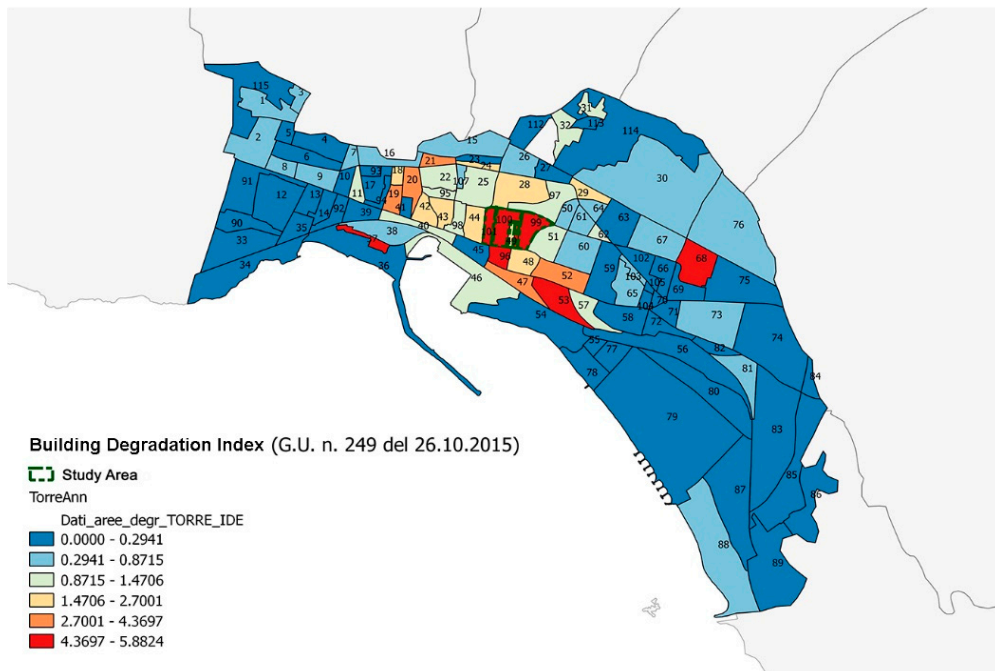


Figure 3. Municipality of Torre Annunziata: Building Discomfort Index (IDE).

The two indexes have been summarized in a single synthetic indicator showing the presence of degraded areas (Figure 4).

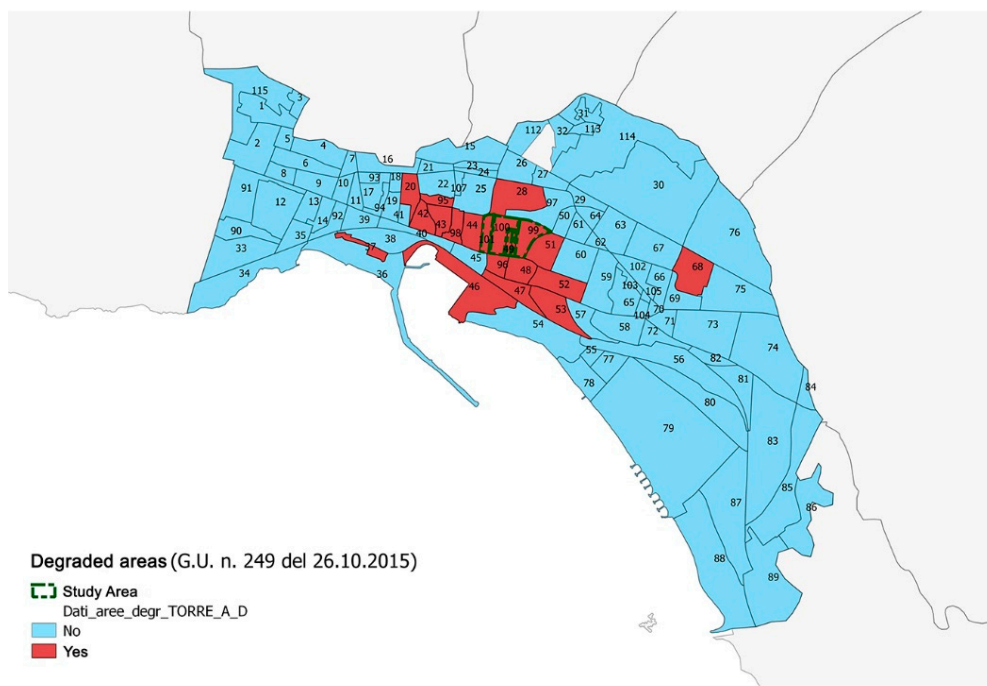


Figure 4. Municipality of Torre Annunziata: degraded areas.

Taking the oldest part of Torre Annunziata as a sample discussion area (Figure 4), it shows the high level of physical degradation and social discomfort. This area is strongly characterized by the presence of ancient pasta manufacturing. The surrounding landscape, marked by the skyline with the volcano Vesuvius, is degraded by the poor quality of the built environment characterized by abandoned buildings, industrial warehouses, service stations, fast roads. After the war, the development, especially in the 1970s and 1980s, caused the overall degradation of the landscape accompanied by a social malaise. It is one of the areas with the highest rate of unemployment and crime, which constitute a further obstacle to development. In recent years, the economic crisis has led to the systematic closure of businesses in the area. The presence of industrial establishments strongly characterizes the landscape: the buildings have a predominantly linear development and are characterized by a considerable volume, with inaccessible walls, reflecting the settlement methods of traditional industry. The degradation makes these spaces alien to the city; the abandonment has consequently an impact on the landscape, already characterized by heavy road infrastructure, now insignificant and partially abandoned.

In order to identify the relationships between urban context indicators and to observe which criteria can determine the direct or indirect impacts, positive or negative, on the landscape, a correlation matrix has been developed (Figure 5).

By placing the productive and economic dimensions as a privileged observer, it is possible to highlight the following interdependencies (Figure 5):

- the vitality of the real estate market is positively influenced by a high population density;
- medium/high incomes are located in areas with a higher number of elderly people;
- civic engagement is stronger in areas of higher average income;
- the level of unemployment is higher where there is a higher concentration of youth rates;
- the rate of urban decay is not linked to any particular indicator, with the (weak) exception of the viability of the real estate market;
- the economic dimension (real estate values and entrepreneurial vitality) improves considerably where the schooling rate is higher;
- the vitality of the real estate market is strongly linked to the vitality of the entrepreneurial system.

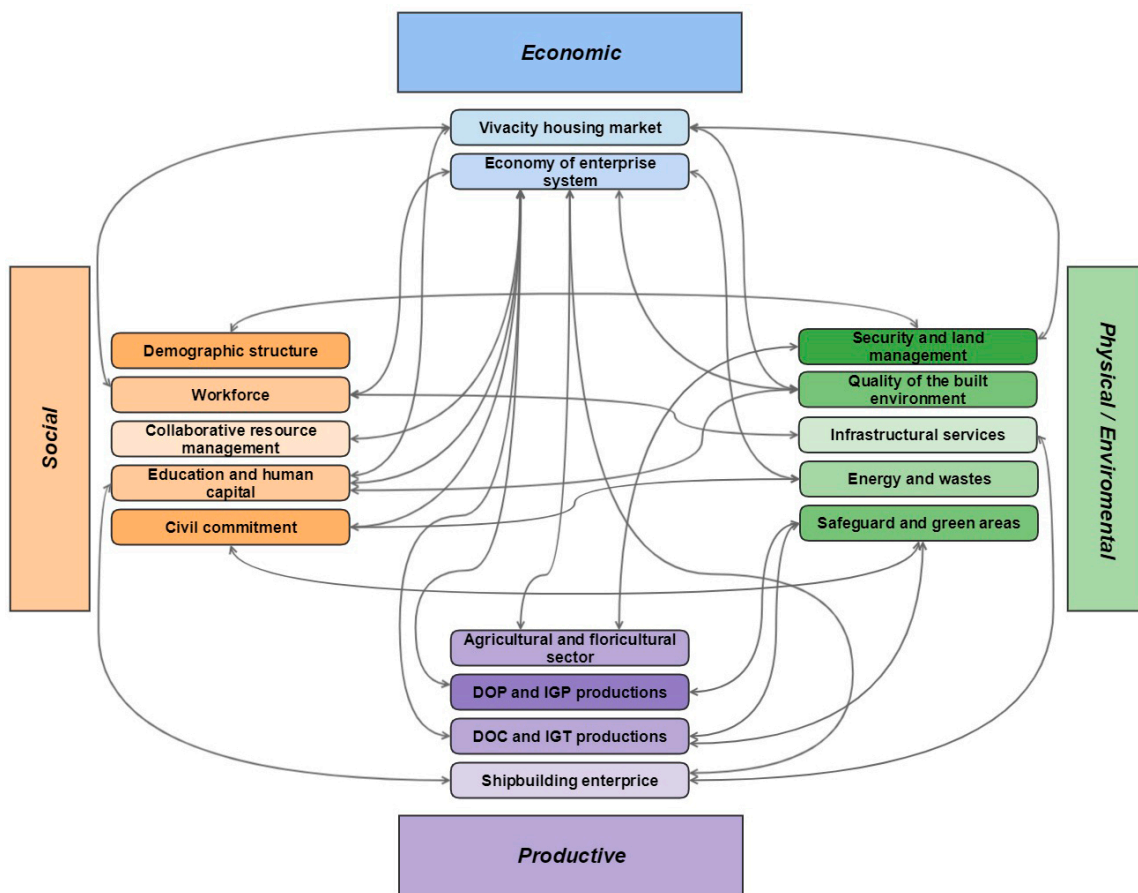


Figure 5. Correlation among criteria (author's elaboration).

Finally, the productive dimension (horticultural, DOP, DOC wines and boating) has close relationship with the level of education, which seems to be the link for the multidimensional reading of the productive landscape.

In order to define the possible drivers and the current development trajectories of the Municipality of Torre Annunziata, the data of the indicators have been analyzed at different spatial scales (buffer-zone, municipal, local) and at different time intervals (before the '900, after the Second World War, after the '80 s). This, together with the results of the correlative analysis, allowed to interpret the processes of transition and transformations over time of the socio-urban system. In the absence of a municipal and large-scale planning, the results of the study report the perspective of a progressive deterioration of HUL and the sale of existing properties. In the short term, the redevelopment of a neighborhood in the northern area and the upgrading of port infrastructure aimed at improving existing entrepreneurial activities could be hypothesized. In the long term, actions for the implementation of the existing regulatory tools to be financed are predictable.

5.1. Performance Indicators for the Circular Urban Regeneration of the Historic Urban Landscape of Torre Annunziata

This step of the research was aimed to assess the development trajectories of the historic urban landscape of Torre Annunziata and to define a circular regeneration scenario as collective opportunity to increase both the potential for communities' cohesion and the capacity to produce innovation.

The system of classes of resilience and of classes of indicators, previously elaborated (Section 4), was made explicit thanks to the measurable descriptive indicators and to the results of the correlative analysis. The table shows the articulation of the qualities of resilience in performance indicators of the productive urban landscape of Torre Annunziata (Table 1). The quality of Robustness, for example,

is the most significant quality in our research. It expresses the characteristics of the social-urban system, which on the one hand give it a capacity for resistance and on the other, if properly managed, an innovative and productive capacity. This quality, at municipal scale, is made explicit through the classes of resilience of Landscape quality, of Security and Resource Management, of Cultural Identity.

The first was developed through groups of indicators that express the physical/environmental dimension of Quality of the built environment and of the Green areas, but also, as suggested by the correlation analysis, the economic dimension related to the Vitality of the real estate market.

The class of Security and Resource Management was developed through groups of indicators that express the ability to manage Risk and Landscape, the availability of Infrastructure services and to manage Energy and Waste in the physical/environmental dimension, and the Collaborative resource management in the social dimension. This last class of indicators expresses partnerships between multiples and multilevel actors (collaboration pacts, public private people partnership, community cooperative, etc.) as tools for new governance and as a driver for improving social cohesion, responsiveness to difficulties, innovation capacity [38].

The class of resilience Cultural Identity was investigated through groups of indicators that highlight the Safeguard and Green Areas and the Consistency of the historical urban landscape in the physical/environmental dimension, then through social data expressing Education and human capital, Civic commitment and Collaborative resources management relating to heritage entrepreneurs and higher education institutions. The social dimension of cultural identity, in fact, highlights the value of heritage for the community to improve the quality of life, and especially the active role of communities in the protection and promotion of their cultural heritage [17]. Furthermore, the partnership between public authorities and higher education institutions focuses on the strategic role that these institutions can play as providers and promoters of knowledge capital [8,39]. This partnership activates a strategic decision making process to increase site attractiveness and to reinforce the overall virtuous socio-economic circle: the local authority provides financial support, investing resources in favor of higher education institutions and enhancing local culture, while the higher education institution supports urban development and stimulates innovation and civic engagement. Finally, the economic and productive dimensions of the resilience class of Cultural Identity have been articulated by indicators that express the Economy of the entrepreneurial system, and the peculiar resources of HUL, represented by Agriculture and floriculture, Products DOP and IGP, Wines DOC and IGT, and Shipbuilding industry.

Thanks to the standardization and aggregation of indicators with the methodology of perfect point [40], for each of the resilience indicators the values at the municipal scale have been identified. In this way it was possible to measure and compare the resilience qualities expressed by the different municipalities belonging to the Buffer zone of Pompeii. The ideal point on which the model is based identifies the ideal value assigned to a given criterion, which represents the optimal value the decision maker should strive for. This parameter coincides with the maximum value of the criterion examined. The worst point is the opposite of the ideal point and the default value is the worst in the attribute table. The following spider diagram [41] permits to compare the performance in terms of resilience expressed by different municipalities belonging to the buffer zone (Figure 6):

The graph shows a different behavior between the municipalities located directly on the coast and those inland. The Municipality of Torre Annunziata has an average behavior in relation to all the municipalities of the buffer zone, but worse than the other coastal municipalities. In fact, a predominantly homogeneous behavior is observed for the seven qualities of resilience, with the exception, in negative, for the quality of Flexibility and in positive for the quality of Reflexivity.

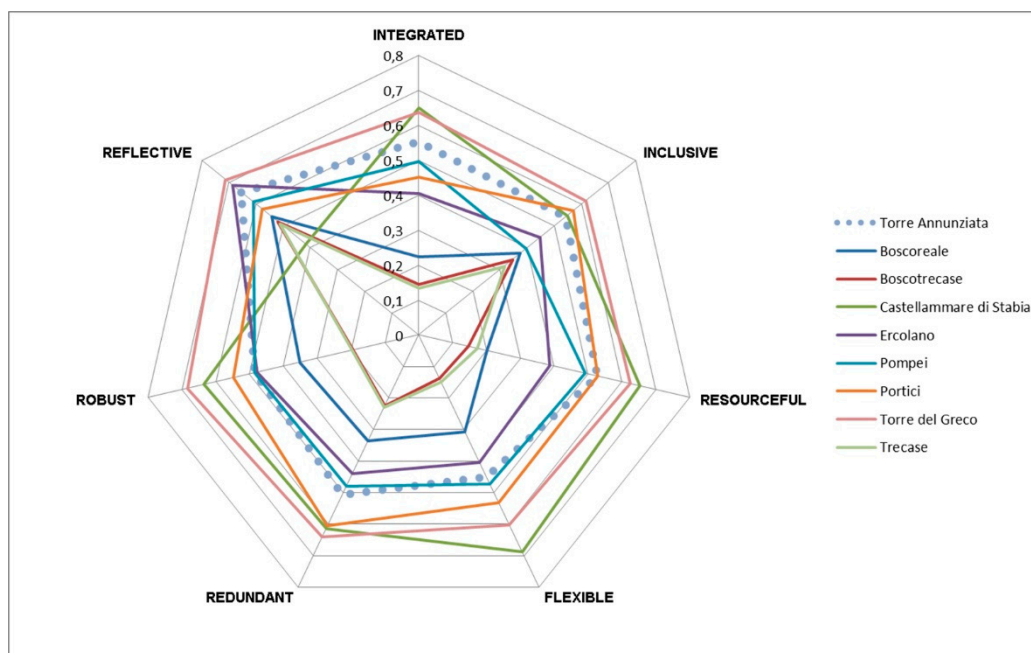


Figure 6. Comparison between the municipalities of the buffer zone.

5.2. Comparison among Regeneration Scenarios

The perspective of HUL, thanks to the elaborated tools, allows unusual interpretations of the Torre Annunziata urban landscape. It is useful for developing innovative regenerative strategies that can contribute to new sustainable urban processes. In the implementation phase, the circular approach allows the resources present in the studied area to be put into system, reactivating the existing ones and recovering those with unexpressed potential. Their systematic identification represents the potential for urban development. This approach is indispensable to orient regeneration strategies aimed at creating new dynamic balances between safeguard and development actions [8]. The circular economy model, in line with the HUL perspective, encourages the creation of a “community of relationships”, a strategic element in determining the quality of life, but also for the generation of new economic value chains [42]. The activation of a multilevel network, in which multiple actors are involved in a process of capacity building in doing together, accompanies the community in the acquisition of a shared awareness of material culture, as a decisive factor for the protection, management and development of the urban and human environment in which it lives [43].

Within this framework, the definition of a scenario of circular regeneration for the productive urban landscape of Torre Annunziata was aimed at ensuring, through innovative governance tools, new spaces of autonomy and leadership for local communities, consistent with the values attributed to the landscape.

The qualities of resilience, together with the analysis of the best practices of public-private partnership and social cooperation aimed at promoting local (productive) resources, have guided a collaborative construction of the settlement demand towards a productive-entrepreneurial scenario for the settlement system. The working group of the research unit of the PRIN project converges on the need to rebalance the symbiosis between construction and production processes, restoring a productive identity to the settlement system to combat physical degradation and social discomfort. The proposed scenario of “Urban District of Sustainable Productions” overcomes the contrast between “heritage to conserve” and “resources to enhance”, stimulating circular processes between landscape and community and promoting a new capacity for self-organization/ self-management. The scenario is based on a collaborative economy, an adaptive model in which the local community is co-starring in the productive-entrepreneurial development of the municipality of Torre Annunziata. Partnerships between multiples and multilevel actors (collaboration pacts, public private people partnership,

community cooperative, etc.) are proposed as tools for new governance and as a driver for improving social cohesion, responsiveness to difficulties, innovation capacity. The system of large-scale land use is characterized by “poles and networks” of self-sustaining and self-reinforcing functions (Figure 7). In the short and medium-long term, this scenario foresees the connection with the projects in progress or planned in the area. For example, it is expected that the port system, the driving source of the historic urban landscape of Torre Annunziata, currently disused, can be positively integrated into the productive, commercial and touristic development. The involvement of the port area in the process of urban development allows to trigger circular regeneration actions because of its ability to relate resources at different scales.

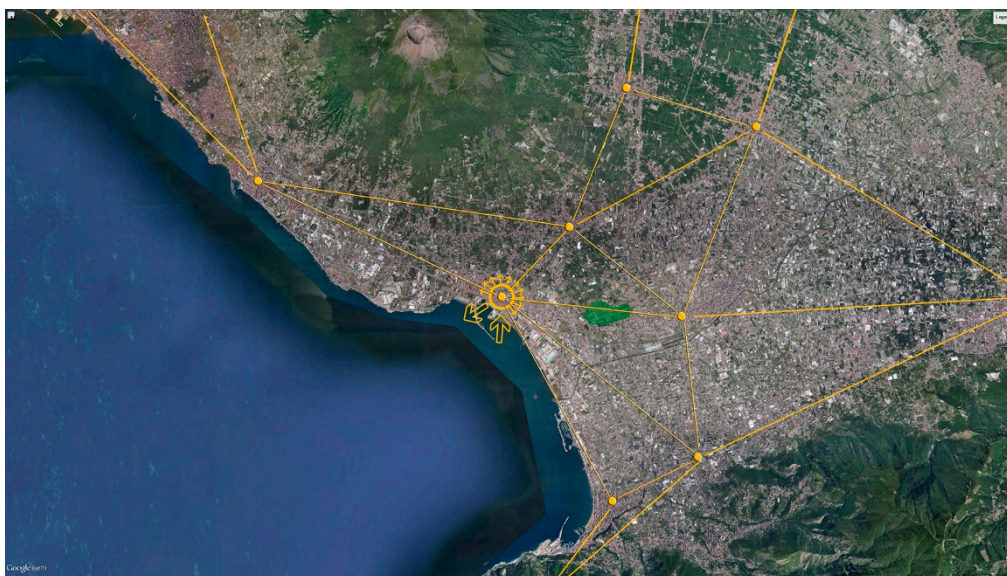


Figure 7. Scenario 1. Strategic plan of an “Urban District of Sustainable Productions” drawn up within the Research Projects of National Relevance (PRIN 2010-2011).

The productive-entrepreneurial scenario was compared with the current scenario and with a cultural-touristic scenario developed in 2011 by the Industrial Union of Naples and by Industrial Association of Naples.

Scenario 2 (Figure 8): strategic cultural-touristic plan, based on “Restoring the project life of Pompeii: a sustainable development project for the Vesuvius area”. The project involves the creation of a cultural-tourist district, with public and private funding, focused on the enhancement of archaeological sites in five municipalities in the buffer zone (Pompeii, Herculaneum and Torre Annunziata, Castellammare di Stabia and Boscoreale) and services located in an abandoned industrial site, on the east coast of Torre Annunziata, near the archaeological excavations of Pompeii.

On the basis of the qualities of resilience, the comparison between urban regeneration scenarios has been conducted with the aim of interpreting the impacts of different strategies and defining priorities in the actions to be taken in the area.

The comparison covered general characteristics, such as objectives, users, strategic approach, client, economic model, financing model, leading resources and qualities of resilience. The main differences between the scenarios emerge with reference to: the strategic approach (top-down for scenarios 0 and 2 vs. bottom-up and top-down for the proposed Scenario 1); the economic model (classic for scenarios 0 and 2 vs. based on models of collaborative and sharing economy for the proposed Scenario 1); the leading resources (building and infrastructure assets for scenario 0, archaeological assets for Scenario 2, vs. productive, built, natural and social resources for Scenario 1).



Figure 8. Scenario 2. Strategic cultural-touristic plan, based on "Restoring the project life in of Pompeii: a sustainable development design project for the area of Vesuvius area", drawn up in 2011 by the Industrial Union of Naples and by Industrial Association of Naples.

The results of the comparative model have been summarized in a conceptual framework that identifies, for each scenario, the qualities of resilience, in four dimensional domains:

- Community: mainly as a unified group of people currently residing in the municipality and which, as recommended by numerous international documents, should play an active role in landscape management;
- Buffer zone: the area surrounding the UNESCO sites of Pompeii, Oplontis and Herculaneum;
- Settlement system: the physical/environmental dimension limited to the area of the case study;
- Productive activities: including activities closely related to the district of sustainable productions, and that productive activities, not only economic, directly and indirectly linked to the production chain.

The following graphs show the impacts that each scenario can produce in the different domains, in relation to the qualities of resilience (Figure 9).

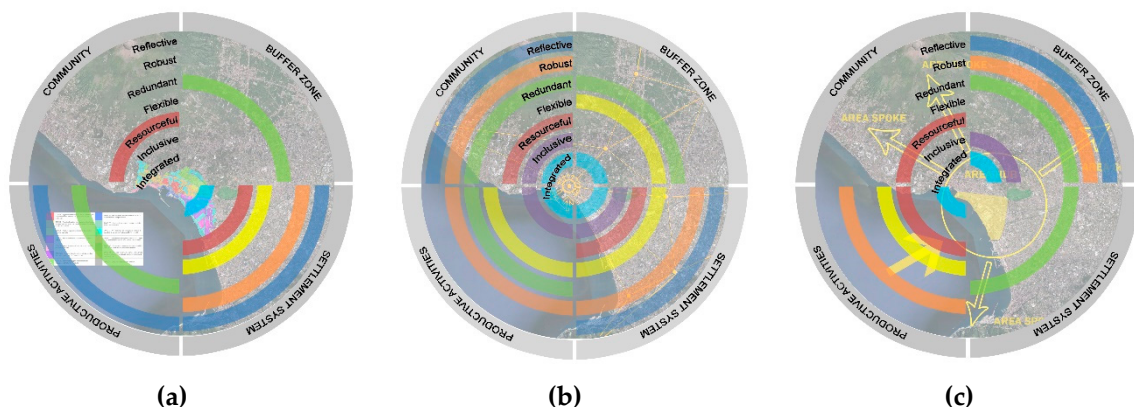


Figure 9. Conceptual framework of comparison among scenarios in four domains. (a) Scenario 0, of non-intervention; (b) Scenario 1, of sustainable productions; (c) Scenario 2, of cultural touristic development.

The comparison showed relevant differences between the scenarios (Figure 9). A diversified strategic vision emerges from the objectives and the end users of the regeneration actions (residents,

city-users vs. tourists). In particular, a different role of the community emerges (Inclusiveness): in scenario 0, non-intervention, and in the cultural-tourist Scenario 2 the community is the subject on which part of the benefits of the development process falls, in Scenario 1 it is a privileged observer, it participates in all the phases of the process of construction of the new model of circular city. Moreover, the scenarios show a different approach, above all in relation to the values attributed to the landscape and their role in the regeneration process (Robustness, Flexibility). In the planned Scenario 1, a large and diversified system of resources (productive, built, natural, social, etc.) is involved, set in motion through a circular economic model, compared with classic one, not inspired by resilient and sustainable systems. A different territorial vision also characterizes the scenarios (poles and networks vs. radial): Scenario 1 involves local and inter-municipal processes in an interscalar mode and is developed by poles of “production-attraction” and networks of connections, compared to models mainly radial or fragmentary (Resourcefulness and Integration). Finally, differences emerge in the prediction of the dissemination of results (short term vs. long term).

In summary, starting from a mixed bottom-up and top-down approach, from an inter-scalar model, from small scale to large area, and from the regeneration of different, mostly endogenous, resources, Scenario 1 foresees a process of construction of a Sustainable Urban Production District. It aims to trigger resilient development processes, linking productivity to culture and creativity, and sustainable, through the circular and regenerative use of resources and fair choices.

6. Conclusions

The research identifies landscape as a holistic indicator of sustainable, inclusive, safe, resilient cities as advocated by Agenda 2030 for Sustainable Development. The Recommendations on the Historic Urban Landscape have been understood as requests for the valorization of the peculiar resources and capacities of the sites, through the promotion of virtuous circular dynamics based on the strengthening and regeneration of the collective identity, the capacity for innovation and the self-sufficiency. The perspective proposed by HUL indicates the thresholds within which change continues to guarantee a coherence (continuity) with the past, with identity, with memory [42].

The conceptual framework in which Circularity, Productivity and Resilience are related has guided the development of the model and tools proposed by the research. They are paradigms embedded in the UNESCO Recommendations on HUL, which have proved to be an effective key to interpreting the phenomena that occur in urban landscapes to achieve the goals of Agenda 2030 of inclusive, safe, resilient and sustainable cities (SDGs 11). In this context, resilience, as a paradigm of reflective, robust, redundant, flexible, resourceful, inclusive, integrated city [28], contains within itself the premises to maximize the value of HUL by activating social, economic and environmental synergies [19]. Moreover, resilience thinking represents an interpretative paradigm, intentional and future-oriented, with the aim of reading in the urban landscape its own evolutionary potential [44].

Experimentation on the case study of the small-medium town of Torre Annunziata, in the Gulf of Naples, underlines the productive interpretation of the landscape, attributing to this term a broader meaning: in this systemic and regenerative perspective, productivity is considered not only in its economic meaning but also as a cultural and social attribute. The regeneration of the landscape contributes to the creation of synergistic relationships activated between different systems, and also between different forms of capital, which constitute the “complex urban landscape” [9].

The interconnected system of descriptive and performance indicators elaborated in the paper represents a proposal to define the complexity and changing values of the urban landscape and at the same time to direct regeneration actions towards sustainability and innovation. Although both the models developed for the descriptive indicators and the performance indicators need to be further tested in urban contexts, the findings of the research confirm our hypothesis that the combination of HUL perspective and resilience thinking have the potential to trigger virtuous circular dynamics and to overcome the dichotomy between identity preservation and development.

The circular economy model, extended to the multiple, multidimensional and interconnected elements of the urban landscape, now allow to identify creative, collaborative and innovative dynamics and successful regenerative mechanisms towards sustainable, inclusive, safe, resilient cities.

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Conflicts of Interest: The authors declare no conflict of interest.

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