Cultures and Local Practices of Sustainability

ROUTES Towards Sustainability Network

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Collaborative decision-making processes for adaptive wastescapes regeneration

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Abstract

the challenges introduced by the Circular Economy make it possible to elaborate new approaches and tools capable of activating changes in resource management and territorial transformations. Considering the city as a complex system, like a living organism, urban metabolism identifies the processes and flows that can help recognise waste as resources. In this perspective, a central role is taken by the decision-making processes which, if structured according to an approach based on collaboration and cooperation, allow to support the identification of regeneration alternatives, and manage the transition to the circular economy. This paper describes the collaborative decision-making process structured within the H2020 REPAiR project, where the interaction among different tools can activate a regenerative process for the waste territories, called wastescapes. The case study of Naples is the context of experimentation, where the methodological process has been tested.

Keywords: decision-making processes, circular economy, co-design, living labs, geodesign.

1. Collaborative decision-making processes in circular economy perspective

Most of the current environmental challenges are caused by human activity in urban settlements. Social capital, made up of human and built capital, are an integral part of natural capital, from an ecosystemic viewpoint, where ecosystem services represent bonds between man and the environment (Costanza et al., 2017). The concepts of space justice (Soja, 2010) and environmental justice (Alier, 2012) are complementary to guarantee the right to the city (Lefebvre, 1996), equity, and well-being in urban and natural areas. In this context, the Sustainable Development Goals (SDG) have sustainability and equity objectives, such as Goal 3 “Ensure healthy lives and promote well-

being for all at all ages"; Goal 10 "Reduce inequality within and among countries"; Goal 11 "Make cities and human settlements inclusive, safe, resilient and sustainable"; Goal 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", and Goal 16 "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels" (IN TEXT CITATION). However, some of these objectives are generic, leading to possible contradictions regarding social equity if no better expressed (Hickel, 2019). The satisfaction of fundamental human needs (Max Neef, 1991) and the landscape services (Termorshuizen & Opdam, 2009; Vallés Planells et al., 2014) present in urban settlements are a starting point for activating regenerative development. The priorities of national and local political measures are focused on economic development, underestimating the importance of environmental, social, and cultural factors as drivers of growth and wellbeing.This lack of balance in the sustainable dimensions for development makes human activities unsustainable for urban and peri-urban areas. The linear economy —based on the take, make, dispose model— consumed the carrying capacity of the natural resources and the economic model is self-regulating with a new environmental ethic (Raworth, 2017) which discusses about growth concept (Latouche, 2008). Considering cities as living systems, like cells, the study of metabolic flows leads to Urban Metabolism (UM) studies (Allen et al., 2012; Currie et al., 2017; Cui, 2018; Fan et al., 2019): metabolism quality is determined by the flows of matter and energy that enter, circulate, and leave the urban organism. Energy and materials incoming into an urban system foster multiple human activities, which produce services, goods, emissions and, on top of that, a big amount of waste. The UM concept applied to the city considers the biological notion referring to the internal processes by which living organisms maintain a continuous exchange of matter and energy with their environment to enable operation, growth, and reproduction (Céspedes Restrepo & Morales-Pinzón, 2018). At the same time, the UM

concerns and is influenced by the way urban communities self-organise and make decisions, consume and save, degrade and recycle resources, share community services, design, and use infrastructures (Sanches & Bento, 2020). According to this perspective, the Circular Economy (CE) paradigm (Ellen Mc Arthur Foundation, 2019) is one of the several approaches that cope with multidimensional urban challenges toward sustainability, to reduce or avoid waste, and generate multiple positive effects.

In the economy of Nature, waste does not exist. Each material is reintroduced in the natural metabolic process. With these predictions, CE brings huge benefits in the application of circular process models to human productions. The actions of reducing, refurbishing, reusing, renovating, and recycling build together new urban systems, leading to two external effects: on the one hand, to a reduction of natural material extractions, and on the other hand, to a non-production of waste; and finally, to innovative urban dynamics. Some cities in the world are on their way to become fully circular in the next decades, by creating growing synergies, thus creating a network of existing and new economic activities. CE embraces all economic activities, and the challenge for innovation offers the opportunity to create a wide range of new jobs and urban scenarios. As complementary elements of social capital, human activities and territories are strongly influenced by each other. The huge amount of daily produced waste has a life cycle impact that once in the landfill, in form of illicit dumping, causes strong environmental injustice events, often occurring in difficult territories.

Human activities and territories can be deeply connected to paths of *unsolved territories* in between (Russo et al., 2018). Unsolved territories proliferate from wasted lands that are consequence of different factors. Following the concept of drosscape (Berger, 2006; Gasparrini & Terracciano, 2016), *wastescapes* are considered those parts of cities not necessarily polluted —but where risk exposure is high— like ghettos, abandoned areas (Russo et al., 2018; Amenta & van Timmeren, 2019; REPAiR, 2017), and those places where social risk caused segregation. In Naples, our case study, the so-called *Land of Fires* (Senior & Mazza, 2004; Alisa et al., 2010; De Rosa,

2018), dangerous materials have been illegally dumped and stocked in the past years, with serious impacts on the health of inhabitants (Membretti, 2016). As a result, contaminated soils and unresolved parts of land that have become wastescapes, bring with them a negative cultural perception that over time takes root in certain areas of the peri-urban landscape. Wastescapes also include agricultural land housing illegal constructions, portions of abandoned historical heritages, housing or productive facilities confiscated by the government from the criminal organisations, partially condoned unauthorized building lots, estates never registered by the tax authorities, unfinished, abandoned or soon to be abandoned buildings, and areas and infrastructures designed to host marginal lives.

From the perspective described above, circular cities can comply with many spatial sustainable challenges, like wastescape reclamation, but they need innovative, adaptive, and synergic approaches where UM management is combined with regional policies and spatial planning (Batty, 2017; Roggema, 2019). Starting from these assumptions, the H2020 REPAiR project, *REsource Management in Peri-Urban Areas: Going Beyond Urban Metabolism*, aims to overcome UM, trying to examine some crucial issues, elaborating, and combining tools and methods at a methodological, as well as operational level.

To cope with these challenges, the hybrid methodology of REPAiR is based on a collaborative decision-making process, stemming from the need of a formal cooperation when taking important decisions and the idea of building consensus group decisions (Wilson, 2003). Collaboration and cooperation are shared between the expert team and to the team with the different stakeholders involved in the decision process, where the diversity of perspectives is considered a valuable resource providing additional insights into possible opportunities or risks. At the same time, the cooperation strongly recommends a more supportive attitude among the people as the best way to create and achieve a common goal (Keeney & Raiffa, 1999; Hastie & Dawes, 2001; Raiffa et al., 2003).

Collaborative decision-making has evolved thanks to the introduction of information and communication technologies at the organizational and

cognitive levels (Zaraté, 2013; Cerreta & Panaro, 2017) underlining the need to work in a cooperative way. Cooperation, collaboration, and coordination define the framework of cooperative decision-support systems. According to these reflections and by taking into account the opportunities of focused partnerships, the Living Labs (LLs) approach has been proposed. LLs are physical and virtual environments, where public-private-people partnerships investigate and test innovations. Actors involved in a LLs are from diverse contexts for a good development of the activities, with the purpose of shaping the needs of the stakeholders in innovation.

LLs are instruments that can be used to improve the innovation capabilities and competitiveness of territories. They seem useful to lead political measures towards the socio-economic challenges of their territories, thus making social inclusion. LLs are especially useful for the interpretation of complex real-life scenarios and are recognised as instruments to promote open innovation and cooperation in several European regions, guided by researchers and experts. The goal of the project is to provide a hybrid decision support system to accelerate CE in spatial planning and identify possible opportunities to change. Peri-Urban Living Labs (PULLs), an interpretation of LLs implemented in peri-urban areas, have been crucial points of the project and have been the context to arrange some workshops which are useful to implement Geodesign process models (Steinitz, 2012; Campagna, 2014) at different steps.

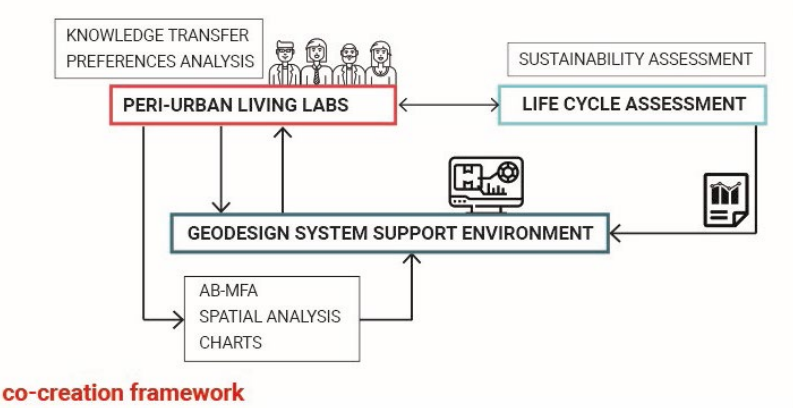
The purpose of this paper is to emphasise the role of the PULLs across the whole methodological process and to present some outcomes of the Naples case study, by exploring: (1) their function in the methodological framework; (2) the main results of REPAiR converged in GDSE platform, and (3) stakeholders' involvement carried out so far, to orient future PULLs.

2. The REPAiR methodology: a collaborative decision-making process

The broad framework of the methodological process is done in co-creation. Co-creation is an integrate and iterative process (Mauser at al., 2013) that support researchers, actors, stakeholders, and decision-makers, which together identify site-specific eco-innovative solutions. The three main columns of the co-creation interactive process are:

1. Peri-Urban Living Labs (PULLs): an open innovation approach that activates some workshops to enable real life contexts where researchers and institutions interact, and where different kinds of knowledge about waste and wastescapes develop, test, and implement place-specific Eco-Innovative Solutions (EISs) (Eriksson et al., 2005; Feurstein et al., 2008; De Bonis et al., 2014; ENoLL, 2016);
2. Geodesign System Support Environment (GDSE): a gis-based platform with a sequence of phases that support a geodesign process (Arciniegas et al., 2016; Arciniegas et al., 2019; Campagna, 2014);
3. Life Cycle Assessment (LCA): a sustainability assessment report on waste supply chains that measures socio-economic and environmental status quo indicators and the impacts produced by the EISs (Guineé et al., 2002; Taelman et al., 2018).

Figure 1. Co-creation framework: PULLs, GDSE and LCA interactions



The interaction between PULLs, GDSE, and LCA is iterative and recursive. The PULLs have been collective workshops where researchers, public institutions, stakeholders, and other actors involved have discussed about waste management and wastescapes. Hard and soft data have produced different outputs of knowledge that have been processed and have become part of GDSE and inputs for LCA (see Figure 1). PULLs allowed actors to express their preferences and they have been moment of knowledge transfer events have occurred.

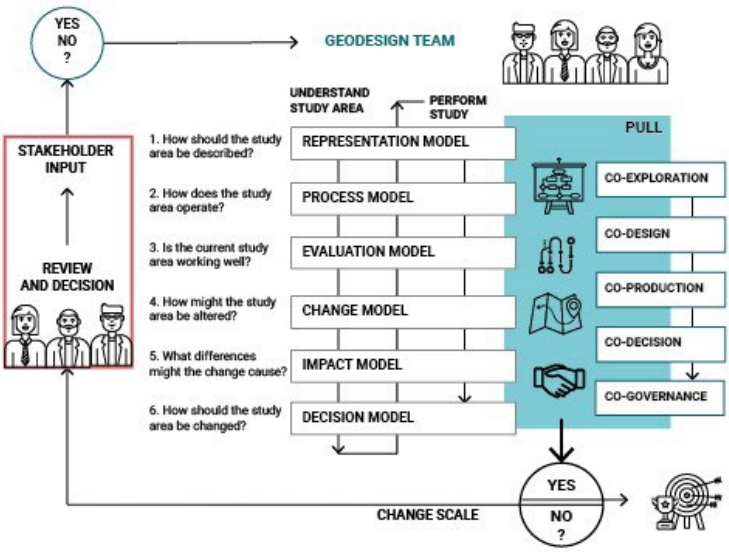
In the different phases of this research, the results from PULLs have been adapted to implement the GDSE platform, and GDSE has allowed to carry out PULLs. LCA has been done based on local data and sustainability assessment reports on each key flow supply chain, comparing the status quo and the impacts of some solutions. The LCA report is published in the GDSE platform to support stakeholders' knowledge in the decision-making system.

3. The role of Peri-Urban Living Labs and the interaction in the GDSE process

The co-creation process has been carried out by following the phases of the geodesign process. The five phases (Co-Exploring, Co-Design, Co-Production, Co-Decision, and Co-Governance) are performed in PULLs and lead by the geodesign team (see Figure 2).

1. Co-exploring phase: PULLs have been the scoping phase of the research, and aim at understanding the most relevant topics of waste management and wastescapes in the focus area mentioned below. Challenges and objectives are pointed out to accelerate circular economy and the regeneration of peri-urban areas. In this phase, geodesign *representation* and *process models* are studied.
2. Co-design phase: PULLs workshops are focused on state Eco-Innovative Solutions (EISs) and actors to involve key flows and spatial strategies. In this, phase *evaluation* and *change models* are considered.
3. Co-production phase: PULLs allow to create decision-maker groups and to point out targets and strategies per key flow. This is the phase where *change* and *decision models* make EISs operative.
4. Co-decision phase: Considering the sustainability assessment reports (LCA) and the flow assessment calculation elaborated in GDSE, decision-making groups can discuss on results collected and deal with *impact* and *decision models* to define a common strategy.
5. Co-governance phase: In this phase, Eco-Innovative Solutions become operative and are accepted by the local municipalities in order to implement through site-specific policies and programmes.

Figure 2. Geodesign system models and PULL phases
from co-exploration to co-governance



To organize a Living Lab (REPAiR, 2017), the following groups and roles must be defined:

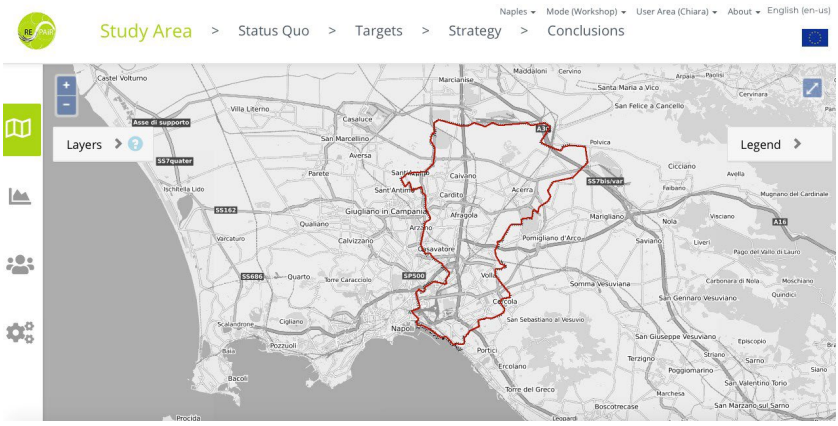
- Core Group (project coordinator, reporting responsible, logistics responsible, communication manager).
- Open Group (administrative entities, university and research centres, financial beneficiaries, public and private sector actors, third sector, NGOs, social enterprises).

They can deal with themes and sub-themes of interest that, in the case of REPAiR, are urban metabolism and waste management; planning and wastescapes.

4. Strategy Co-design for CDW in the Naples case study

The Naples focus area includes eleven Municipalities: Acerra, Afragola, Caivano, Cardito, Casalnuovo di Napoli, Casoria, Cercola, Crispano, Frattaminore, Napoli East districts, and Volla (see Figure 3).

Figure 3. Naples focus area in the frame of the GDSE first step



Starting from the study area, the GDSE process allows the Core Group to let the Open Group know the status quo of wastescapes and waste flows, to rank the main target, to develop solutions, to combine a Strategy and, in the end, to evaluate the results of the group in the Conclusions. In the next paragraphs, the collaborative decision-making process for CDW will be explained, focusing on some relevant aspects: activity-based material flow analysis, the involvement of actors in Naples PULLs to elaborate the EISs for such key flow.

4.1 Activity-Based Material Flow Analysis for CDW

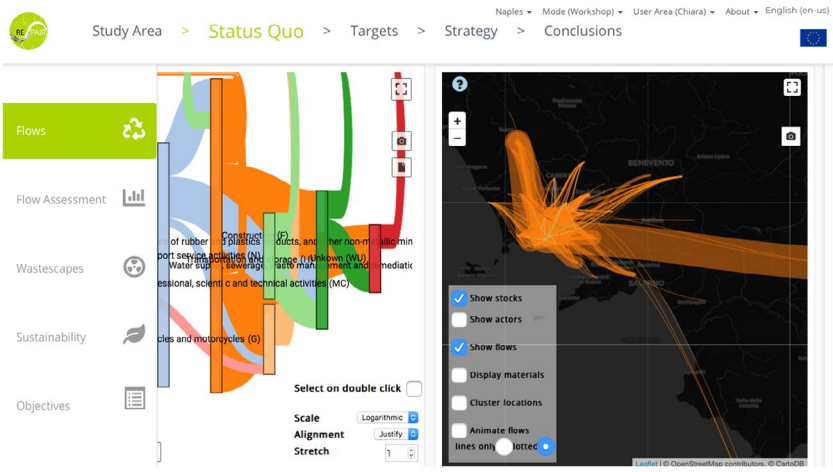
The waste flow maps are one of the innovations of the GDSE platform. In the status quo section, dynamic evaluation maps of waste flows allow to visualize the current scenario of the supply chains (Arciniegas et al., 2019). The platform allows the study of the metabolic scenario that shows spatial information of origin, destination, and the amount of each considered material flow. The Naples case study selected organic waste (OW) and construction and demolition waste (CDW) as key flows.

In the Activity-Based Material Flow Analysis (AB-MFA) data, we describe: origins and destinations of each stream (that correspond to companies in the case of CDW), and their quality and amount. The actors have been classified according to their Nomenclature of Economic Activities (NACE) code, which is the European statistical classification of economic activities (EUROSTAT). The NACE code generically classifies Activity Groups, Activities, and Actors. In this way, each company is clustered in its group of similar activities. These clusters can support analysis by layers. Regional solutions to improve local waste metabolism can be generically tested on cluster groups, and not only on some actors.

Waste flows are classified according to the European Waste Catalogue (EWC) codes (EC, 2000 Commission Decision 2000/532/EC). In Italy, the homologous classification of economic activities, ATECO (ECOnomical Activities), is a type of classification adopted by the Italian National Statistical Institute (ISTAT) for national economic statistical surveys. In the Naples case study, the data collection for the AB-MFA has been carried out with the support of the Campania Regional Environmental Protection Agency (ARPAC) and the Chamber of Commerce. Waste flows are tracked and checked by the waste register of ARPAC, from unique environmental model (MUD) declarations. Data have been elaborated and implemented for organic waste fraction produced by households and companies and for CDW flows (MUD, 2015). The maps produced with such data are in the Status Quo section of the GDSE process (see Figure 4).

Specific views are prepared before the GDSE/PULLs workshops, by organising the sub-fraction of each flow in layers, according to the suitable criteria to support the GDSE workshop session. Flow maps (Figure 5) and a Sankey diagram (Figure 6) offer multiple information: knowing the existing scenario of waste metabolism, analysing the main clusters of related activities, understanding at glance the main activities and actors involved in the management of a key flow from a first analysis. Some strategic actors can be involved in the decision-making process in a GDSE session to test regional policies or implementing ideas in new eco-innovative strategies.

Figure 4. Status quo section in GDSE platform.

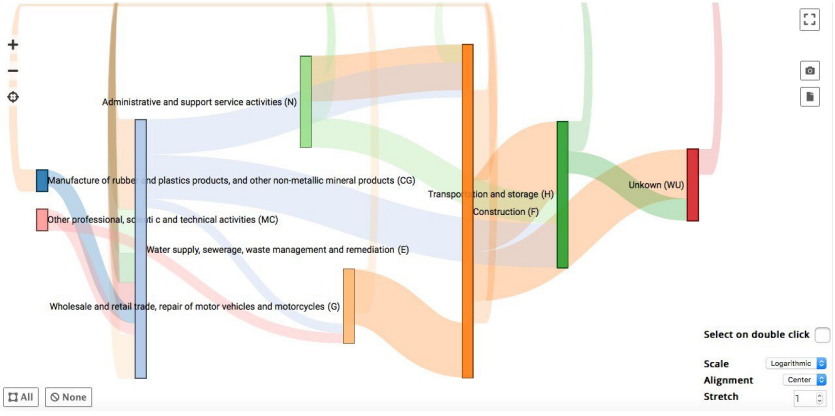


Note: The view shows mixed construction and demolition waste (EWC 170904) produced in the Naples focus area in 2015 (MUD data). Map elaborated in GDSE (prepared by the authors).

Figure 5. Activity based-material flow map of mixed construction and demolition waste (EWC 170904) produced in Naples focus area in 2015

Note: Map elaborated in GDSE (prepared by the authors).

Figure 6. Sankey diagram at Activity level of AB-MFA mixed construction and demolition waste (EWC 170904) produced in Naples focus area in 2015



Note: Map elaborated in GDSE (prepared by the authors).

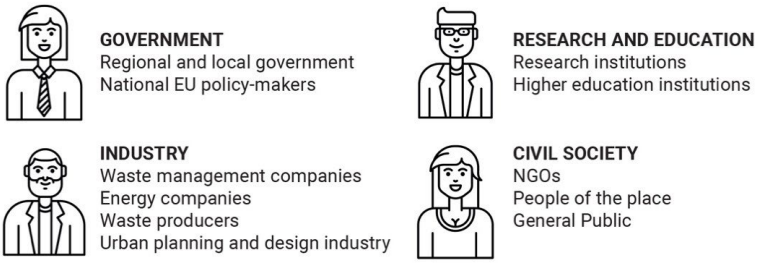
The waste stream of CDW (EWC 17) accounts for around 40 % of the total waste produced in Europe (Deloitte, 2017). In Italy, this amount corresponds to approximately 52 million tons of non-hazardous waste (ISPRA, 2015). According to official data, 75 % of these materials are officially recovered, but there are many complexities in the whole chain, mainly related to bureaucratic processes and regulatory ambiguities, which do not facilitate the reuse of such materials in the logic of circular economy. There are also several shadow flows in the construction sectors in Europe like in other countries (Hebel et al., 2014), that are not tracked and, thus, they are not considered in recycling rate statistics (Legambiente, 2019). A crucial challenge is to trigger the market of Recycled Aggregates (RA) that are produced from inert waste treatment plants, but regulatory conditions obstruct it and their reintroduction in metabolic processes. The Italian Nation Association of Building Constructors (*Associazione Nazionale costruttori Edili* – ANCE) with the Supra-Regional Waste Observatory (*Osservatorio Rifiuti Sovraregionale* - O.R.So) have developed a project to improve CDW management and RA market introducing a national open-source platform, *Borsino Inerti*, connected to O.R.So, that is a mandatory system used by companies in the waste management sector. Companies that are already required to fill forms in O.R.So will be able to interact with construction companies or freelance professionals interested in buying certified recycled materials. RA can generally be used in many landscape architecture works, road fills, or they can be recycled to make new building materials. The Campania Region production of special waste stands at around 6.8 million tons, 4.9 % of the national total. During the PULLs, citizens and local environmental associations highlighted the problem of abandoning of CDW as a widespread local problem in the Naples peri-urban area. This phenomenon produces a proliferation of wastescapes, and it has been considered in many PULLs. Anyway, abandoned CDW have not been considered in the Material Flow Analysis, because of the lack of necessary geolocalised hard data. From PULLs, it emerged that regulatory obstacles to the circular metabolism of CDW are also due to: the absence of specific actions for selective demolition in current regional regulations

(PRGRS, 2011), whose actualization is ongoing at the date of the present paper; the low cost and high availability of quarry materials; the distrust of construction companies toward recycled products; the absence of recycled aggregates in regional pricing, and poor separation at the source of waste and use of selective demolition practices (REPAiR, 2018). By starting from the global and local scenarios and considering the critical issues raised, a set of eco-innovative solutions (EISs) have been proposed, implemented in GDSE, and assessed in combined strategies to work synergically.

4.2 The involvement of actors in the decision-making process of the Naples case study

The main categories of actors involved in the whole process include the scientific community (higher education and research), industry, NGOs, civil society, public in general, political measures, media, and investors (see Figure 7).

Figure 7. Stakeholders categories in REPAiR



In the first co-exploring phase, the main difficulties and potentials on waste management and wastescapes have been identified through collective discussions, using decision trees and semi-structured interviews (elaborated by Berruti, Guida, & Palestino, 2017) with an open multidimensional and multiscale approach. Issues emerged in the

top four PULLs of the co-exploring phase and interviews concerning a wide range of issues about the legacy of waste crisis in Campania. The Municipalities of Naples Focus Area that took part in PULLs were: Frattaminore, Casalnuovo, Caivano, Afragola, Acerra, Casoria, the City of Naples, the Metropolitan City of Naples, and the Campania Regional Authority. The waste management companies were SAPNA, ASIA, CEA, and Epsilon 2000 Society. Some of the main outlined problems of the Campania Region are: waste balls disposal and relative infringement proceeding, lack of cooperation between institutions, popular distrust in local governance and in waste management system, NIMBY effect and difficulties in conducting waste treatment or recycling plants, waste abandonment, proliferation of wastescapes due to social behaviours and lack of control, underuse of waste facilities in function, and a lack of interaction between public and private bodies. Wastescapes proliferation emerged as deeply connected to the urban metabolism of waste, not only because of the illicit phenomena of waste management, but also due to the waste management activities in Campania Region. The big amount of waste daily transported in treatment plants outside Campania Region, or abroad, has a huge environmental and economic impact. It is evident that a distance reduction of waste treatment and recycling represents the common goal for both waste flows analysed (organic and construction and demolition waste), as it will consequently close the recycling circle at a regional scale. Bottlenecks in the recycling and waste supply chains are different according to the waste fraction considered. Regarding CDW, the emerged issues mentioned above were outlined in specific focus groups. A key role was played by the trade associations of Neapolitan builders (ACEN, or *Associazione Eostruttori Edili Napoletani*), where the fourth PULL took place, the cadastre of waste by ARPAC, and the section of General Management of the Integrated Water and Waste Cycle Office.

The second phase implemented the previous one with the co-design of the eco-innovative solutions or EISs. The four PULLs carried out in Afragola (Naples) in 2018 aimed at the regeneration and rethinking of wastescapes starting from both territorial problems and those related to

the dysfunctions of waste management. In this phase, some wastescapes have been mapped in collaboration with NGOs and citizens, who have played a central role in the knowledge of the territory and less evident issues. In the end of this phase, a set of EISs that proposed the *Beyond INERTia* strategy have been defined.

In the third phase of the PULLs, the verification of the solutions identified for both OW and CDW were analysed by experts of the waste management, public administration, and company sectors. Focus groups and interdisciplinary Knowledge Transfer events with other partners of the REPAiR consortium gave place to this phase. The relevance of some EISs has been confirmed, while other EISs considered by citizens and associations have been criticised because of their inconsistency with the Italian Law.

Table 1. PULLs carried out in the Naples case study from 2017 to 2019

PULL		PLACE	DATE	PARTICIPATION	CORE ISSUE
CO-EXPLORATION	1	NAPOLI	10/4/17	66%	Kick of PULL
	2	CASORIA	31/05/17	40%	Waste management
	3	CAIVANO	14/09/17	18%	OW
	4	NAPOLI	29/11/17	50%	CDW
CO-DESIGN	5	AFRAGOLA	14/02/18	76%	Wastescapes
	6	AFRAGOLA	07/03/18	96%	Wastescapes
	7	AFRAGOLA	28/03/18	60%	Wastescapes
	8	AFRAGOLA	23/04/18	73%	Wastescapes
CO-PRODUCTION	9	NAPOLI	16/07/18	70%	EISs and strategies
	10	NAPOLI	15/01/19	72%	EISs and strategies
	11	NAPOLI	13/02/19	60%	EISs and strategies
	12	NAPOLI	27/02/19	77%	EISs and strategies
	13	NAPOLI	18/04/19	67%	EISs and strategies
				63%	

Currently, the GDSE has been implemented starting from the work done so far by PULLs. The next steps aim at creating groups that focus on co-producing the strategies developed in the collaborative decision-making process.

It is an ongoing process, monitored in the research by REPAiR team and in different PULLs. In October of 2019, the REPAiR team of Naples took part in a technical table convening on CDW for the next regional plan for the management of special waste (PRGRS – *Piano Regionale per la Gestione dei Rifiuti Speciali in Campania*), for the Scoping phase, together with ACEN and other actors involved. GDSE has been proposed as a tool for co-exploring and co-designing plan strategies but using it on a regional scale results in some obstacles yet to be solved.

4.3 Stakeholders involved in the PULL workshops for CDW management

Stakeholders involved in CDW analysis and solutions include different actors from the scientific community, industry, trade associations, civil society/general public, policy makers (Campania Regional Authority, specifically, the section of General Management of the Integrated Water and Waste Cycle Office), and some private investors.

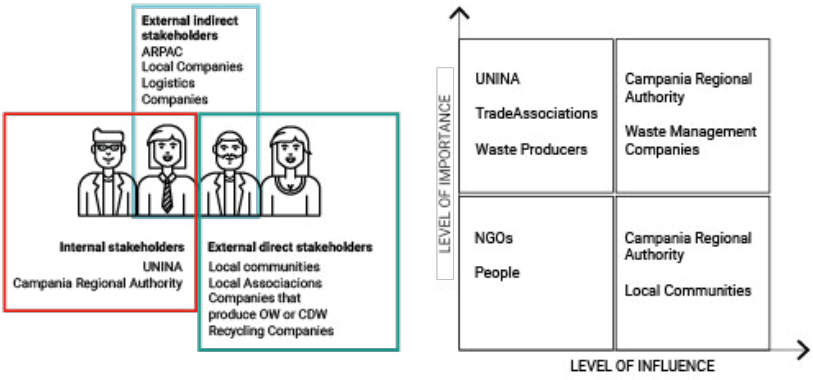
The *Beyond INERTia* strategy has been defined as set of site-specific EISs (REPAiR, 2018) to cope with the current challenges and bottlenecks of the recycling supply chain of CDW. As mentioned in the status quo analysis, the main part of this flow consists of inert waste, considering the identified dysfunctions in local supply chain. The single EISs of this strategy focused on the management of the mixed inert waste fraction. PULLs and scientific research identified the necessity of:

- free collection points for CDW disposed by little producers;
- a Regional Concession Fee on quarries of sand and gravel;

- incentives for companies that make selective demolition;
- a regional sustainability certification for recycled aggregates from inert waste;
- the item and price of recycled aggregates in tender specifications;
- recycled aggregates for landscape architecture operations.

These solutions have been technically implemented into the GDSE platform. Each one can have an impact on the reduction or modification of CDW flows. Using the GDSE, the actors involved in the geodesign process can combine solutions in strategies and select implementation areas. Internal and external stakeholders, who took part in this process, have a different influence and importance in the decision-making process (see Figure 8) to co-produce strategies. Considering a stakeholder analysis into the geodesign process is yet to be explored.

Figure 8. Venn diagram and influence matrix



5. Discussion and conclusions

This paper clarified the methodological structure of the collaborative decision-making process experienced in the REPAiR research project and the Naples case study, focusing on the work carried out on the management of waste streams by the construction and demolition sectors. The strategies developed so far within the PULLs and the GDSE session have not yet been adopted and implemented by the Naples region stakeholders, but Campania Region is interested in testing GDSE in new regional Waste Management Plans.

Furthermore, this paper did not address the issue of data adaptation to implement the GDSE. Raw data need precise and specific processing which, for now, constitute the main obstacle in the direct use of the software at a regional scale. The hybrid decision-making process (Cerreta & Poli, 2017) structured and implemented in the REPAiR project activated a continuous cooperation activity and makes it possible to categorize clear common and shared objectives to obtain ongoing feedbacks from the various stakeholders and to have an order of their preferences with respect to the eco-innovative solutions proposed, according to the combinations and implementation areas selected in the Geodesign process. Some difficulties have been encountered in involving the actors in an experimental research, as well as keeping them active in the process over time. According to the experience developed, the parts involved in the project have been selected with regards to specific criteria. The decision-making objectives can be of various kinds and be proposed by different stakeholders, according to the Geodesign session to be developed.

In the Campania Region, this methodology can be particularly useful in regional and municipal policies concerning waste management. Following the emergency condition from ten years ago, some of the territories —wastescapes— studied still carry open wounds. The population, therefore, experiences mixed moods and the accumulated mistrust of waste management has often been expressed in the PULL workshops. In

the Naples case study, the issue of illicit waste trafficking was considered tangentially, like in the mapping of wastescape as a product of non-legal actions. Shadow waste streams have not been traced due to the absence of structured data and the scarce relevance of this phenomenon in the proposed circular economy processes. Rather, the UNINA research team managed to highlight actions aimed at preventing waste, in line with some regional policies. The authors are aware that many system malfunctions do not depend on political decisions and planning of fragile territories only, but on the presence of criminal powers that influence both regional and local choices, at many steps of the waste management process chain.

At the same time, the authors stress the importance of activating a collaborative decision-making process to speed up the transition towards the CE in the region of Campania, as well as all the other regions of Italy. Today, this transition represents a path that many countries are taking up to improve the environmental and economic conditions of the production system. Using new tools to design territorial synergies on a local scale, integrating different competences, and even conflicting interests, is a step forward in the democratic process of spatial and environmental justice.

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