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## Recovery and Maintenance Scenarios for the Productive Landascape

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### Abstract

The research experience performed by the Reuse, Recovery and Maintenance Laboratory (LRRM) of DiARC refers to PRIN project "The defence of the landscape between conservation and transformation. Economics and beauty for sustainable development". The research has addressed the issue of the rebalancing of the relationship between physical space, established communities, economies. The productive urban landscape of Torre Annunziata, identified as a case study, has been analyzed as a complex and adaptive system. It is the result of processes that have determined, in time, the identity of the territories. The paper illustrates the methodology for interpretation of built environment. The work is aimed to identify the conservative and transformative vocations, to draw project scenarios compatible with Recommendation of Historic Urban Landscape Unesco, 2011.

### Parole chiave:

PE8-10 Production technology, process engineering  
SH3-9 Spatial development, land use, regional planning  
SH5-11 Cultural heritage, cultural memory  
PE8-3 Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

### Settlement systems and multi-dimensional vulnerability of the historic urban landscape

The cognitive survey of the built environment refers to an orientation of the architecture technological culture (Ciribini, 1984), consisting of systemic approach: the latter allows the study and analysis the configuration processes of elements not only in relation to the organizational and structural component, but also in relation to the definition of specific dynamics of a system, in order to identify current behaviour and prefigure the future<sup>1</sup>.

The built environment is a high complexity system, the multiscale approach allows the reading and the analysis as over-system, characterized by attributes and structured in interacting systems. The connections and interdependencies are not linear and are variable over time In the settlement systems.

This variability characterizes the different settlement systems over time and space. The uniqueness of a *place* helps identify and analyzes its *identity*.

The connotation of the variability of relations, due to events and changes in a settlement system, synergistically involves the constituent sub-systems, requiring the development of a cognitive framework at the same time of synchronic and diachronic nature.

With the aim of reading the variability over time of settlement systems, the work introduces an interpretive key consists of the multi-dimensional vulnerability. It is understood as the lack of capacity of a system to resist the pressure / criticality (Miller et al., 2010). In other words, the vulnerability has been regarded as the measure of the inability of a system to respond to external pressures exerted on it (Fortune and Peters, 1995), causing an increased risk of negative impacts resulting from unexpected shocks.

A vulnerable ecosystem is a system that has lost the ability to auto-regenerate becoming exposed to the risk of a negative impact, which previously could be absorbed (Naudé and all, 2008). Consequently small pressures can qualitatively alter the state and radically developing a vulnerable system (system understood as the set of individuals, communities, economic organization, the infrastructure system, the territory as a whole, etc.) (Cutter and Finch, 2007), causing impacts that impede the restoration of the previous situation (Graziano, P., 2012). These pressures on built environment connote the intensification of the vulnerability of the tangible and intangible heritage (fig. 1).

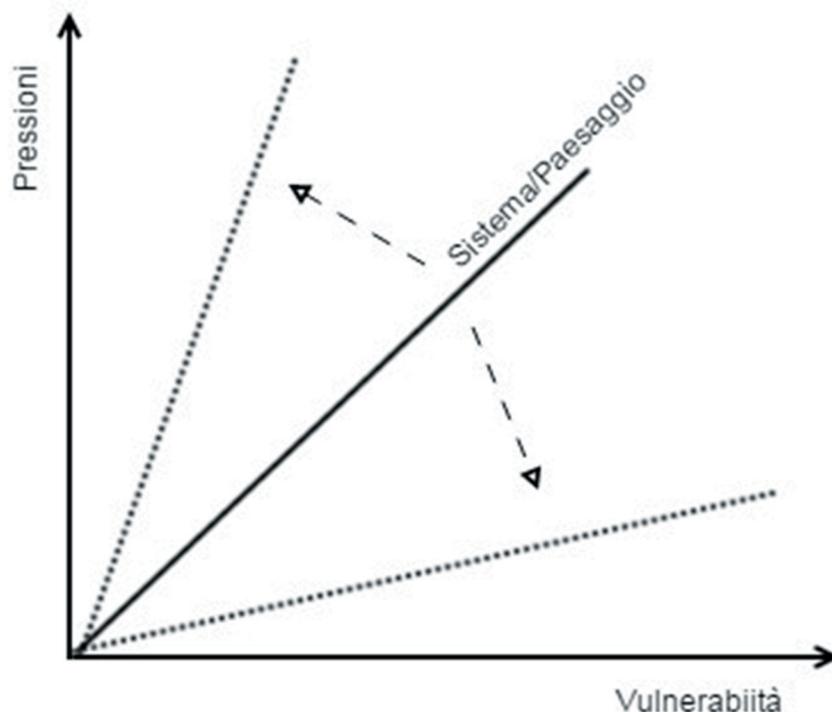


Fig.1. Pressures and a system vulnerability. Source: elaboration on Miller et al, 2010).

The transformations can be interpreted as the result of possible perturbation pressures into the settlement system (Diano, 2015). The nonlinear evolution generated in systems where the pressures are not controlled (Fujita, Viola, 2014), with negative reactions to the relationship dynamics between perturbation pressures and safeguarding the identifying characteristics of the Historic Urban Landscape (Miller et al., 2010) .

It shows the need to define the asset management procedures, expression mode of settle-

ment communities (UNESCO, 2013), in order to limit exposure to loss and distortion of the distinctive characteristics (Catherine, 2012).

In this new configuration the actors involved in the modification of the environment built, have responsible for managing the pressures, to identify ways and priorities and to mitigate the vulnerability of settlements.

The vulnerability control becomes necessary condition to address the dynamic processes (Fujita, Viola 2014). In a multi-dimensional vision of the built environment the concept of vulnerability refers not only to the physical / environmental aspects, but also the social and economic aspects (Gurrieri, 2011).

The construction of the vulnerability framework to landscape scale interprets the interaction overlap between place and community, and it refers to its main dimensions: economic, physical/environmental, social (UNESCO, 2011). Then the identification of criteria/indicators allows to measure what choices lead to a reduction of the vulnerability of the landscape and consequently an increase of its "resilience".

In order to interpret the complexity of the landscape, the paper refers to the definition contained in section 9 of the UNESCO Recommendation on the Historic Urban Landscape (UNESCO, 2011) which defines the different layers that make up the landscape: the landscape is the overlap and the interaction of cultural and natural values in time. This interpretation using "hard" data (natural features, built environment, infrastructure, land use, etc.) and perceptive data, "soft" (perceptions, visual relationships etc.), and including also social and cultural practices and values, economic processes, intangible dimensions of heritage as related to diversity and identity.

The research uses this interpretation to determine the criteria/indicators that compose the landscape and the vulnerability thresholds for each criteria, and/or set of indicators. Through the thresholds, the methodology intended to measure, anticipate and manage the dosage between conservation and transformation induced by the impact of new actions. It is the basis of the recovery theory.

The multidimensional vulnerability framework is completed by the study on the perturbation pressures that the settlement system has undergone. The observation of pressures and their interdependence can be investigated through correlation matrices. The understanding of the relations between communities and built environment allows us to outline the economic risk factors, social and physical that determine the multidimensional vulnerability (Turvey, 2007).

Identify the relationship between pressure/criteria/indicators in the context drives on strategic projects, it considers the effects of the changes not only on the criteria involved, but also on those closely related. Analyzing the correlation between the different dimensions that we have considered, we can identify which new actions/pressures determine direct or indirect impacts, positive or negative, on the landscape.

The theoretical approach has been validated on a case study, consisting of the Buffer Zone of Pompeii. The area has been defined by the Ministry of Heritage and Culture together with the Campania Region as the surrounding area UNESCO sites of Pompeii, Oplontis and Herculaneum.

Compared to municipalities (Pompeii, Herculaneum and Torre Annunziata, Torre del Greek, Trecase, Boscoreale, Boscotrecase, Castellammare di Stabia, Arcades), research has focused on the area of Torre Annunziata, showing a paradox in terms of value: on the one hand, the high historical and cultural value of the archaeological sites internationally recognized

(Oplontis); on the other hand, the widespread degradation, caused by uncontrolled changes/pressure, which has damaged the value of not only economic, but also environmental and social. As a result was developed a model description of the vulnerability multidimensional framework that traces the theoretical approach.

### **The settlement system and perturbative pressures: the case study of Torre Annunziata**

The research analyzed the productive urban landscape of Torre Annunziata. The character and the identity of the ancient settlement can be traced in his past industrial economy and in the strong bonds between the built and environment system, the social and cultural system (Fusco Girard, 2014). The study of the state system perturbations allowed the analysis of settlement environmental behaviours. It evolves into finding a new balance, dynamic and different from the previous.

This inclusive and holistic vision is an integrated approach to understanding the continuous changes in the functional use, in the social structure, in the economic context of the historic urban landscape (Diano, 2015).

The specific object of study was the physical anthropic character of Torre Annunziata landscape. The processes of industrialization and de-industrialization have weighed on the built environment, the transition processes triggered by anthropic and environmental pressures (fig. 2).

A rooted regeneration aptitude characterizes Torre Annunziata landscape. It is a strong point that can trigger rebalancing process between built resources, environmental resources, cultural values, to achieve new forms of balance between fragile resources, latent potentiality, safeguard actions and socio-economic development objectives.

The physical anthropic system has been observed since the second half of the nineteenth century to today. (Di Battista, 2006). It is the ancient and productive building. The perturbations system investigated is connect to environmental phenomena, to pressures linked to the development of production technologies, to social and economic pressure. These perturbations have produced physical degradation, economic and social effects to the urban structure.

### **Environmental pressures**

A system of environmental pressures has weighed on and still afflicts the Torre Annunziata settlement system (fig. 3). The presence of the Vesuvio with its eruptive risk, seismic risk, the hydrogeological and waterproofing phenomena, erosion, degradation and land use, are the complex endogenous and exogenous pressures system. Over the centuries volcanic activity, silent now, has been characterized by explosive and effusive phenomena, which have led to later destructions of the built environment of the agricultural areas and the natural landscape.

Torre Annunziata is part of the seismic map of the Italian territory, it is zone 2 medium seismic risk (Ordinance PCM3274 / 2003 Ordinance PCM 3519/2006).

Phenomena related to the hydrogeological instability (Excerpt Basin Plan for the hydrogeological structure, updated 2011), were caused by gradual reduction of the green cover of the soils. Over the last three centuries they have led periodically, landslides and flooding events, the instability and hydrogeological vulnerability of pyroclastic soils.

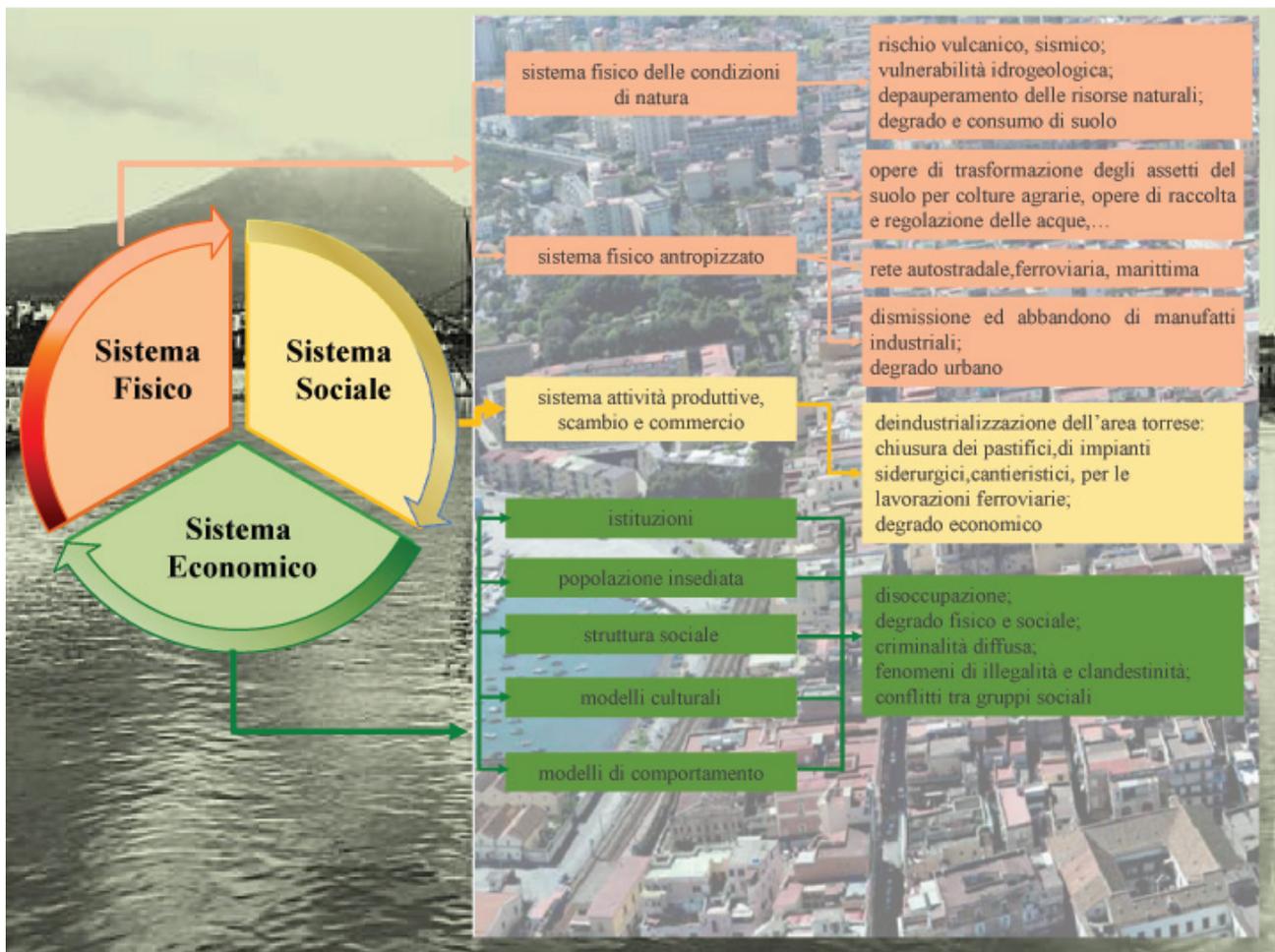


Fig. 2. The settlement system and perturbation pressures of Torre Annunziata.

Finally, the uncontrolled growth phenomena of the settlement load, phenomena of: the (abusive) expansion, the built fabric, the under-use, the abandonment and divestment of open spaces and built areas, weigh on additional burden of an area characterized by geomorphological dynamism.

### Technological innovation pressures

A system of exogenous pressures can be attributed to technological innovation processes related to the pasta production (fig. 4).

In Torre Annunziata pasta production sets new records for the guarantee of quality product, for the high quality of the Taganrog durum wheat come from Russia, for the skills acquired by the workers, for the favorable climatic conditions that facilitate the natural drying processes (Abenante, 2011).

The technology of pasta production is carried out according to the three phases of preparation of the dough of semola and hot water, the forming of the pasta and drying. The pasta is produced for personal consumption of the family or for sale and trade, according to a craft business dimension.

Small laboratories to the ground floors of residential buildings using the particular configu-

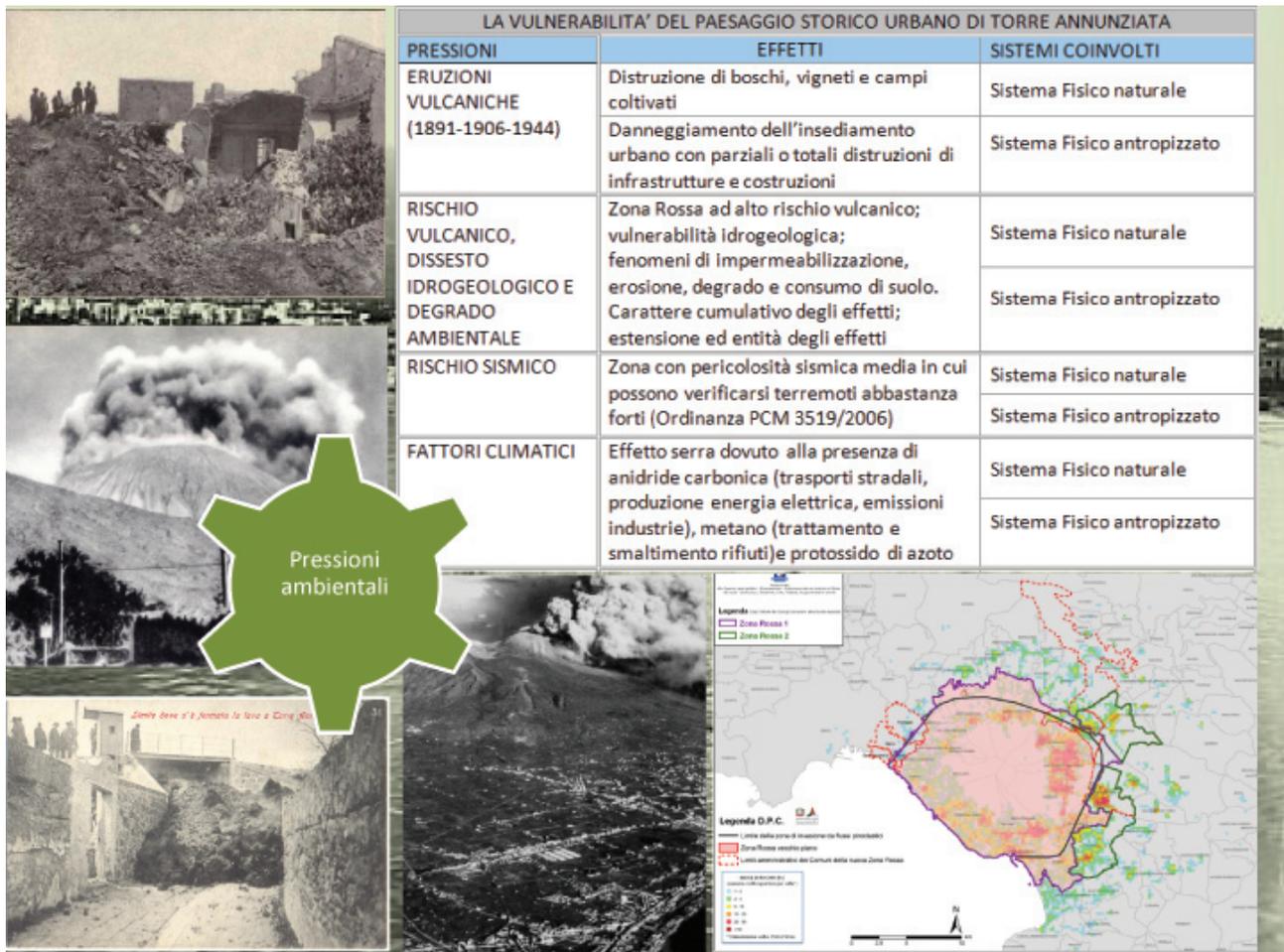


Fig. 3. Environmental pressures.

ration of spatial elements both for the production activities which for the storage and sale of the finished product; courtyards and patios, terraces and outdoor public spaces with housing neighboring, are used both for the first drying phase called “*incartamento*”, which for the completion of the process.

The storages in the basement are being exploited for the phase of “*rinvenimento*”, the second stage of the drying process, in which the pasta is kept in a humid room for at least 12 hours (Gargiulo, Quintavalle, 1983). All the family is involved in the pasta production and sale, with the aid of workers for heavier operations (Dati, 1962).

Until the 20s of the twentieth century, technological innovations essentially concern the first two phases; they affect the acceleration of the production process, on layout of the pasta factories for requesting of appropriate spaces for the production.

All the urban economy turn of the pasta industry, by increasing the port activities for the import of Russian wheat and export of pasta (Amatori, Colli, 2001).

Most of the population is involved in the production process or in related industries (Masi, 2006). In 1910, 60% of Italian pasta is produced in the province of Naples; 700,000 tons are exported to the United States.

The increase in production volumes determines a greater demand for spaces for the drying process.



Fig. 4. Technological innovation pressures.

Between the '20s and' 30s of the twentieth century, the mode of production is overturned by the invention of new machines for the production and drying pasta. The "metodo Cirillo" drastically reduces the drying time.

The Braibanti machine allows a single manufacturing process without stopping and scraps from semola to pasta. The realization of automatic tentering and rotary driers with high and very high temperatures cycles accelerate the pasta production. The pasta factories sprung up in the urban landscape, within residential buildings become obsolete. The building organism crisis is generated by the foreshadowing of an industrial condition that becomes incompatible with the physical dimension of the building construction. Spatial elements that host the activities of the production process are subject to changes.

They are converted to exclusive residential use with division of building system in more residential units.

Buildings of stone masonry, with ceilings of vaults and terraces coverage plans are tailored to the new housing functions with operations affecting both the environmental system that the functional-spatial system of the building construction.

The closure of circular window and basement window wells that favored the drying of pasta heavily alters the climatic conditions of the building. The functional-space system is also modified as a result of interventions for the realization of housing units.

The interventions exclude the first level, that hosts the home of the pasta factory owner and involving the ground floor, the basement, the courtyard and the last level.

A slow process of densification and saturation of the interior open spaces involves urban blocks, it marking their transformation.

Manufacturing activity, which for a century has become entrenched in the urban system consists of blocks, buildings, streets and squares conformed to the production sites, is replaced by the residential function, which distorts the identity of the fertile productive and luxuriant landscape.

### Social pressures

In the late nineteenth century perturbative pressures of a social nature, due to poor working conditions and remuneration of workers and a reflection of the industry's first economic crisis, weighing on the balance of the urban landscape conditions (fig. 5).



Fig. 5. Social pressures.

Remuneration at piece rates, the working day of 16 hours for adults, 14 hours for children, no festive rest, the speed and skill required have a negative effect on economic and social condition of the pasta makers and of all those who work in related industries (Colaps, 1986).

The gap between the production and social condition of the working class development is of significant size because it does not translate into improvement in levels of economic and social welfare for most of the population involved in the activities of the pasta making (de Majo, 2001).

On the contrary, the introduction of machines fed by hydraulic motors and then mechanical, up to the continuous machine, reduce the time of processing the pasta, free a number of spatial elements in which the workers carry out the manual operations. All this causes the decrease in the number of employees to the individual phases of the production process.

The succession of financial crises is determined by huge debts incurred by small businessmen for the technological upgrading of systems, from an inability to revenue management, as an ineffective technical direction imposed by the new production times.

Effects are found in a large decrease in the use of workers, unemployment, social tensions with a consequent change in the social structure of the population.

### Economic pressures

Economic pressures determined by the outbreak of the First World War and the socialist revolution in Russia causing the blocking of wheat imports from Russia and does not allow you to export the pasta to the United States of America and Canada, which are large consumer markets for presence of Italian migrants (Giordano, 1992) (fig. 6).

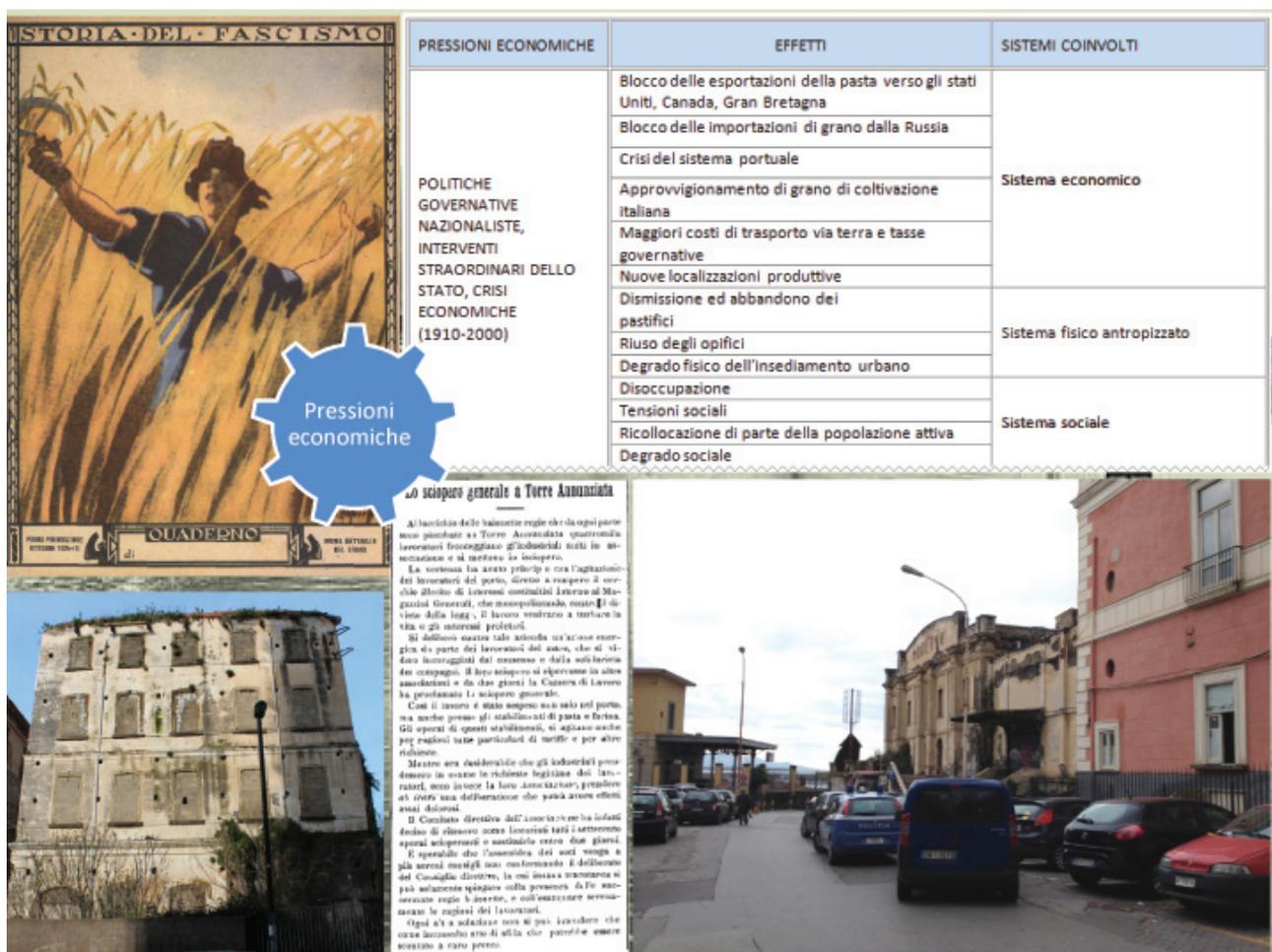


Fig. 6. Economic pressures.

The restriction of trade, the difficulties of access to bank credit, cause a sudden and abrupt reduction in production the latter limited and worsened by the imposition of the State ration policy (Candeloro, 2002). The first effects are seen in the crisis of port system of Torre Annunziata: the wheat coming from the Puglia Region and the central and northern others regions does not make competitive the port system and the wheat ground transportation is made even more onerous by the application of a special fee.

The immediate post-war period was marked by a reversal of the trend for the recovery of production caused by increased demand for consumer goods. This new condition encourages small businessmen to rebuild and to expand the existing buildings to increase the production.

The abolition of the storage system and the reinstatement of the norms on the import of foreign wheat are further promote the economic recovery.

In 1957 the export markets pasta scenario changes. The nearest European Square replaces the place overseas because of free movement of people, services, goods and capital in the European Common Market.

However, the Torre Annunziata pasta factories are not able to compete with larger northern industrial facilities, partly falling in the agri-food sector of the *Instituto per la Ricostruzione Industriale* (IRI).

They are bound to lose both the inability to access concessional credit terms, which for management failure that prevented the merger of small businesses, for the construction of new production facilities, and for inability to pursue the establishment of associations of consortia for the production and marketing of pasta bearing the Torre Annunziata brand<sup>2</sup> (Pinto, Viola, 2015).

The small owners declare bankrupt or interrupt the productive activities and they sell building constructions. A small industrial district disappears, born for the ingenuity and the creativity of some businessmen, involving all people.

Technological and functional obsolescence, poor business skills, inadequate economic policies and ineffective interventions of governments, causing degradation phenomena economic, social and physical of the urban landscape of Torre Annunziata.

Physical degradation due to processing operations of building organisms to adapt to the new housing needs, decommissioning and abandonment of industrial activities, unemployment, social strains, widespread phenomena of petty crime and lawlessness threaten the balance between systems and break the relationships between place and community.

The urban landscape loses quality and identity.

### **The analysis of the vulnerability of Torre Annunziata**

The analysis of pressures and consequent transformations has allowed to built the multi-scale vulnerability framework, referring to the context of Torre Annunziata. Thematic maps for the definition of the multi-dimensional vulnerability of the landscape system (Fusco et al., 2016; Biancamano, 2016) have been developed in the geographic information system. The GIS has allowed to overlay the knowledge of spatial data (Sessa, De Martino, 2005) connects the information (numerical indicators, open data, points of interest, etc ...) in the territorial framework. The integration of knowledge tools (Rocchi et al., 2015) with GIS has constructed complex maps (Cerreta and De Toro, 2012) containing information about the context and the landscape (fig. 7).

In particular at the urban scale (divided into census boxes), the vulnerability framework can

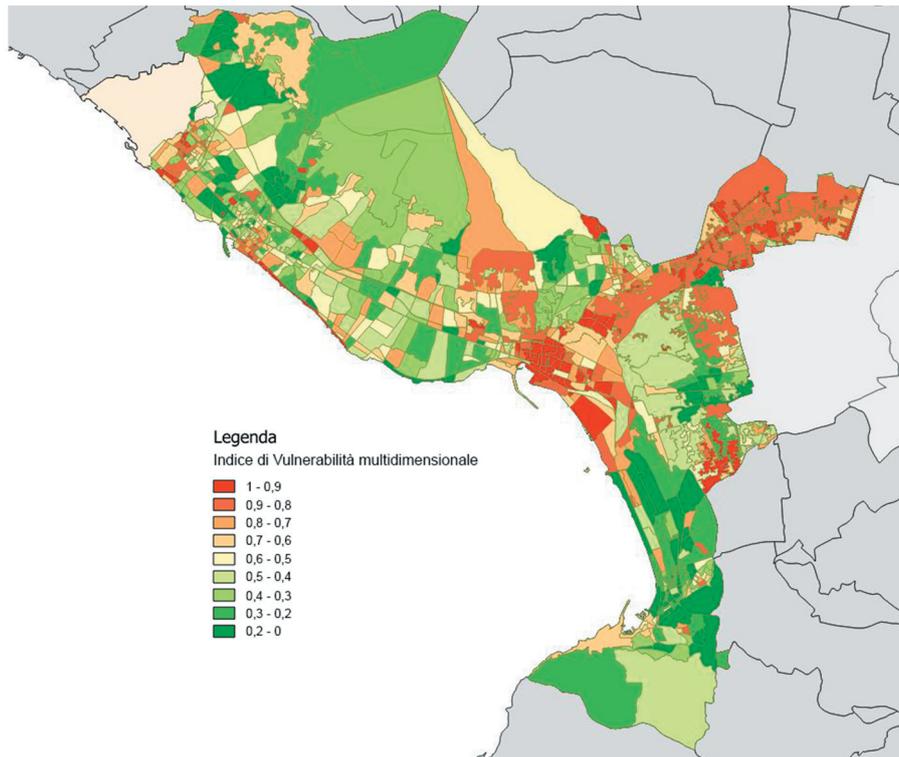
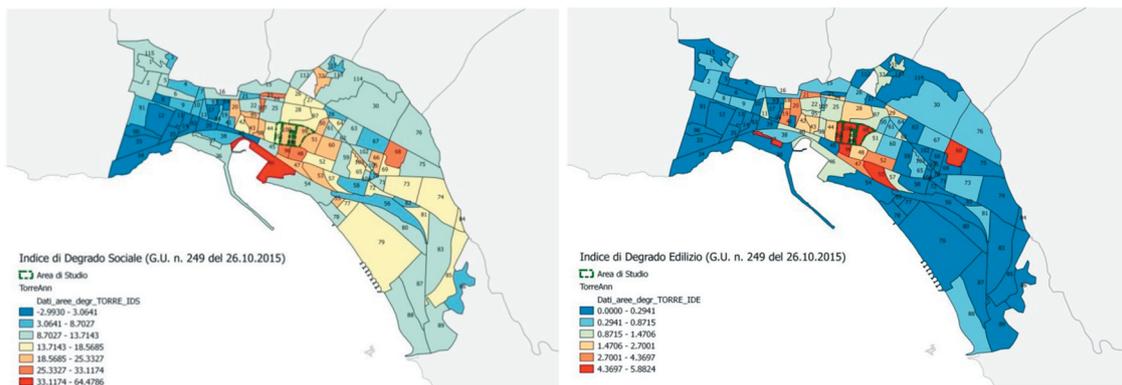


Fig. 7. Multidimensional Vulnerability Index.

be composed on the basis of two synthetic indexes: the Social Discomfort Index (IDS) (fig. 8.a) and the Building Code Discomfort Index ( IDE) (fig. 8.b), according to the D.PCM directives. 10.15.2015 (Italian Official Gazette N ° 249 10/26/15). The indices are composed from the weighted average of the deviations of the indicator values by their respective national averages.



a) Social Discomfort Index (IDS)    b) Building Discomfort Index (IDE)

Fig. 8. Social Discomfort (IDS) and Building Discomfort (IDE) Index.

The two indexes have been summarized in a single synthetic indicator that shows the presence of degraded areas in the city (fig. 9).

Research has shown that the areas affected by the presence of pasta factories have a high degradation of the social and physical systems. The landscape (characterized by the skyline with Vesuvius volcano) is degraded by the presence of abandoned buildings, industrial warehouses, gas stations, fast roads.

The development implemented after the war, especially in the 70s and 80s, caused the overall degradation of the landscape, accompanied by a social malaise. It is, in fact, one of the areas with the highest rate of unemployment and crime. This condition represents a further obstacle to development. In recent years, the economic crisis has led to the systematic closure of companies in the area.

The factories strongly characterize the landscape: the buildings have a development predominantly linear, stand out for significant cubic volume and are bordered by inaccessible walls, reflecting the settlement mode of traditional industry (Russo, 2011).

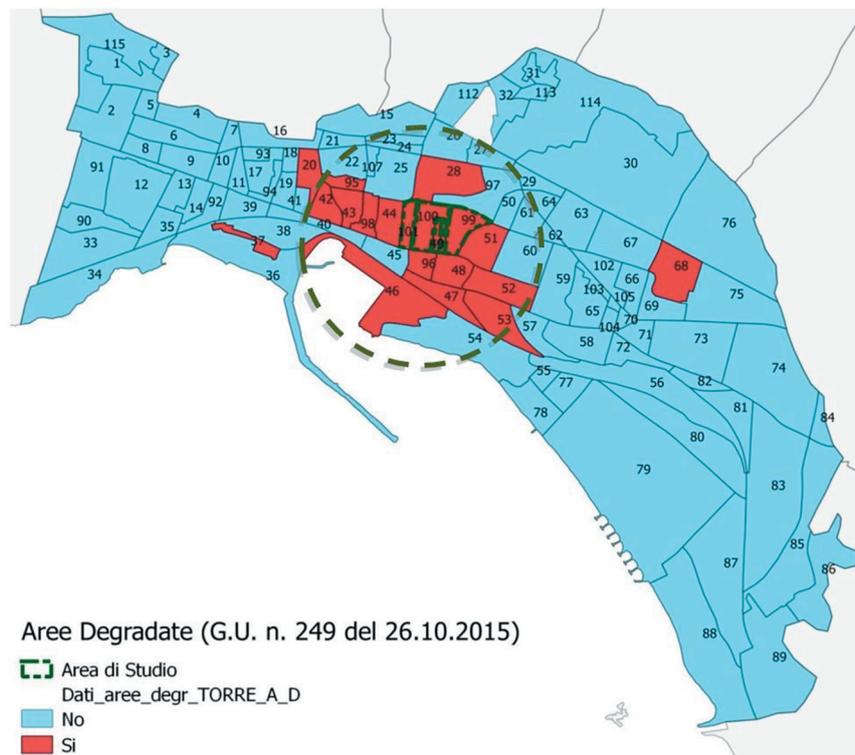


Fig. 9. Degradation Index.

## Conclusions

The construction of a framework of the built environment transformations, occurred as a result of perturbation pressures, it allows to decode the attitudes of the settlements system to re-create new equilibrium conditions to vary the synergies and to define unexpressed vocations in systems to guarantee a quality of life in degraded settlement (Grin, 2010).

The planning of transformations has the goal to identify compatible strategies and actions with a future that preserves identity and values ingrained in local communities (Musso, 2012).

The major challenge faced by the research was to outline scenarios for the recovery and maintenance for old production contexts that go beyond the horizon of development linked only to economic growth. The goal is to shift the balance of settlement systems, based on the awareness of enhancing resources that, in the past, have combined utility and beauty (Fusco, 2016; Pinto, 2016).

## Note

1. The PRIN research coordinated by Prof. Carlo Truppi, started in 2013 and ended in 2016, involved seven universities with interdisciplinary competences. In particular for the unit of Naples, the contribution of the sector Designing Technological Architecture with the Laboratory Reuse Recovery and Maintenance (LRRM), concerned the protection of sedimented identity and the recovery of productive urban landscapes characterized in the past by an excellent quality.

2. The city of Gragnano, 15 Km from Torre Annunziata still produces pasta. The Consorzio Gragnano Città della pasta, was born in 2003. It gathers 12 historical pasta factories, with an annual turnover of more than 300 million euro. In 2013, the Gragnano pasta has obtained the IGP. It's first EU recognition of quality assigned to the pasta in Italy and Europe.

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