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Measuring the green efficiency in the settlements structure

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Measuring the green efficiency in the settlements structure 2

sommario

Table of contents/*Sommario*

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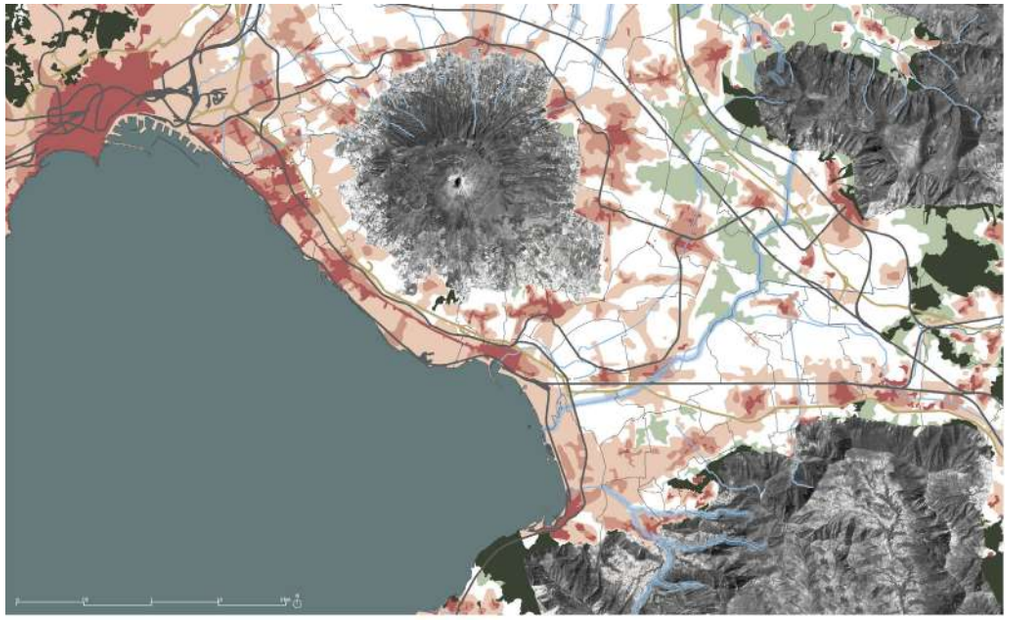
abstract

Periurban Coastal Landscape: a method to identify and map Resource-Scapes

Libera Amenta, Anna Attademo

Abstract

The mapping of contemporary urban systems, if based on a Circular Urban Metabolism approach, and on life cycles of territories, can help to track down the presence of potential indicators of regenerative resources (both materials and intangibles). This paper[1] presents an "How-to" tool for urbanists and policy makers, to map the territory based on the presence of waste, and guide the identification of certain territories, namely Resource-Scapes, in which the intervention can trigger wider regenerative processes. The case study is the EcoRegen research, funded by the University of Naples Federico II (2020-22), with a specific focus on Resource-Scapes of the coastline, and the transversal transects land-sea of the metropolitan area of Naples. The presented data have been collected through research and didactic activities, cataloguing spaces in a GIS-based



database. This work aims to reach a wide audience. On the one hand, this mapping method contributes to the recognition of wastescapes as local resource-scapes, as an opportunity for public authorities (at urban and regional level), and policy makers to analyze and plan contemporary urbanizations. On the other hand, it could be useful also for academic research and didactic experiments, as a field ground for future research agenda, and delineating open questions.

Keywords:
urban metabolism, resource-scape, coastal landscape

Paesaggio costiero periurbano: un metodo per identificare e mappare i Paesaggi-Risorsa.

La mappatura dei sistemi urbani contemporanei, se basata su un approccio di Circular Urban Metabolism, e sui cicli di vita dei territori, può essere utile a rintracciare la presenza di potenziali indicatori di risorse rigenerative (sia tangibili che intangibili). Questo articolo[1] presenta uno strumento "*How-to*" per urbanisti e *policy makers*, per mappare il territorio in base alla presenza degli scarti e per guidare l'identificazione di alcuni territori, cosiddetti *Resource-Scapes*, in cui l'intervento può innescare processi rigenerativi più ampi. Il caso di studio è la ricerca EcoRegen, finanziata dall'Università degli Studi di Napoli Federico II (2020-22), con un focus specifico sui *Resource-Scapes* della costa, e sui transetti trasversali terra-mare dell'area metropolitana di Napoli. I dati presentati sono stati raccolti attraverso attività di ricerca e didattica, catalogando gli spazi in un database basato su tecnologia GIS. Questo lavoro mira a raggiungere un vasto pubblico: da un lato, questo metodo di mappatura contribuisce al riconoscimento dei paesaggi scartati (*wastescape*) come spazi-risorsa a livello locale, e come opportunità sia per le autorità pubbliche (a livello urbano e regionale) che per i responsabili politici di analizzare e pianificare le urbanizzazioni contemporanee; dall'altra, può risultare utile anche per la ricerca accademica e gli esperimenti didattici, come campo di applicazione per futuri programmi di ricerca e per delineare ulteriori questioni da approfondire.

Parole Chiave:
metabolismo urbano, Paesaggi-Risorsa, paesaggi costieri

Periurban Coastal Landscape: a method to identify and map Resource-Scapes.

Libera Amenta, Anna Attademo

1. Introduction

1.1. Research background

This journal paper aims at shedding light on the importance of the analyses of the territorial conditions of wastefulness and abandonment along coastal areas. The latter could be a starting point for the urban project, aimed at imagining possible futures and different social processes (Munarin, 2022), and at triggering regenerative approaches (Amenta, Russo, & van Timmeren, 2022). This paper has the ambition to show "the capacity of mapping as a research tool [...] The method of using cartographies as research tools—mapping operations—calls for reflecting on the diverse role that cartographies can assume in the process of knowledge construction. In the language of architects and urbanists, mapping means at the same time recording, retracing and processing, whereas these operations are not always performed in chronological order (Furlan, Wandl, Cavalieri, & Unceta, 2022)".

The mapping method which this paper intends to delineate is for identifying resource-scapes in coastal landscapes. The starting point is the conceptualization of the so-called wastescapes (Amenta & Attademo, 2016; Amenta & van Timmeren, 2018; REPAiR, 2018). Their regeneration is based on a Circular Urban and Territorial Metabolism approach (Girardet, 2010; Grulois, Tosi, & Crosas, 2018), and applies the concept of life cycles, proper of the industrial ecology field, to territories and their spatial characteristics.

The current linear process of growth and urban and territorial metabolism has been based so far on the keywords "supply-consume-disposal" (Pasini, 2022), exceeding the safe limits of ecosystems (Russo, 2022). Thus, resource scarcity is exacerbated, with a specific reference to natural resources (e.g. water, air, soil, etc.), often overlooked in the discourse on circular economy principles (Williams, 2019). In contemporary urban and territorial systems, soil above all is under pressure due to continuous growing urbanization processes, and it is often depleted, polluted, abandoned, and finally wasted. To develop an appropriate knowledge on this kind of spaces, towards their regeneration, it is possible to re-interpret them as resources, by mapping them.

Being fully circular it is not sufficient. We aim to extend the circularity principles from the recycling of material resources (for example goods, and energy) to a sustainable and ecologically oriented regeneration of wastescapes. The latter are understood as one of the negative consequences of the linear process of growth of contemporary urban and territorial systems (REPAiR, 2018).

The marginal areas of peri-urban territories, in-between urban and rural, are generally the most affected by the problem of wastescapes since they represent fragile and vul-

nerable territories, exposed to overlapping multi-risks. Peri-urban areas are shaped by low-density urbanizations with low-quality public spaces, mixed functions, large infrastructure networks overlapped to the territories without specific relationships among them, and by complex waste geographies to be managed.

This work is grounding on the research by Kevin Lynch (Lynch, 1990), and Lars Lerup (Lerup, 1995), and it is building upon the Drosscape definition developed by Alan Berger in 2006 (Berger, 2006), regarding the conditions of the landscape of the American territory. In addition to this, through the REPAiR project, it has been proposed a complete taxonomy of wastescapes (REPAiR, 2018), to define the current spatial, environmental, and socio-economic conditions. This is to establish a shared taxonomy for their possible recovery. In this way, discarded urban areas, mainly characterized by a bad quality of life, scarce quality of public spaces and environmental problems can be mapped. They represent the leftovers of exhausted life cycles within contemporary cities, in reference to the effects e.g. of deindustrialisation and Post-Fordism, technological obsolescence, new social habits.

Grounding on the REPAiR project methodology, there was the occasion to deepen the understanding of wastescapes along the coastline through the research project "EcoRegen. Circular economies and periurban areas regeneration", funded by the University of Naples Federico II (2020-22). Applying a circular metabolism approach for the sustainable use of local resources, EcoRegen focuses on the territories in transition along the coast from East Naples up to Castellammare di Stabia, including transects of periurban areas inland. EcoRegen aims to build eco-sustainable and resilient territories focusing on the regeneration of wastescapes. It develops design tools in which integrated actions for circularity and welfare are identified.

The authors developed the following research objectives: (O.1) conceptualization and (O.2) testing of indicators for the definition of wastescapes and for their transformation. The research question is: *How is it possible to map the territory based on the presence of waste, to guide regeneration and to identify certain territories, namely Resource-Scapes, in which the intervention can trigger wider processes?*

The paper is constituted by: Chapter 1, identifying the evolution of concepts in literature (1.2) and the description of the specific case study to apply the conceptualization; Chapter 2 presenting the methodology for the mapping and the construction of a database; Chapter 3 speculates on how the hypothesized methods are site-specifically applied; Chapter 4 concludes with further perspective for research.

1.2. Wastescapes: an evolving concept

The Department of Architecture of the University of Naples Federico II[2], through different research projects and consultancy activities, has been developing – in the last decade - a methodology to define a complex mapping process for recognizing wastescapes. A number of co-design activities have been developed in Urban and Peri-Urban Living Labs, finalized to a circular regeneration of wastescapes, in urban and peri-urban areas.

The case studies in which these working methods of mapping and co-designing for the

regeneration of urban fringes have been tested are spread within the wide conurbation of the Metropolitan Area of Naples, in which it is possible to recognize phenomena of urban and demographic decline. This territory is generally lacking in urban services, facilities, and adequate public spaces. Here, different challenges overlap, and they lead to socio-ecological imbalances, compromising the healthy relationships among citizens and the urban and territorial systems. These challenges can be related to the ecological network, which, in this context, is highly fragmented, being crossed by large scale infrastructures, e.g. highways and railways, which overlap sometimes without creating a clear relationship with the local landscapes, representing a barrier for the ecological continuity (Amenta et al., 2019; Attademo & Formato, n.d.).

This - still in progress - approach to the planning process, has been aimed to reinterpret the fragmentation of the territory of Campania Region, studying wastescapes as valuable resources for a sustainable regeneration of urban and peri-urban territories. By implementing sustainable strategies for wastescapes, the existing networks of wastescapes can represent a potentiality to re-establish healthy environments.

Wastescapes has been interpreted as an evolving concept, and a fertile topic for didactic experimentations[3] and research. Since 2012, the DiARC research group focused on this topic, at first with the Italian National Research Project Recycle-Italy[4] exploring and redefining the concept of drosscape in the Metropolitan Area of Naples, exploring them as porosities and malleable areas (Secchi, 1984) within the consolidated city, and constituted by abandoned spaces, underused infrastructures, and buildings. The research worked on the implementation of a hybrid metabolism expanding and clarifying a taxonomy, identifying the crisis of life cycles of buildings and territories, through a multiscalar approach to investigate uses, flows, social demands, economic gaps, and using time as a material for the project (Formato, Amenta, Castiello, & De Marco, 2014).

Afterwards, in 2016 the Horizon 2020 project REPAiR – REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism (Grant Agreement No. 688920), added to the Drosscape definition, by interpreting waste flows and wastescapes as resources for sustainable regeneration. REPAiR approach looks at these discarded and unresolved areas as potentialities to achieve a better and prosperous future for all.

REPAiR produced a new taxonomy, interpreting the layered complexity referred to wastescapes. Many challenges overlap when we encounter wastescapes in the spatial configuration of contemporary territories: socio-environmental challenges (as instance threat to biodiversity, quality of the landscapes, intensive and linear use of local resources included soil, good health, and overall quality of life); moreover, economic challenges related to the need of a different growth which can assure business opportunities without compromising the health of ecosystems (Amenta & van Timmeren, 2018).

REPAiR identified the following six categories for an improved definition of wastescapes (REPAiR, 2018): degraded land; degraded water and connected areas; declining fields; settlements and building in crisis; dross of facilities and infrastructures; operational infrastructure of waste (REPAiR, 2018). REPAiR Eco-innovations work for a systemic concept of circularity in six periurban contexts around Europe.

1.3. Coastal and Periurban wastescapes constitute "fragile" territories

"The project of a new public space between the sea and the hinterland could involve all these conflicting functions creating, with different strategies, a potential multifunctional landscape. In Naples as well, because the waterfront is still waiting to be re-connected with the story of the city itself" (Russo, 2017, p. 364).

Research has been showing that the contact areas between ports and hinterlands constitute fragmented landscapes and porous territories that can be reconnected through new systems of green networks (De Martino et al., 2022) representing reservoirs of a so-called "third landscape" (Clément, 2005).

This is the case e.g. of the areas along the coastline that goes from East Naples towards the city of Castellammare di Stabia, where we can distinguish an historical, consolidated and marginal city (see fig. 1). Here former industrial territories, gated areas, and disrupted buildings form a network of potential landscapes to be re-drawn and re-thought towards sustainable regenerations. A regenerative approach means here to re-connect the territorial existing infrastructures with ecological networks, environmental solutions, and, not-least, with a renewed landscape in the sea-land interface. Working with wastescapes in coastal areas for developing new perspectives for the sea-land interface, as has been developed within the research funded by the University of Naples Federico II, entitled "EcoRegen. Circular economies and periurban areas regeneration". The work done within the EcoRegen framework contributed to identifying coastal wastescapes – namely the fragilities also related the social housing districts - as fertile territories where to implement eco-innovative strategies and circular visions for the benefit of the whole local community. Along coastal territories many issues are mixed up and risk is one of these. Coastal wastescapes can indeed been defined as a specific kind of wastescapes that can be recognised within different contexts, even globally. Coastal wastescapes are affected by similar challenges indeed, as instance by problems related to (i) soil pollution - due to industrial activities which formerly characterised these territories, (ii) spatial fragmentation - due to the overlapping of different functional zones very often defined by fenced areas; (iii) social issues - related to the absence of functions and flexible spaces to be used for different purposes.

Logistically linked to coastal areas, peri-urban wastescapes can be nailed down in the outskirts of contemporary cities, and they are defined by specific characteristics. There the agriculture and food topics take a prominent role to be deepened to understand the processes that caused the dismission, underuse or pollution of certain periurban territories. The system of these kinds of landscapes constitute a "fragile city"[5] (Fig.2). The latter is characterized by a strong periurban connotation, that is an intermediate territory between urban and rural, spatially fragmented, characterized by mixed uses and consisting of spread mixed functions. These areas are in contrast with the consolidated parts of the urban systems characterized by a higher population density. An indicator for identifying a fragile city is as instance the presence of many public housing buildings, too often lacking in terms of architectural quality and good quality and maintenance of the related public open spaces. In addition, a bad quality of the sea waters (data re-

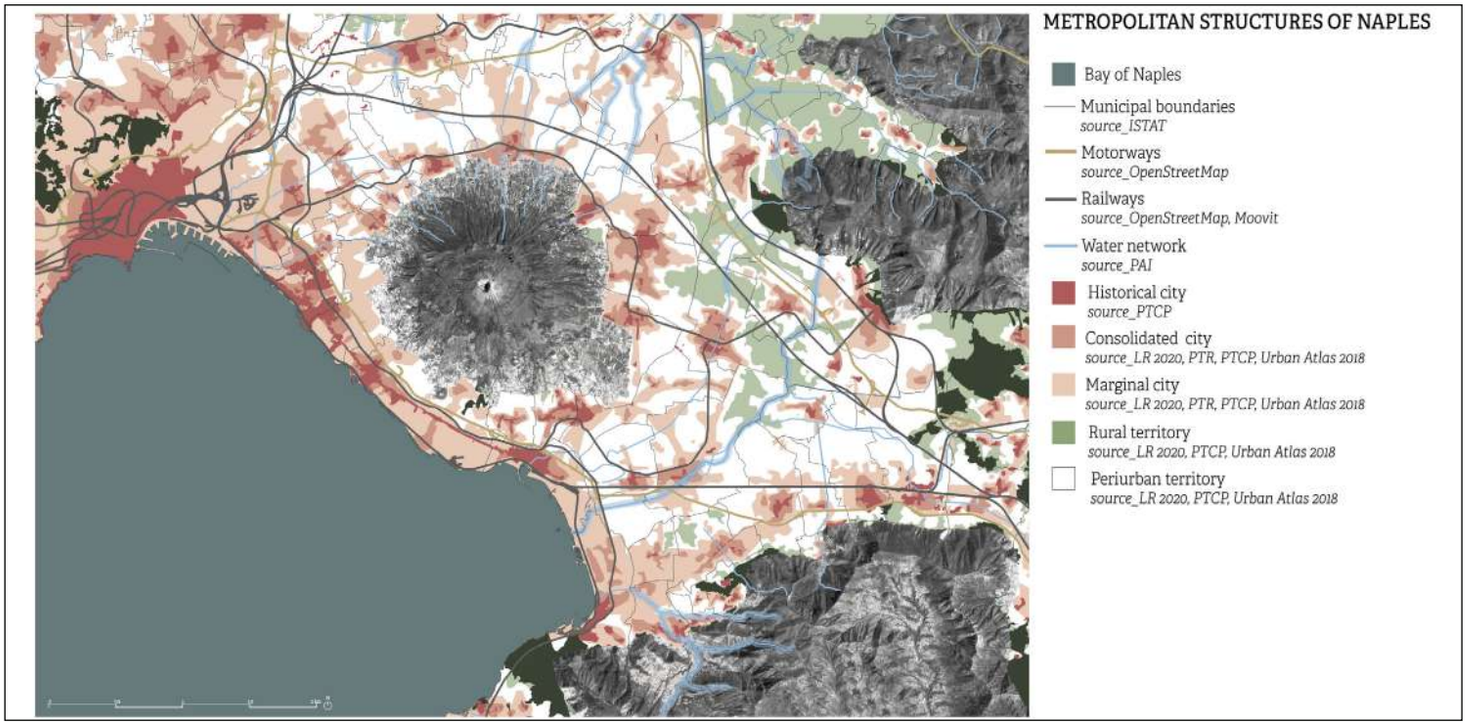


Fig.1 - Metropolitan structures of Naples. Source: Master Thesis in Urbanism, entitled: "Stitch-up. Re-connect and re-conceptualise wastescapes", Master Degree in Architecture (MAPA), Department of Architecture, University of Naples "Federico II", Students: F. Esposito, T.M. Ambrosino, Tutor prof. L. Amenta, Co-tutor prof. M. Cerreta, a.y. 2020-2021. The Thesis has been developed within EcoRegen research framework.

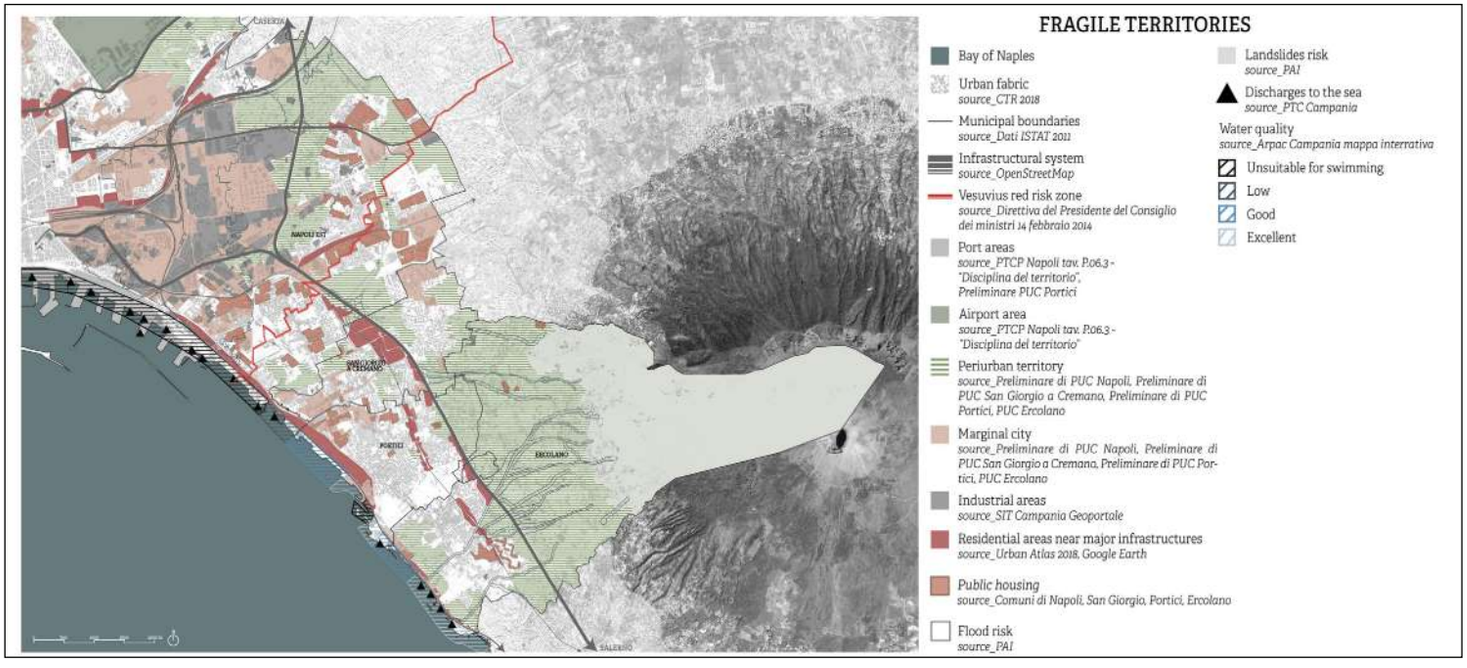


Fig. 2 - Fragile territories in the coastal metropolitan structures of Naples. Source: Master Thesis in Urbanism, entitled: "Stitch-up. Re-connect and re-conceptualise wastescapes", Master Degree in Architecture (MAPA), Department of Architecture, University of Naples "Federico II", Students: F. Esposito, T.M. Ambrosino, Tutor prof. L. Amenta, Co-tutor prof. M. Cerreta, a.y. 2020-2021. The Thesis has been developed within EcoRegen research framework.

trieved from the Arpac interactive map on quality of the water) is prohibiting residents and tourists from swimming, constituting a potential condition for risk for citizens and visitors.

2. Material and methods. A mapping methodology for wastescapes

The following paragraphs define the mapping methodology, adopted from REPAiR and then further developed in EcoRegen. It is composed by: initial steps, resulting in GIS-based maps, constituted by overlapped thematic data and connected to (O.1) conceptualization; follow-up process, resulting in a database with complex attributions tables and connected to (O.2) testing of indicators for the definition of wastescapes and for their transformation.

2.1. Initial steps

The mapping methodology, developed within the research project EcoRegen, started from the available spatial data relating to the six abovementioned wastescape categories (REPAiR, 2018). This taxonomy has made it possible to identify, within the wider territory, the presence of six macro-categories of wastescapes and related sub-categories, for each of which the research combined: statistical data (e.g., Eurostat), also with the use of composite indicators; national/regional/local datasets; interpolation with data from accredited sector studies; photointerpretation of satellite images or non-spatial data; co-mapping activities, etc. (REPAiR, 2018). When data are not available yet, or existing datasets not sufficiently or timely updated, it is necessary to critically use complementary tools, e.g. resulting from fieldworks and co-creation activities to identify the different categories of wastescapes and their site-specific conditions.

The sixth category namely the “operational infrastructure of waste” is never analysed separately, being interconnected and interdependent with the other five drosscapes categories and with processes of Material Flow Analysis.

This framework foresees the building of a complex dataset composed of elements related to the following dimensions: socio-economic, environmental, sustainability, functions/uses and so on.

As it is patent from the summary elaborated by the authors in the table below (Table 1), starting from the findings inserted in the Deliverable D3.3. of the project REPAiR, the process is also dependent on the scale on which it is performed as it is underlined in the statement “scale matters” (REPAiR, 2018, p. 21).; thus data sources need to be continuously adapted as the scale changes. In line with the Geodesign approach (Steinitz, 2012), this work proposes that scales must be chosen in relation to topics investigated to ensure that they can be properly visualized, interpreted and understood. In REPAiR, the mapping of wastescapes was deepened at different scales: global, European, national; regional/metropolitan (focus area); some relevant local dimensions, also related to co-mapping activities (sample area) have been added too. Each scale was relevant to understand specific interrelations. As instance, at the territorial scale (regional/metro-

Tab. 1 - Wastescapes layers defined and mapped in H2020 REPAiR project (REPAiR, D.3.3, 2019). The table is a re-elaboration by the authors of the REPAIR datasets .

Table 1. Wastescapes layers defined and mapped in H2020 REPAiR project (REPAiR, D.3.3, 2019)

Categories	Sub-categories	How to map
Degraded lands	w_1_1 Polluted Soils	Official national/regional cadastre of contaminated soils (e.g. Arpa) - Additional contaminated soils ("Land of Fires" areas) have been mapped by the Regional Authority under the national Decree no. 136/2013
	w_1_2 Artificial Soils	Urban Atlas dataset: cat. 1.3.1. "Mineral extraction and dump sites". More detailed information could be available in regional catalogues and geomorphological studies.
Degraded water	w_2_1 Degraded water bodies	Index of Biological Integrity (IBI). Specific parameters about contaminants (heavy metals, pesticides, etc.) are generally available for the main water bodies, thanks to the presence of monitoring sites.
	w_2_2 Elements linked to degrades waters	Banks, shores, tanks, plants, and other elements linked to w_2_1
	w_2_3 Flooding zones	Official national/regional Flood Hazard and Flood Risk Maps
Declining Fields	w_3_1 Abandoned agricultural fields	Urban Atlas dataset: cat. 1.3.4. "Land without current use" (It also includes lots included into w_4. For this reason, in the pilot cases a data selection has been operated by overlapping with a dataset of the unbuilt, considering lots external to urban contexts). More detailed information about w_3_1 could be available in agricultural land use maps, elaborated at municipal/provincial or regional scale.
	w_3_2 Vulnerable lands	Official European/regional/metropolitan maps.
Settlements and buildings in crisis	w_4_1 Vacant underused buildings and settlements	Three steps procedures: 1) firstly use Urban Atlas remaining part of the category 1.3.4. "Land without current use", cut from w_3_1; 2) then, use the statistical data provided by Eurostat for any census units, about vacancy and underuse; 3) finally, a catalogue of brownfields could be available (municipal scale).
	w_4_2 Urban settlements suffering from fatigue	Use of two composite indicators based on statistical data (source: Eurostat on census units): 1) indicator of urban suffering, stemming from the 2013 Prin Postmetropolis. This is a composite indicator defined as the average of the following variables: structural dependency ratio; unemployment rate; lower secondary education rate; overcrowding rate; 2) indicator of poor housing, based on the data on conservation status of residential buildings.
	w_4_3 Informal settlements	Data provided by institutional actors (i.e. Municipality or Provincial/Metropolitan Authorities, as well as Prefecture), associations and citizens co-mapping activities.
	w_4_4 Urban lots in transformation tampered	Elaborations of the cartographic database provided by the regional authorities or by the municipalities (i.e. mapping fences, fences, etc.) and photo-interpretation of satellite images.
	w_4_5 Unauthorized buildings and settlements	Two scales process: on the focus area scale, w_4_5 have been identified through a perimeter survey of all existing settlements that do not comply with the forecasts of expansion of urban plans; on the sample area scale, a more detailed work has been carried out on the basis of the data provided by the municipal administrations, photo-interpretation, and the interpretations of the year of construction of each building located in unauthorized contexts (in Italy only the buildings constructed illegally until 2003 can receive the amnesty).
	w_4_6 Confiscated assets	Municipal data
Dross of facilities and infrastructures	w_5_1 Neglected dismissed underused infrastructures	Regional or metropolitan lists or sector studies, such as traffic and mobility plans.
	w_5_2 Dismissed underused public facilities	Regional or metropolitan lists or sector studies
	w_5_3 Interstitial spaces of infrastructures networks	Urban Atlas dataset: cat. 1.2.1 "Road and rail network and associated land" - For noise, light and odour landscapes: Municipal/Metropolitan Authorities maps. If data is unavailable, a map with buffer areas proportional to the type of infrastructure or production activity can be generated. A perceptive dimension is also necessary to be investigated through co-mapping activities. Light pollution can be mapped on the basis of satellite images at night.
Operational infrastructures of waste		Official regional/metropolitan/municipal lists or maps.

politan) it is possible to read the networked nature of the wastescape which constitute a potential archipelago for new public functions; conversely, at the local scale (neighborhood/sample area) the nature of the different wasted lands or neglected buildings/ infrastructure can be comprehended (e.g. the soil is polluted or not; it is a wide area or an interstitial/in between area, and so on): this is beneficial for defining a compatible design (process or project) for sustainable uses of wastescapes.

2.2. Follow-up process

EcoRegen research builds upon this mapping method, with the purpose to create a database of wastescapes[6] in a different case study area in comparison with the REPAiR project (Fig. 3).

The EcoRegen database of wastescapes has the ambition to be an open source Webgis and an easy accessible repository for research and didactic.

According to the above mentioned, each area is completely defined not only for basic information and for its belonging to a specific category of wastescape, but also for its peculiar conditions. The latter, which are site specific, make it possible to transform wastescapes, through the project, by implementing the lens of circularity.

To make the mapping process easier, and as it is shown in the following list, this cataloguing process can be divided into four main macro-categories, then divided into sub-categories: (i) Basic Data; (ii) Enabling contexts conditions; (iii) Eco-Innovation applicable conditions; (iv) LCA or other methods of life-cycle evaluation applicable conditions.

Each of these categories refers to information inputted in the EcoRegen database at the scale of the focus area, with a specific detailed analysis at the scale of the sample areas.

Six sample areas - transects - have been defined in the whole coastal territory comprised among East Naples and Castellammare di Stabia.

Some information is not only texts in the attributions table of the database, but hyperlinks that connect to external materials.

(i) Basic Data is referred to: name (if available), address, municipality, cadastral data, main dimensions (area, height, volume, etc.). They can be integrated by technical drawings (if available), in the form of hyperlinks.

(ii) Enabling context conditions (REPAiR, 2018) are seen as a premises for an easier and more effective transformation. In fact, the REPAiR maps produced through the spatial analysis, define the enabling contexts on which to test eco-innovative solutions (REPAiR, 2017). The notion of enabling contexts is introduced in the research to rationalise the links between spatial analysis and eco-innovative solutions, addressing the interest of co-creation activities towards some priority areas. Enabling contexts can be defined as specific locations within the focus area/sample area that are more suitable for developing circularity projects.

According to literature (Choo & Alvarenga Neto, 2010), enabling conditions may cover

four major groups: (i) social relationships and interactions based on norms and values; (ii) common knowledge or shared epistemic practices and commitments; (iii) use of information systems and information management processes to support knowledge activities; (iv) leadership and vision structures.

According to the REPAiR project, these conditions applied to contexts should entail:

Category of Wastescapes, referred to the mentioned mapping method (REPAiR, 2018).

Ownership of areas, which is explanatory of the public or private status of property. Literature and practice (Attademo, Formato, 2019) show the significance of intervening first on public spots, as they break down the costs of acquisition and are immediately prone to transformation. They usually act as catalysts, to trigger development that can transfer themselves to private areas too. This incremental logic allows both immediate reuses and the promotion of further and more radical operations in the future, to be implemented as soon as more resources (financial, but also technical; see Russo, 2020 on plan efficiency) are available. In this sense, temporary uses have proven to be central in the strategies of several European cities, with a specific focus on public space (Inti, 2011). Mapping private spaces in need can also be relevant to stimulate a process of collaboration, capable of rebuilding common values and social identity. "Transforming private space" (Private Europe, 2019) can mean to restart from the collective space (within residential estate or gardens thresholds spots, re-designed for public use) as a space of mediation, ensuring the needs of isolation and privacy (Simmel, 1950) and cooperation at the same time (Mattei, 2012; Formato, 2012).

Accessibility of areas, which refers to an enlisting of the ways to access the area, with a specific focus on the presence of public transportation or sustainable mobility nearby. In reference to Bernardo Secchi studies on accessibility, spatial fragmentation is interlinked to social vulnerability due to un-accessible spatial capital (Secchi, 2013). Socio-spatial inequalities constitute unequal access to opportunities, are then intertwined to environmental vulnerability in wastescapes, creating "the new urban question" (Secchi, 2010, 2013) for planners.

Furthermore, wastescapes are often nearby big infrastructural junctions, only perceived as barriers to accessibility policies. But, from the mentioned "scale matters" perspective, to operate successfully on wastescapes, it is necessary to look simultaneously at different scales: for example, through regional policies and projects of connection; or, clustering contiguous but still separate awaiting areas, enhancing the continuity among ecological and public space systems.

Transformability of areas, which in REPAiR approach is related to local stakeholders, participating in co-creation activities and/or that can be actively involved in the decision-making process. This is then specifically referred to the economic, social, behavioural composition of actors already or potentially interested in the transformation of the site.

As previously stated by the authors (Amenta, Attademo et al., 2019), the shallow involvement of generic stakeholders is not relevant in a co-creation process and it's rather

established a cooperation between actual end-users, working in a "user-driven open innovation ecosystem" (EC, 2009) with common goals, and various competences (Innovation Alcotra, 2013).

This way, various stakeholders are asked to cooperate to identify/develop strategies and services. Eventually, the process would result in the creation of a connection among roles and approaches in the decision-making, even in situations which normally function in a sectorial manner. That is why, in EcoRegen research, Transformability has been further related to the cataloguing of the current governance model, acting in the areas. As stated in SDG 16, fragmented local governments and planning systems can be connected to conflict and insecurity in delivering results that are spatially and socially just, in the presence of blurred conditions and rights (Berruti, Palestino, 2020).

Then, the cataloguing process has specifically focused on filing the presence of: (i) projects in prevision, (ii) projects in progress, (iii) availability of public or private fundings to regenerate the areas (at various institutional levels).

As in the case of the *Ownership* condition, the cataloguing highlights the presence of areas that can act as catalysts for the extension of transformation process, in innovating the urban design incrementally. Overcoming the old rational-comprehensive design model (Formato, 2015), this approach proposes a dynamic perspective in which the institutions actively facilitate experimenting with participatory tools and the final results of transformation is mediated by prefigurative actions, that could act over time on wider transformative scenarios (Russo et al., 2023).

Relation to the waste-specific geography is informed by two typologies of data: results from a Material Flow Analysis and from Spatial Analysis (especially with relation to category w_6: Operational infrastructures of waste). It defines if the area is crossed by waste flows and/or it coincides with or is near a source/delivery/treatment point belonging to the waste management cycle. For example, the relation with the Material Flow Analysis has been deepened in Ecoregen research through the accounting and spatialization of waste flows, selecting and mapping existing Construction & Demolition Waste destination sites within the whole Metropolitan Area of Naples.

Therefore, this condition and its interaction with the rest of the examined indicators, becomes a linking point between accounting and spatial effects, overcoming the typical issue of Urban Metabolism of being mainly focused on technology and economy, leaving aside the need for ecological and systemic thinking (Korhonen et al., 2018).

(iii) Additional elements to apply Eco-Innovative Solutions:

Urban functions, as defined by local regulation, guide the implementation of specific eco-innovative solutions and strategies in identified wastescapes; the degree of transformability of certain areas will be crucial indeed to make choices in relation to the possible future use of buildings, or compatible uses of soils affected by abandonment, contamination, and risk.

The *current destination* of certain areas, buildings, or infrastructures (are they in use or not in use?) should be mapped to define the value of these spaces for the local

population, the sense of belonging, citizens behaviors, and possible temporary uses already in place or to be defined.

Local regulation constraints define as instance the infrastructural buffer zones which can be also mapped, constituting an important part of the concept of wastescapes. Buffer zones of infrastructures are significant biodiversity reserves and they can constitute a third landscape (Clément, 2005). Their transformation is not necessarily dedicated to people. These areas can be also left accessible only for non-human actors for safety reasons and constraints. Territories at risk are also identified within local regulations. Together with wastescapes, they have a characteristic of fragility that needs to be mapped.

Contamination data should be also referred to in the mapping of wastescapes. This is crucial to identify current pollutants, potential activated processes for the characterization of the pollutants, and envisioning new strategies of recovery.

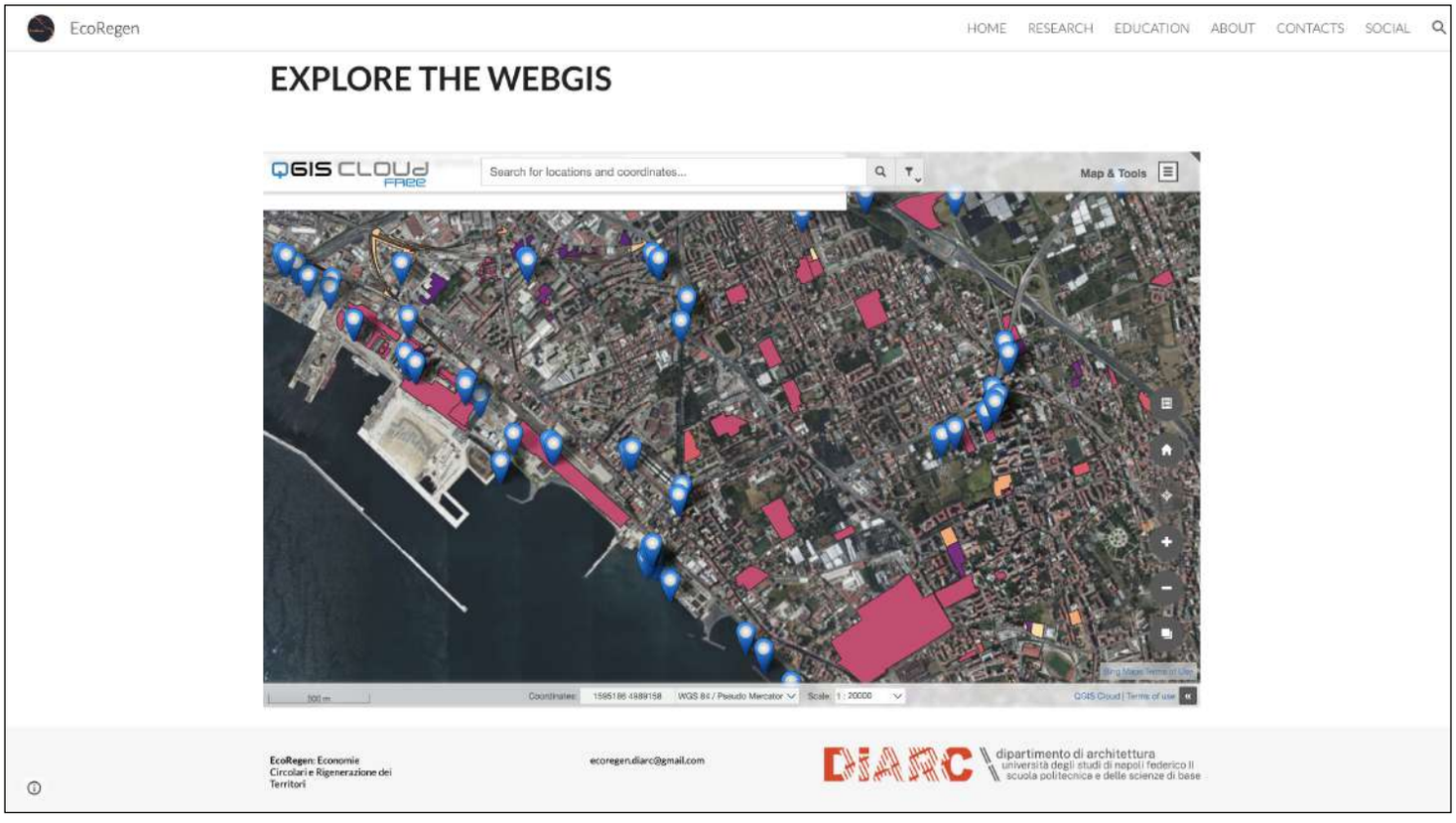


Fig. 3 - EcoRegen database at the scale of the focus area. Each wastescape is identified by a pink area. By clicking on the area, it is possible to access all the relative information. Blue spots are photographs developed for the research by professional photographer and architecture researcher Mario Ferrara.

(iv) Additional elements to apply LCA and/or environmental design:

The *analysis of building materials and building components*, which could be available after a process of selective demolition or refurbishment is elaborated through the direct measurements, or it could be based on available data or estimated data on quantity and system components. These estimations are also directly linked to the building age of the

building, which determines the typical building materials and techniques used in certain periods. The availability of quantity and characteristic of construction and demolition waste is linked to building age, and it depends on the necessity to refurbish certain parts which are not suitable anymore for the function they were built for.

As for the *physical aspect of outdoors*, it is necessary to map equipment, permeable/non-permeable open spaces, vegetation, borders. The mapping of the open spaces pertaining to buildings in need of regeneration processes becomes relevant especially for social housing districts where the open spaces, being public, can become a new network of services for all the community.

3. Results. Interpretations of the cataloguing in EcoRegen database: a case study of transects along the coastline

The presented methodology has been applied within the EcoRegen research mapping of wastescapes in a specific area: the coastline, and the transversal transects land-sea, of the metropolitan area of Naples: from the eastern part of the city, where the port is located, to Castellammare di Stabia, towards the Sorrento peninsula. This mapping experimentation can be conceived as a contribution to a conceptualization of these landscapes as urban and periurban resources.

The starting point is a test on a Geddesian transect (see the Valley Section, 1909 drawing of Patrick Geddes), an ecological model stretching from inner land to the seaside of Naples. This coincides with the definition of a peri-urban area as a potential recognizable space of integration of both settlements and modes of production and consumption, of potential closure of cycle and supply chains.

Therefore, the research defines a series of representative longitudinal sections of the coastline, transversal transects as points of interaction between natural habitats and resources, infrastructure and settlements, socioeconomic uses and practices.

Along these transversal transects that go up from the coast to the inland areas, covering the whole valley section, the research critically identifies figures of the urban-peri-urban relationship, spaces with variable geometry with a large presence of critical issues: informality, devoid of services and infrastructures, ecosystems in crisis, etc.

Traveling through the research transects, features of a new periurban area are recognizable, overcoming the traditional dichotomies that characterize the urban gradient - rural: density vs dispersion, urban vs rural, settlement vs voids, are integrated with a critical and multidisciplinary perspective, which enhances the presence of ecosystem values and areas within which these values can be expressed as regenerative and rebalancing elements.

The peri-urban is then a space of “footprints” of rural societies that are slowly dissolving, but also of transitional perspectives: a territory under pressure and dynamically transformed, through its own uses and informality (Russo et al. 2023).

This experimentation is a preparatory frame for the research, in which the wastescapes constitute a ridge that is further cut out between the interstices of the valley section, on

which questions can then be defined and scenarios can be framed.

In the variety of conditions identified along the transects, mapping wastescapes offers the opportunity to rebalance not only environmental gaps between fragile territories and advantaged ones, but also social inequalities.

Therefore, wastescapes are both an ecological resource and a space for the re-appropriation of quality of living, with the intention of overcoming the concept of "public facility" that derives from the twentieth century (see the Italian law on standards DM 1444/68), to build spaces as common goods and ecological "machines" (Attademo, Berruti, 2022).

The wastescape database proceeded along the transects as intermediate scales, representative of emblematic conditions. Wastescapes become potential catalysts (PURPLE, 2004) of a new demand for sustainable quality of living and the environment. The mapping experimentation guides the identification of priority territories, enabling contexts, selected through the construction and intersection between further systems of priority criteria, susceptibility to environmental and social vulnerability, etc. (Fig. 4)

The database works at different scales, responding to different questions at each identifiable scale: from the functioning of existing supply chains and disposal cycles, to regenerative interventions and eco-innovative processes.

In this descriptive framework, wastescapes are not autonomous places (or not entirely), but neither are they only part of a functioning system within cities. They are shreds to be mended, integrating them with larger operations -and with different time schedules/speeds, which define fields of transformation.

Their malleability, especially in the areas that most strongly display characteristics of informality, is strongly dependent on their being part of the compact city or, conversely, of periurban patterns. Wastescapes represent all those spaces that can potentially be connected to support the complex socio-ecological system of the mentioned "transversal transects", representing its infrastructure.

Wastescapes are the gears that support the basic infrastructure, in the perspective of the "project of the ground" (Secchi, 1986), which sets in motion a given (eco)system in a virtuous way, spatializing the circular economy.

Until their "unveiling" (through mapping), wastescapes constitute the problem to be remedied, the dross that derives from a spatial-production phenomenon that has stopped or has never functioned optimally. Once mapped, they constitute the catalysts for thinking in spatial terms within circular processes.

This perspective has repercussions on the forms and tools of regeneration. The reactivation of awaiting spaces does not refer to a neutral business horizon of circular economy, but leads to a systemic approach, re-interpreting a strictly "economic" cycle (e.g. waste recycling) to minimize production of further waste and entropy.

This identification connects with the spatial design, embedding transformative resources (wastescapes), both understood as a potential reservoir of space ("stock" of territory), immediately available to be (re)used in an ecological key; and as producers of secondary raw material itself (as in the case of the recovery of construction and demolition waste).

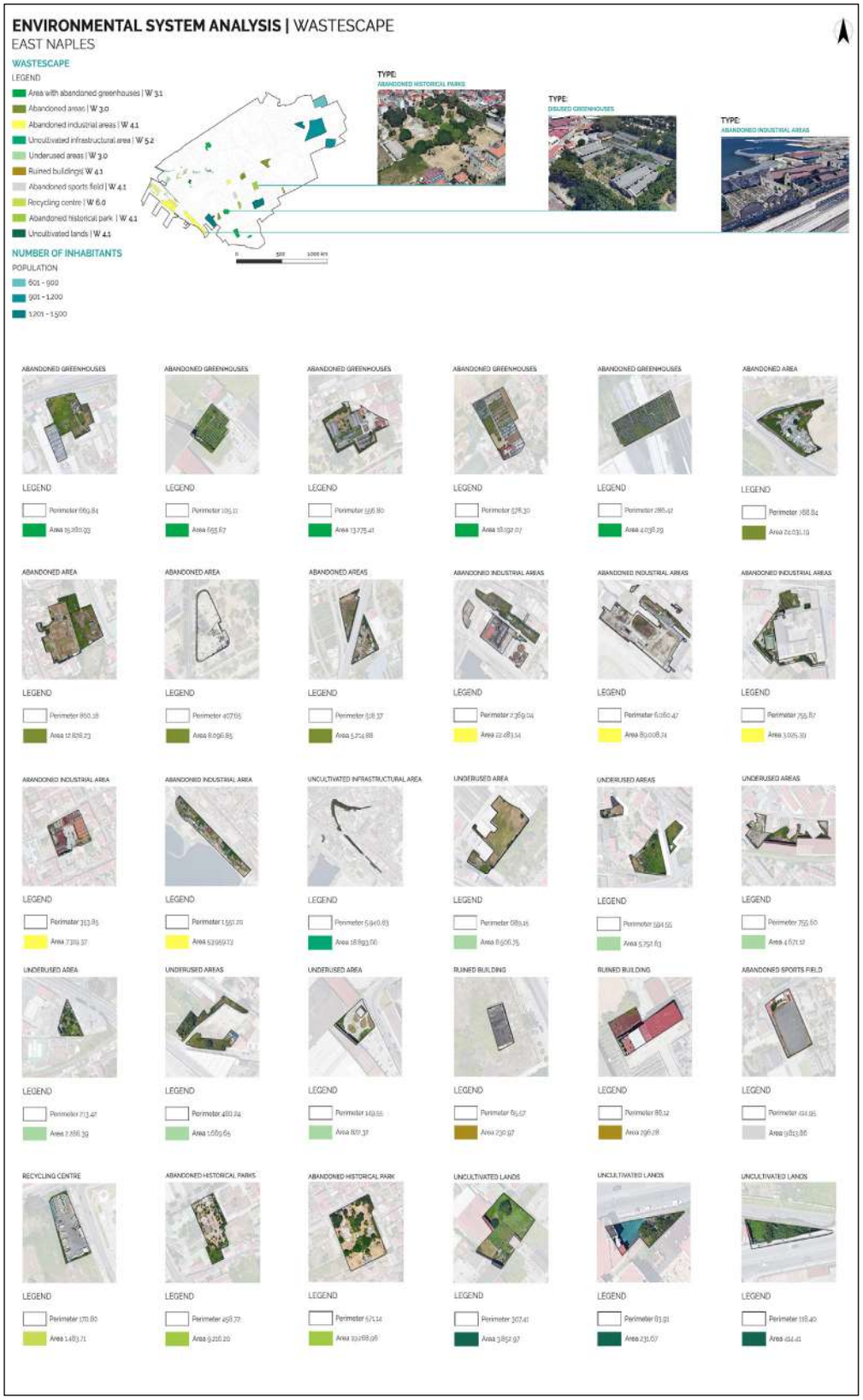


Fig. 4 - Classification of wastescapes related to highly populated residential enclaves in the Eastern neighborhoods of Naples. Wastescapes are here mapped as a reservoir of public and green space in coastal periurban patterns suffering from disadvantaged physical and socioeconomic conditions. Source: the image is an editing by the authors of the project by the students Francesca Capasso, Fabiana Diglio, Federica Ferrandino, Sonia Fraricciardi, Giorgia Gelormini, Anna Musella during the Class Governing Urban Metabolism, Bachelor Degree in Sustainable Development and Territorial Networks, Tutor prof. A. Attademo, M. Rigillo, a.y. 2021-22.

4. 4. Discussion and Conclusions: open questions

Mapping represents a descriptive method capable of making use of plural tools, which defines places both in analytical and perceptive terms, containing an oriented vision toward regeneration. The aim of the mapping exercise is not only to build an expanded knowledge, but also to contribute to the construction of a strategic-planning perspective, capable of working on the potentials of the territory to promote processes of ecological transition and ecosystem rebalancing.

The methodological approach and the experimentations to map wastescapes intend to identify wastescapes as potential resources in the contemporary territories. The understanding of wastescapes is already targeting them in the perspective of "change models" (Steinitz, 2012) to re-input them into the system as ecological resources, capable of responding to the needs expressed now and in the future by the communities.

Their current condition of "criticality", degradation, and waiting conditions, are not the only reasons that drive the mapping exercise on wastescapes. Rather, their connotation of resource-space makes them an interesting starting point to define a regenerative approach to cities and territories (Amenta et al., 2022).

The re-conceptualization of wastescapes as Resource-Scapes is strictly related to their potential ecological values and potential, making them as potential networks of (public) open spaces able to contribute to the ecosystem services once regenerated.

In the mapping exercise, basic data are obviously crucial to identify the exact location of the mapped wastescapes, but they can also be extracted later for further research on the relationship between proximities to certain activities or to certain areas at risk with the number of wastescapes present. The network of wastescapes in a context of risk or multi-risk defines a fragile city in which it is urgent to apply circular and sustainable solutions, towards a regenerative territory capable of maximizing its own values and local resources through a biobased approach.

In the urban and territorial metabolic perspective, wastescapes are valuable resources, in which their state of degradation must be overcome to be able to enhance their uses and local values. As in the metabolic understanding, resources remain resources even if they are not used, having a condition of a potential use. The same is for wastescapes that, even if they do not have a specific use, represent already a resource for urban and territorial systems. The possible degradation and criticality that is present in wastescapes, is a condition that requires priority activation, not one that precludes regeneration.

Endnotes

1 In 2016, the authors published the paper "Circular wastescapes" (Crios, 12/2016), describing a research project, conducted and coordinated in 2015 by Michelangelo Russo together with Libera Amenta, Anna Attademo and Enrico Formato, within the Department of Architecture of the University of Naples Federico II. Under the lead of the University of TU Delft , the research was then submitted to the European Commission that has eventually financed it for the Horizon 2020 Program (entitled REPAiR). This article is a follow-up of that essay, based on the results of further research projects.

2 Specifically, the research group coordinated by prof. Michelangelo Russo.

3 See the didactic experience of the authors in the courses "Urbanism Laboratory" at the Master Degree in Architecture (Amenta) and "Governing Urban Metabolism" at the Bachelor Degree in Sustainable Development and Territorial Networks (Attademo) of the University of Naples "Federico II".

4 The Neapolitan Research unit of the PRIN RECYCLE ITALY has been coordinated by prof. Carlo Gasparrini, Department of Architecture, University of Naples Federico II.

5 As it is also possible to see in the elaborations carried out in the Master Thesis in Urbanism - developed within the EcoRegen research framework - and entitled: "Stitch-up. Re-connect and re-conceptualise wastescapes", Master Degree in Architecture (MAPA), Department of Architecture, University of Naples "Federico II", by the Students: F. Esposito, T.M. Ambrosino, and tutored by prof. L. Amenta, co-tutor prof. M. Cerreta, in the a.y. 2020-2021.

6 Link to the EcoRegen database: https://www.ecoregen.it/research/esplorazioni/database

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