

*Article*

# Operationalizing the Circular City Model for Naples City-Port: A Hybrid Development Strategy

Maria Cerreta<sup>1,\*</sup>, Eleonora Giovane di Girasole<sup>2</sup>, Giuliano Poli<sup>3</sup> and Stefania Regalbuto<sup>4</sup>

<sup>1</sup> Department of Architecture (DiARC), University of Naples Federico II; maria.cerreta@unina.it

<sup>2</sup> Institute for Research on Innovation and Services for Development (IRISS), National Research Council of Italy (CNR); e.giovenedigirasole@iriss.cnr.it;

<sup>3</sup> Department of Architecture (DiARC), University of Naples Federico II; giuliano.poli@unina.it

<sup>4</sup> Department of Architecture (DiARC), University of Naples Federico II; stefania.regalbuto@unina.it

\* Correspondence: maria.cerreta@unina.it

**Abstract:** The city-port involves a decisive reality for the economic development of the territories and nations, capable of significantly influencing the conditions of well-being and quality of life, and of making the Circular City Model operational, preserving and enhancing seas and marine resources in a sustainable way, through the construction of appropriate production and consumption models, with attention to relations with the urban and territorial system. The Circular Economy paradigm identifies the ideal context in the city-port to rethink traditional development models and make ports driver areas for the regeneration of the city and metropolitan territories, in compliance with the EU Directive 2014/89 which considers maritime spatial planning as a tool for public authorities and stakeholders to achieve an integrated approach, promoting the development of maritime and coastal economies and the sustainable use of resources. The paper, starting from these assumptions, presents an adaptive decision-making process for the strategies development of the Naples (Italy) commercial port, aimed at re-establishing a sustainable city-port relationship and making operative Circular Economy principles.

**Keywords:** circular city model; city-port; Sustainable Indicators; SDGs; Role Play Game (RPG); PROMETHEE method; Stakeholders analysis; multi-dimensional evaluation; adaptive decision-making process

## 1. Introduction

The concept of urban development according to the Urban Agenda [1,2] recognizes that cities play an essential role in the development of Circular Economy (CE) processes, allowing potential measures to influence circular consumption, urban resource management, circular business enablers and drivers, and governance, in order to implement the Circular City Model (CCM) [3-5]. Within a cross-scale perspective, the idea of CCM provides the theoretical framework within which to identify, elaborate and assess urban and territorial sustainable development and regenerative strategies. Aiming at operationalizing sustainability targets, CE principles can support to structuring an evaluative methodological approach to manage the transition [6,7]. Regarded as “place-based” and “use-inspired” transition, the CCM leverages knowledge systems and developmental change methodologies to support the sustainability paradigm shift, where the city and its dynamics have a central role, and the city-port identifies a specific enabling context [8-11].

In the past, over the centuries, harbour spaces have been strongly influenced urban identity and urban morphology, shaping cities’ spatial features and functions, both at local and regional level, considered as the core of the city as economic and social driving force [12-16] and activating complementary and symbiotic relationships among the sea, the cost, the city and the territory [8]. This symbiosis, over time, has been interrupted generating an ever greater separation of the port from the city, both respect to the functions and system of relations, due to growing need for autonomy and expansion spaces [17,18].

Nowadays, the harbour requests autonomy and spaces, while the city claims integration and dialogue. The European Committee of the City-Regions underlines that cities and port areas are an essential component of the economic system of the European Union, which strongly influences, under conditions of increasing globalization, the possibility of relaunching growth, improving efficiency, stimulating innovation and long-term competitiveness [19].

In this perspective, the ports have been recognized as a strategic hub, an engine for growth, both for the transportation system and economic competitiveness, since they have got great potentials in terms of job opportunities and investments [20]. Nevertheless, developing these activities, and consequently extending the spaces of logistics, is expected to impact on the cities in economic, social and environmental terms, negatively influencing the well-being and the quality of life [12,21-25].

According to COTER [19], in order to ensure the sustainable development of port-cities, it is, therefore, necessary to adopt innovative and integrated solutions which are in line with the principles of urban development in the EU, taking into account the economic, social and environmental aspects of these places. In this context, the paradigm of CE [26-28], when it is applied to the cities, becomes a key factor to review development processes [6,29-32].

At the same time, the CE can be a suitable paradigm to respond to the sustainability challenges for the harbours, on the one hand, guaranteeing their competitiveness in a world of limited resources, on the other hand, promoting innovation, reducing environmental impacts and redefining city-port relationships and boundaries [33-35]. The CE in the harbours can represent a synergistic process that combines economic, logistic and industrial activities with the cultural and social heritage of harbour and the creativity of its wider community, generating a dynamic, complex and sustainable system.

Indeed, in port-cities the development model provided by Circular Cities fosters an original balance between different objectives and purposes, maximizing port efficiency and productivity, and optimizing the city impacts in terms of employment, environmental conditions and quality of life, combining micro-economic and macro-economic purposes [36,37].

In this perspective, in order to frame and implement the CCM processes for the sustainable development of the port-cities, it is possible to refer, on the one hand, to the "Sustainable Development Goals" (SDGs) [31,38] and, on the other hand, to the "Maritime Spatial Planning" of the European Directive 2014/89 [39], elaborating adaptive multi-dimensional decision-making processes able to integrate evaluative approaches and tools, useful to take into account complex interactions and face conflicts in the overlapping areas of the city-port [40].

According to an ecosystem-based approach, in order to promote a sustainable future development, United Nations [31,38,41] have been identified the 17 Sustainable Development Goals (SDGs), which require complementary actions by governments, civil society, science, and business. In particular, it is interesting to work on the processes of transformation and sustainable development exploiting strong interdependencies between the 17 SDGs, their integrated and complementary relationships, and potential synergies and multiple co-benefits [42-44]. The approach of SDGs is particularly significant for the planning of coastal areas and port cities, which require complex urban and maritime transformation processes, considering the long-term time horizon in which the guidelines for urban planning unfold, in addition to the impacts that these actions have on the territories from the environmental, economic, and socio-cultural point of view. A further reference to examine the issues of sustainability, related to the development of port-cities is represented by the "Maritime Spatial Planning" [39]. The European Directive, in order to promote the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources, acknowledging the programmatic objectives of the previous directives, recognizes the planning of maritime space as a decisive tool able to consider and integrate economic, social and environmental aspects.

In line with this approach, in Italy, in 2017, the "Guidelines containing the criteria for the management of the maritime space" [45,46] were elaborated. The planning of the maritime space is configured as a process, which, starting from the identification and clarification of the macro-conflicts and the synergies that characterize it, intends to respond to real problems, through the definition of an adequate management plan. The process is divided into different phases which include the

gathering of information, the adoption of decisions, the implementation, the revision and/or the updating, and the control of the execution, taking into due consideration the land-sea interactions and the best knowledge available, involving the various stakeholders, and taking into account the long-term changes due to climate change.

In this context, merging methodological research approaches around the complexity of urban port systems and integrated assessment approach, understood as structured and adaptive process which guides and supports the elaboration of decisions and the choice of preferable scenarios, implies to deal with situations of uncertainty and value conflicts that, sometimes, cannot be overcome only through the use of traditional tools [47–49]. Therefore, facing the challenge of the sustainability of the circular port-cities implies structuring decision-making processes consistent with the Agenda 2030 objectives and the "Maritime Spatial Planning" directive operational, activating contexts open to the constant and synergistic interaction between knowledge and skills, in which integrated evaluation approaches [22] can play a decisive role.

The paper, in Section 2, introduces materials and methods of the adaptive and multi-dimensional decision-making process elaborated for the city-port system in Naples (Italy) in order to identify a hybrid development strategy able to implement the CCM; in Section 3, the different phases of the proposed methodological approach have been applied to the case study; in Section 4, the results have been described, and in Section 5, the discussion of the potentials and critical aspects, and conclusion open to the future research steps are presented.

## 2. Materials and Methods

The main purpose of this study is the elaboration of an evaluative framework for the definition and experimentation of a multidisciplinary and integrated methodology, which allows structuring an adaptive decision-making process useful to implement the CCM, and oriented to support the elaboration of a spatial transformation and development strategy of port-cities. According to the above perspective, the goal is designing a sustainable and circular development of the city-port system in Naples (Italy), considering East Naples' harbour and San Giovanni a Teduccio neighborhood, recognizing a crucial role to an integrated and multi-methodological approach [40] able to support the elaboration and selection of future scenarios, by considering the following drivers:

- the observation and interpretation of the harbour's complex interface in relation to the surrounding urban context;
- the provisioning of different scenarios which are based on the synergy between harbour's logistics and various urban functions;
- the evaluation of identity-related place's features and local communities' needs.

Within this context, the methodological workflow has been carried out through four operational steps (Fig.1). The proposed methodological framework applies a place-based and adaptive approach with mixed evaluation methods, eliciting soft and hard knowledge domains, which have been expressed and evaluated through a core set of Sustainability Indicators (SI), linked to Sustainable Development Goals (SDGs) [42,43]. The operational steps will be deeply described in the next subsections.

### 2.1 Problem structuring

The multi-functionality and multi-dimensionality of decision-making processes have to be strongly considered when dealing with complex flows related to the logistics, the city-port interaction zones, the multimodal transport systems, the definition of harbour layout and the provisioning of functions and services that fit with the urban and public spaces. The overlapping of these issues necessarily requires the co-existence of diversified skills and backgrounds. Structuring the decision-making problem considering the main issues arising from public debate is the crucial step for elaborating, evaluating and defining multi-dimensional solutions. The knowledge acquisition about complex flows and correlated phenomena is expected to be a structured process, by which data coming from different sources must be organized in well-defined categories and processed into meaningful indicators. Nevertheless, the knowledge deriving from institutional sources must necessarily be combined with direct investigation of the so-called "soft dimensions". In this way, the

local communities and social networks can play an important role in communicating criticalities and potentials, as well as needs and requirements.

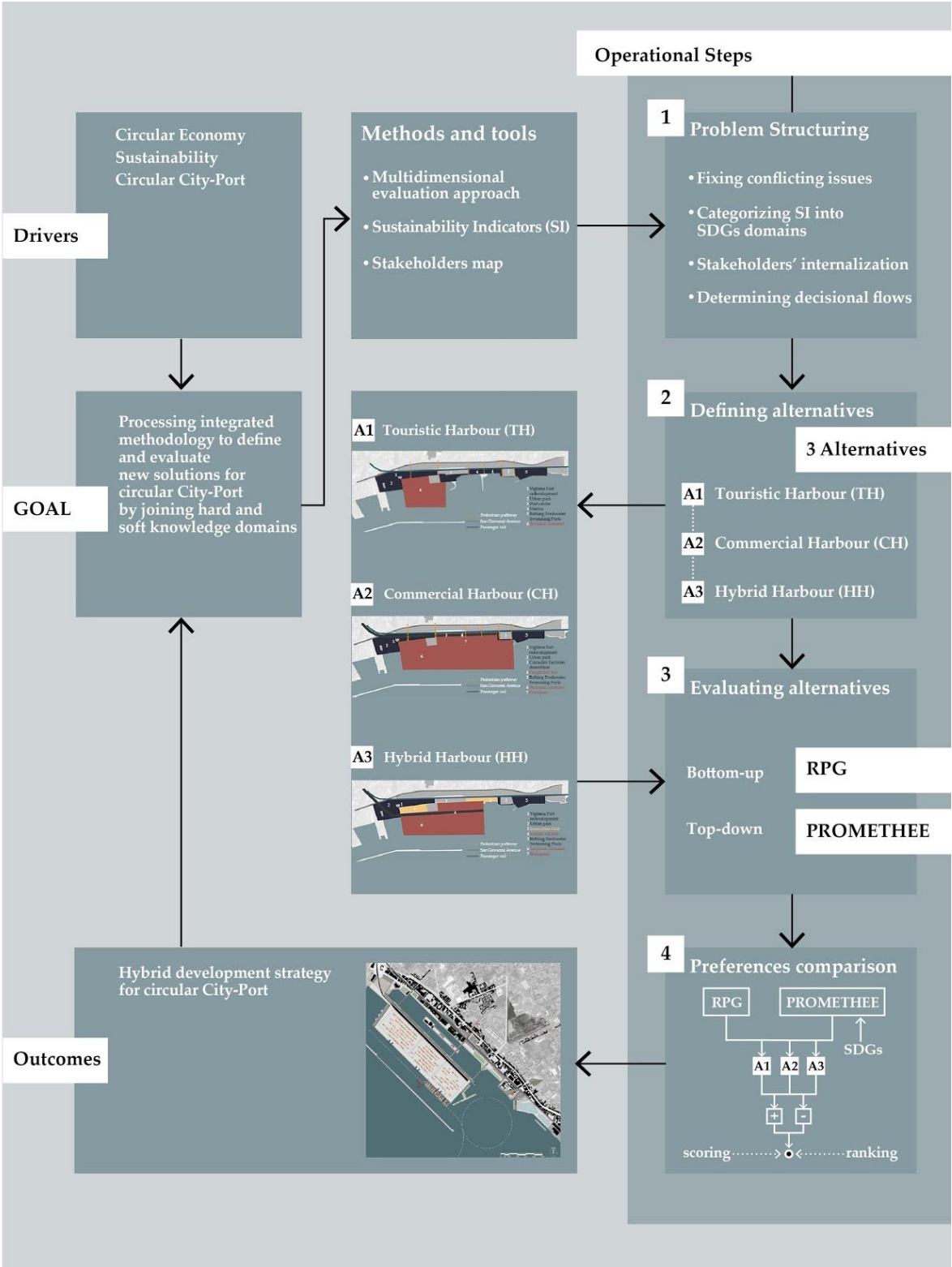


Figure 1. Methodological framework

Moreover, the identification of significant stakeholders is one of the crucial phases, since it is useful for understanding the institutional context and the different interests that arise within complex decision-making arenas. Directing the choice towards a vision of balanced development and CE,

indeed, implies the effort to evaluate compromise solutions that are able to reduce the trade-offs and, concurrently, to afford different instances in an effective and coherent way.

## 2.2 Defining alternatives

Generating design alternatives allows forecasting different development scenarios according to the economic, social, environmental trends, the main interests of the stakeholders involved, and the spatial configuration of the city-port. Three main alternatives, that correspond respectively to touristic, commercial and hybrid visions of development for Naples' harbour and San Giovanni a Teduccio neighborhood, have been defined and drawn. The best-fit design alternative should lead to mediation among urban neighborhoods and port authority spaces, and its choice has to be determined to take into account conflicting needs and interests about functions and spaces, and their relations systems.

## 2.3 Evaluating alternatives

The operational skills of the multidimensional assessment tools have been used to solve complex problems. Two streams of evaluation, which respectively lead to hard and soft knowledge elicitation, have been requested by the decision-making problem structure in order to answer two main typologies of issues.

The first issue tried to answer the following typologies of questions: Which opportunities and threats derive from each of the three proposed alternatives? What about the needs and concerns of people living within the influence area of the harbours?

The Role-Playing Methods (RPMs) [50,51] have been selected as the most useful tools to gather the preferences of citizens dynamically and fast. The outcome of RPM is a scoring process that shows the participants' preferences of respect to proposed alternatives.

The second issue, instead, concerns the following questions: How to evaluate the performances of design alternatives respect to sustainability and CE instances? Which SDGs must be considered? And, in this perspective, which are the preferences of the most influential stakeholders?

The PROMETHEE multicriteria method [52-54] has been chosen since it allows us to analyze different scenarios that show the visions of the main stakeholders engaged and, consequently, it performs a total ranking of alternatives based on the aggregation of all the stakeholders' judgments.

## 2.4 Preferences comparison

Comparing the results of the evaluation and analyzing the alternatives scores addressed the choice toward balanced solutions that try to reduce conflicts. Indeed, matching PROMETHEE ranking with RPM scoring means investigate fundamentally about opportunities and threats which have been expressed during the RPM rounds, and about the conveniences to pursue each alternative in relation to SI through PROMETHEE bar charts. The review of the results, indeed, aids decision-makers and experts designing new complex visions of development for the city-port system.

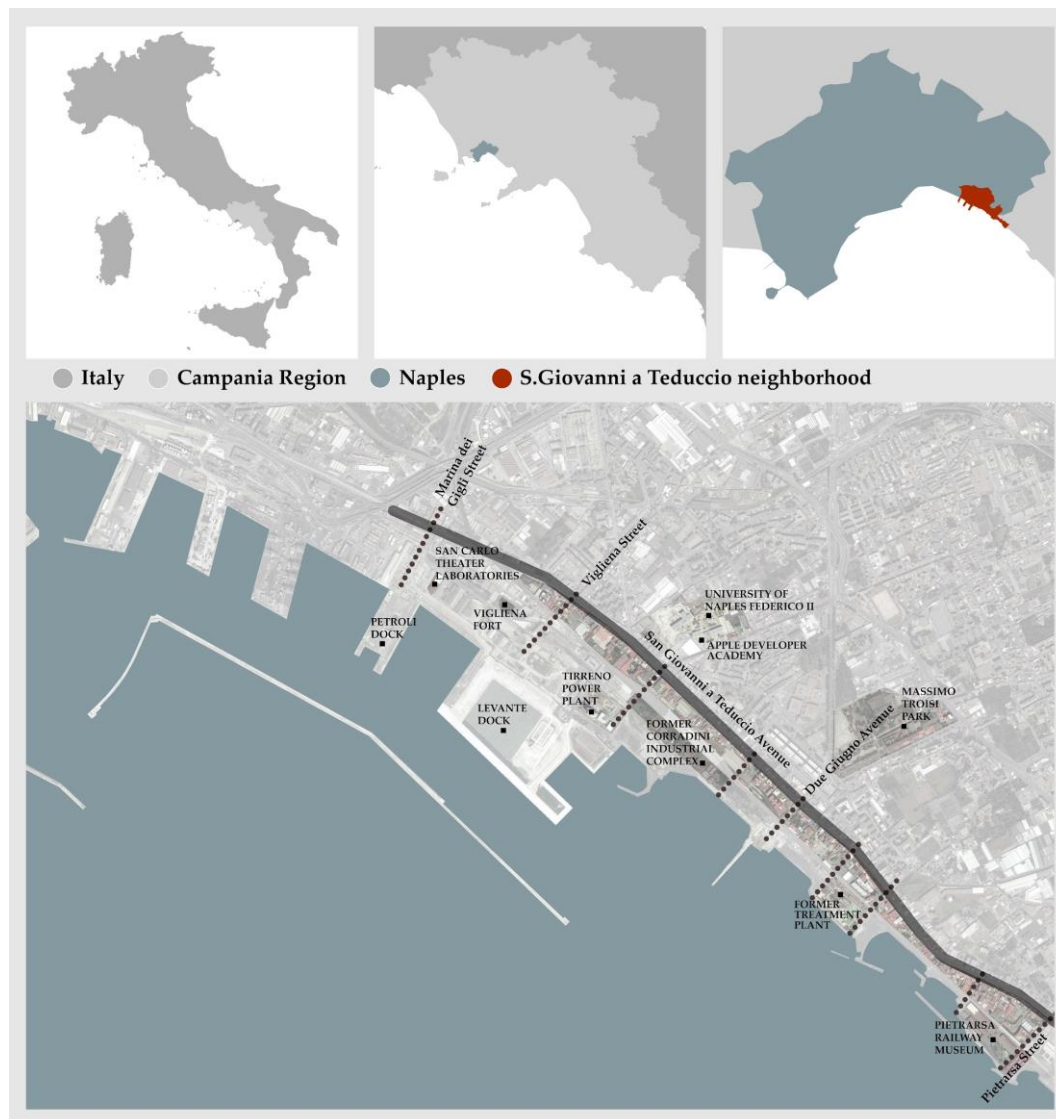
## 2.5 Outcome

The preferable-fit alternative, taking into account complex issues, needs and conflicting points of view, has been shaped like one of the possible spatial configurations for circular city-port development. A master plan has been drawn by the flexible vision of the future, which is attentive to continuous change in economic, environmental and social conditions of the intervention context.

## 3. A multi-dimensional decision-making process for East Naples city-port system regeneration

Aiming at testing and developing the above proposed adaptive multi-methodological decision-making process, the port of East Naples (Italy) trading area has been selected as a case study. Localized on the eastside of the Naples Gulf, the focus area extends within the VI Municipality of Naples Metropolitan City, in the district of San Giovanni a Teduccio (Fig.2).





**Figure 2. The focus area: San Giovanni a Teduccio port area**

Although it formerly was agricultural, the area experienced the urbanization process as the result of Naples-Portici passenger railway realization dating back to 1839, until to reach its maximum economic and property development during the industrial age. As a consequence of changing pattern of land use which took place in the post-industrial era, the coastal area of San Giovanni a Teduccio is currently marked by the widespread presence of residential properties (the population density is approximately 6,841.9/Km), abandoned industrial buildings and brownfields, strengthening the previous caesura between port and city. Moreover, the strong decrease in demand for industrial activities led to a significant employment crisis. Suffice it to say that out of 11,159 inhabitants the unemployment rate amounts to 36.5%, whereas the rate of youth unemployment is 69.4%.

More specifically, the focus area develops on the stretch of “Via San Giovanni a Teduccio”, between “Via Marina dei Gigli” and “Via Pietrarsa”, including enclosed areas both into urban fabric and coastline. Located on the coastal strip, it turns out to be detached from the behind the urban fabric. After the realization of Naples-Portici railway, indeed, a gradual process of separation between port and city, later reinforced by the construction of the line of houses overlooking “Via San Giovanni a Teduccio”, was initiated. The inaccessibility together with the progressive abandonment of industrial activities there located has caused brownfield and drosscapes [55], also known as “non-port places” or “non-place ports” [56], to arise.

The boundaries of the focus area extending between Petroli Dock and Pietrarsa Railway Museum, are formed to the North by the “Via San Giovanni a Teduccio” and to the South from the

coastline. Furthermore, the railway as well as the road network crossing it, together with the largely disused pre-existing buildings that serve as urban landmarks, divide the area into five parts.

In particular, in the sector between the Petroli Dock and “Via Vigliena”, within a largely disused industrial and residential area, there are the former Cirio Factory, already redeveloped and repurposed as San Carlo Theater laboratories in addition to Vigliena Fort, currently abandoned. Continuing eastwards, in correspondence of Levante Dock is the currently operational Tirreno power plant beyond the ex Corradini factory, an industrial complex actually disused, which extends close to the Naples-Portici railway line up to “Viale Due Giugno”. Still further east, along the coastline, stands the former treatment plant, now almost completely abandoned. Finally, in the area of “Via Pietrarsa”, the former steel industry, now in use as a Railway Museum is located.

Extending over the coastal strip between the residential district and port authority zone, the focus area lies within city-port settlement as an enclave, whose administrative boundaries are regulated by twofold policy systems: the Metropolitan City of Naples and Port System Authority of the Central Tyrrhenian Sea (AdSP).

In line with the objectives of Italian legislative decree n. 169/2016, within the cross-scale and place-based theoretical framework provided by the concept of regenerative development, a strategy that is able to overcome the fragmentation of local interests, thus enhancing city-port system attractiveness and competitiveness for both internal and external markets, is intended to be pursued. According to recent literature, indeed, as the result of their geographical location, port areas have often been the flywheel for economic and social development at the regional scope [23, 57].

In this context, employing the aforementioned adaptive multi-methodological decision-making process, aiming at triggering the development of the city-port system, a regenerative strategy for San Giovanni a Teduccio coastal area, taking into account its multiple domains and stakeholders, has been proposed.

First of all large amounts of data with different features have been collected and then structured into the SIs database. More in-depth, in order to draw up a knowledge-based system and support Decision Makers (DM) in taking choices regarding urban transformation, the decision problem structuring and the subsequent definition of suitable design alternatives, combining an appropriate set of indicators with institutional analysis results, has been carried out.

Moreover, with the aim of aiding DMs in choosing the best-fit alternative among a feasible set, structuring soft and hard data and employing Multi-Criteria Decision Making (MCDM) methods as part of the Decision Support System (DSS) methodological approach [58], the evaluation of three alternative development scenarios have been carried out.

### *3.1 Sustainability Indicators and Sustainable Development Goals: relationships and interactions*

According to Agenda 21 (Chapter 40) and the United Nations Conference on Sustainable Development (UNCSD or “Rio+20”), convenes June 20-22, 2012 in Rio de Janeiro, Brazil, quantifying information and categorizing data into structured indicators play a relevant role when simple or composite indicators have been conceived as proxies to measure the sustainability thresholds and, concurrently, circular economy values [59,60]. In this paper, the indicators have been used as tools for operationalizing, monitoring and assessing the SDGs’ targets at the local scope [61]. Since the information gap on the study area was relevant and current data needed, it has been not feasible computing the SDGs at the local scale, but a new selection of indicators has been done considering the SDGs 9, 11 and 12 [31] (Fig.3).

Specifically, Goal 9, “Industry, innovation, and infrastructure”, considers that investment in infrastructure and innovation are crucial drivers of economic growth and development, with specific attention to the growth of new industries and information and communication technologies, able to providing new jobs and promoting energy efficiency.

At the same time, Goal 11, “Sustainable cities and communities”, identifies that significantly transforming the way to build and manage urban spaces for making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and

economies. This involves investment in public transport, creating green public spaces, and improving urban planning and management in participatory and inclusive ways.

Furthermore, Goal 12, “Responsible consumption and production”, underlines that achieving economic growth and sustainable development requires to urgently reduce ecological footprint by changing the way to produce and consume goods and resources. According to this Goal, the efficient management of natural resources, and the recycling and reducing of waste are equally important to move towards more sustainable patterns of consumption by 2030, and for creating more efficient production and supply chains.

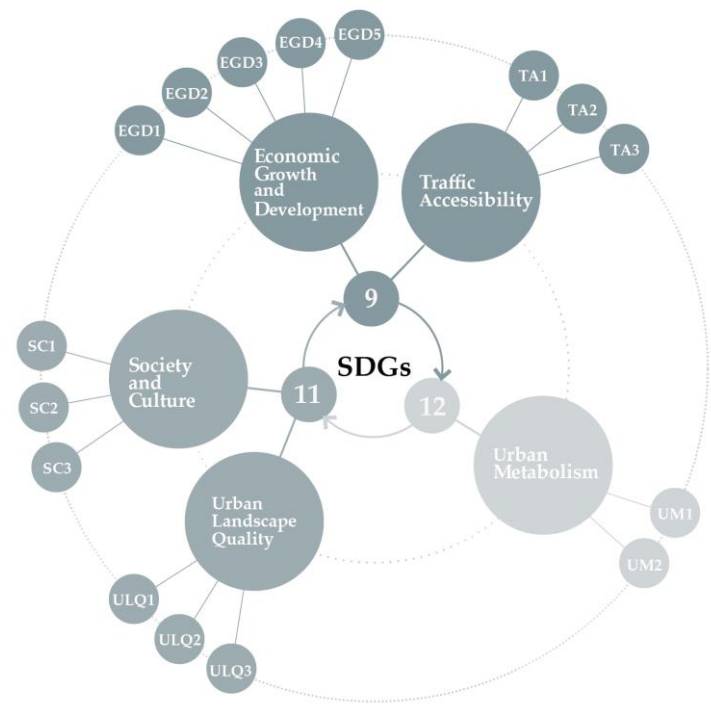


Figure 3. The relationship between SDGs and SIs domains

Taking into account the selected Goals, the new indicators have been formulated according to site-specific issues which have been categorized into five relevant domains for city-port regeneration. The aforementioned domains - which address to Economic Growth and Development, Traffic Accessibility, Urban Metabolism, Society and Culture, Urban Landscape Quality - have been made explicit by subsets of Sustainability Indicators (SIs) [40], totally amounting to sixteen indicators. Table 1 shows the indicators list, highlighting five domains, code, indicator source (IS), data source (DS), unit of measure (UM) and indicators’ value (Table 1).

The formulated SIs have been used as a monitoring set and tested on a focus area which includes San Giovanni a Teduccio neighborhood and Naples port trading zones.

According to the conceptual approach, the core set of indicators, which are independent of political agendas, has been based on models of sustainable development and CE processes for city-port regeneration [61,62]. Nevertheless, the selection of the indicators has been derived also by the main issues afforded during the public debate with local stakeholders about the future development of Naples harbour.



**Table 1.** Sustainability Indicators (SIs)

Domain	Code	Indicator	IS/DS <sup>1</sup>	UM <sup>2</sup>	Value
Economic Growth and Development	EGD1	Costs	Authors elaboration	mln€	0
	EGD2	Job potential	ITACA/ISTAT	%	14.6
	EGD3	Unemployment rate	LEED/ISTAT	%	13.2
	EGD4	Incidence of high-medium specialized jobs	ISTAT	%	19.9
	EGD5	Incidence of low specialized jobs	ISTAT	%	24.9
Traffic Accessibility	TA1	Cargo handling (import)	ISPRA	TEU <sup>3</sup>	536,917
	TA2	Cargo handling (export)		TEU	499,631
	TA3	Number of docks		TEU	828
Urban Metabolism	UM1	Air quality index (AQI)	LEED/ISPRA	mg/Nm3	40.9
	UM2	Organic Municipal Solid Waste (OW-MSW) recycled in the district	LEED/ISPRA	ton/year	0
Society and culture	SC1	Number of social-cultural associations	EC/Survey	num.	8
	SC2	Number of cultural services	EC/Survey	num.	10
	SC3	Number of high schools involved in cultural initiatives	EC/Survey	num.	8
Urban Landscape Quality	ULQ1	Walkability (length of pedestrian path)	ITACA	Km	2.23
	ULQ2	Drosscapes	EC/MEF	mq	62.03
	ULQ3	Green public spaces	ITACA/OSM	he	3.66

<sup>1</sup> Indicator Source (IS) / Data Source (DS); <sup>2</sup> Unit of Measure (UM); <sup>3</sup>Twenty-foot Equivalent Unit (TEU)

On the one hand, the indicators have been used to quantify and easily communicate complex information about the area of investigation, on the other hand, they have been set as evaluation parameters to produce scenarios with stakeholders' points of view. According to Rodriguez-Anton et al. [63], a significant correlation between SDGs and CE indicators subsists as well as European

Countries can achieve SDGs fostering circular initiatives, considering CE as a favored tool to reach sustainable development.

3.2 Stakeholders internalization within the urban transformation process

It is widely acknowledged that the success of urban transformations, and particularly those based on large construction or infrastructure projects, is strictly related to the overall success of the design process, which is in turn significantly influenced by involved stakeholders’ interests and concerns [64]. Hence, stakeholders assumed as individuals and organizations that are actively involved in the project or whose interests may be affected as the result of project execution or project completion could be regarded as one of the major uncertainty factors in projects [65].

In line with recent researches on urban water governance [66], internalization of a broad base of key stakeholders within urban planning leveraging on process innovation has been recognized as key factor to foster transition in urban water infrastructure [67,68]. In the context of Research Oriented Action Research approach [69] leveraging on a cyclic and iterative process, local actors have been: (i) identified, (ii) analyzed, (iii) prioritized and (iv) engaged.

In view of economic, social, cultural and environmental activities, both port and urban ones, occurring in the coastal strip, a list of existing and potential stakeholders as well as any organization have been identified. Local actors have been afterward gathered in “providers”, “influencers”, “users” and “governors” categories, that have been in turn analyzed and prioritized according to “power” and “interest” criteria. Employing “Power-Interest Grid” [70,71] allows selecting a manageable number of stakeholders while assuming a broad definition of the concept [51] and elaborating a Stakeholders’ Map (Fig.4). In this Map, “providers” and “governors” have been recognized as the two categories with the most relevant stake even if with varying degrees of power. Indeed, whereas “governors” have a high degree of the results of the evaluation, “providers” have less influence.

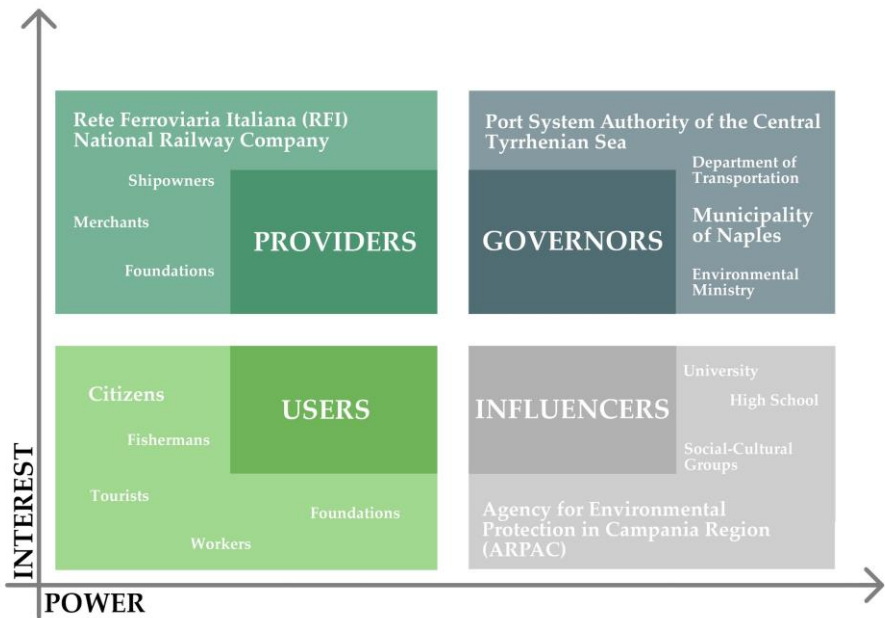


Figure 4. Stakeholders’ Map (revised from Freeman, 1984)

The lower categories, instead, reveal themselves as less interested. “Influencers” could exert a significant impact on policies affecting the future context, whereas “users” exhibit a low degree of interest in or power to influence the strategic outcomes. In order to involve local actors, within a stakeholder engagement approach [72], a series of theme-based focus groups with the main institutional stakeholders at local scope currently in force have been held. The viewpoints of different stakeholders have been thus collected as the input of knowledge system at the base of the scenarios

structuring process. Subsequently, with the aim of manage conflicting relationships, a stakeholder dialogue as interdisciplinary interaction between various actors [73-77] has been carried out.

In an open and respectful context, triggering processes of mutual responsibility and information-sharing [78], multi-stakeholder dialogue fosters reciprocal engagement, understanding, and learning [73,79], and has been therefore regarded as a vital component in the learning processes due to its ability to co-constructed ethical obligations and responsibilities [80]. The internalization of local stakeholders, allowing a more detailed knowledge framework structuring, has therefore oriented the overall collaborative planning process, in its implementing, operating and maintenance phases.

### *3.3 Development alternatives for San Giovanni a Teduccio port area*

With the aim of defining a sustainable development strategy for Naples city-port system, plan forecasts provided by regulatory instruments currently in force alongside some city-port regeneration best-practices have been analysed. More in-depth, the project for tourist port drawn by Municipality of Naples in 1995, along with the masterplan for the commercial port development identified by Port System Authority of the Central Tyrrhenian Sea in 2018, aside from freight railroad localization project proposed by National Railway Company Rete Ferroviaria Italiana (RFI) have been considered. Starting from the combined analysis of regulatory instruments and good practices, within the multidisciplinary working group of the Second Level Master in "Sustainable Design and Planning of Port Areas" of the Department of Architecture (DiARC), University of Naples Federico II, three different development strategies have therefore been defined (Fig.5), then presented to local stakeholders.

#### *3.3.1 Alternative 1: Tourist development (A1)*

Assuming tourist development as a goal for San Giovanni a Teduccio port area regeneration, a strategic vision, called "A1", has been elaborated. More specifically, in order to establish the conditions for sustainable tourism, a regenerative strategy based on tourist development combined with urban functions has been pursued. In this perspective, a set of actions aiming at structuring an environment permeable to both tourist and local flows has been proposed. Basing on the individuation of historic buildings and roads regarded as crucial in reconnecting the coast to the city, the intervention area can be divided into six sectors for each of which a strategic action has been identified. The redevelopment of Vigliena Fort and its bordering area currently abandoned and the subsequent urban park realisation is assumed. The already completed re-use intervention of the former Cirio Factories which currently host San Carlo laboratories could be regarded as the starter for the redesign of the area within a circular perspective. In this context, a re-use intervention has been also planned for the ex Corradini factory. The industrial archeology plant on which a restriction has been recently placed by Superintendence of Cultural Heritage would host a port-center, i.e. an educational and exhibition center with the aim of promoting and spreading the knowledge of the activities taking place in the port among the local population.

Within the buildings of the former industrial complex, commercial activities related to local handicraft and agricultural production, as well as those of a tertiary nature, would also be located. For the stretch of coastline between the ex Corradini factory and the treatment plant, which is now almost completely abandoned, it is planned to build a marina also served as a sea taxi. Immediately East of that stretch of coast, there is the treatment plant for which the recently approved planning tools foresee the relocation to another area within the eastern part of Naples.

In the area on which it is located, the construction of a city park has been planned. Finally, in the stretch between the treatment plan and the nearby Pietrarsa Railway Museum, in response to a demand for land use made manifest even though informally by local citizens, the construction of bathing freshwater swimming pools is expected.

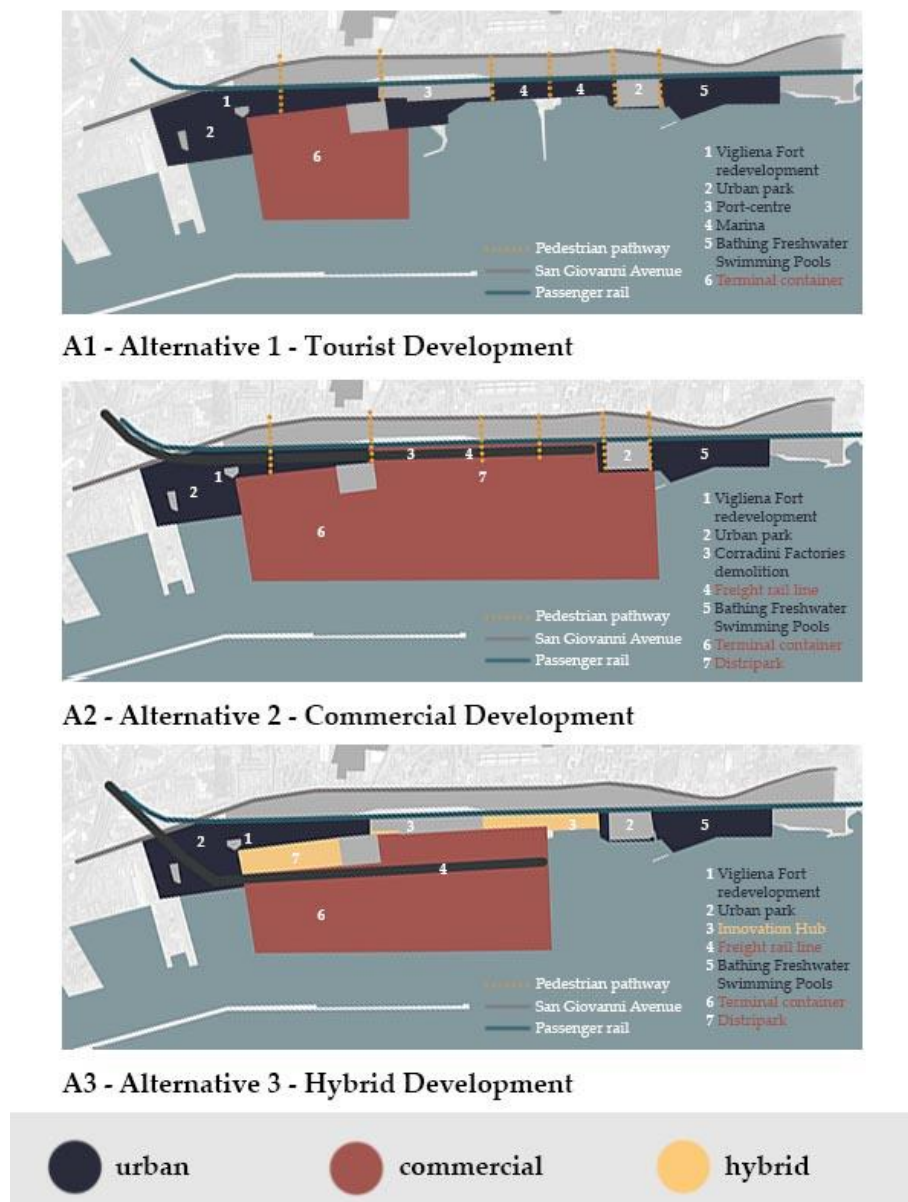


Figure 5. Three development alternatives for the San Giovanni port area

The commercial port activities would take place in “Levante Dock”. In order to allow it to be used as terminal container, activities for the realization of the overwhelmed bathtub have been projected. The areas immediately adjacent to the Tirreno Power plant and located north of “Levante Dock” will serve the terminal container. A system of pedestrian and cycle paths is designed to reconnect “Via San Giovanni a Teduccio” with the coastline, bypassing the historic railway line which has launched a gradual and pressing detachment of the city from the coast. In order to improve the accessibility of the area, also the reorganization of the vehicular traffic along with the construction of new parking areas and with the strengthening of public transport has been planned. In this context, it is expected that the new functions allocated within the main urban landmarks there located will act as attractors, therefore catalysts for flows.



### 3.3.2 Alternative 2: Commercial development (A2)

Another strategic vision proposed for the regeneration of the area is based on the commercial development of the port, which has been identified as “A2”. Recognizing the planning guidelines provided by the Port System Authority of the Central Tyrrhenian Sea, the extension of the terminal container to obtain a quay 1.8 km long is expected. The areas immediately adjacent to the Tirreno Power plant and located at North of “Levante Dock” will serve the terminal container. The demolition of the ex Corradini factory and the subsequent construction of the freight rail line close to the quay, as proposed by the National Railway Company RFI, are thus envisaged. Implementing plan forecasts as part of strategic vision is intended to encourage the establishment of companies and manufacturing enterprises, with the aim of boosting economic production both at the local and territorial scope. Within an integrated and cross-scale perspective, a strategy pivoting on the commercial development of the port combined with commercial and tertiary urban functions has been so pursued. East of Tirrenia Power plant, a distripark has been therefore planned. Composed of “distribution” and “park”, this name refers to an integrated logistics hub for storage, manufacturing, quality control and distribution of goods, more specifically, in the case in point, freight containers. Aiming to redevelop “Vigliena Fort” and the surrounding area, an urban park has been projected. The stretch of coastline between the ex Corradini factory and the treatment plant is instead intended to be used as outside equipped space belonging to distripark. It is also forecast that the former treatment plant will be converted into an urban space whereas the next stretch of coast extended until Pietrarsa Railway Museum will host bathing freshwater swimming pools. Finally, the reorganization of the pedestrian, cycle and vehicular crossings system is proposed in order to improve the accessibility of the area.

### 3.3.3 Alternative 3: Hybrid development (A3)

Finally, in compliance with Sustainability Development Goals (SDGs) provided by United Nations in the Agenda 2030, within a multidimensional perspective, a further planning alternative leveraging on a hybrid development strategy, which has been identified as “A3”, has been proposed. In this context, the draft plan aim at localizing both urban and commercial functions close to the coastline. The expansion of the commercial quay is therefore expected at 1.2 km. The construction of the freight rail line close to the quay, albeit with a different route from that proposed by the National Railway Company RFI, has been envisaged. The areas immediately adjacent to the Tirreno Power plant and located north of “Levante Dock” will be used as distripark. The ex Corradini factory would host an innovation hub, which activities based on digital innovation triggers connections for both manufacturing and service industries and research. The stretch of coast between the former abandoned industrial complex and the treatment plant is intended for outdoor equipped space belonging to the innovation hub. For the redevelopment of the areas on which “Vigliena Fort”, the treatment plant, and the subsequent stretch of coast that extends to the Pietrarsa Railway Museum stand, the previously described interventions are proposed. Finally, the reorganization of the pedestrian, cycle and vehicular crossings system is identified in order to improve the accessibility of the area.

## 4. Results

### 4.1 Role-Playing simulation for San Giovanni a Teducci neighborhood: a bottom-up approach

The Role-Playing Game (RPG) consists of techniques and methods engaging stakeholders in collaborative decision-making and actions, simulating scenarios in which participants can choose to interpret different roles, and fostering critical thinking and intrinsic motivation of involved people [81]. Such methods allow citizens to get more aware of the main issues and implications of planning and design processes, within conflicting perspectives and interests, enhancing communication and rationality in decision-making [50]. Indeed, RPG should support local communities and stakeholders to deal with complex situations, also improving the learning contents and facilitating debates about

real-world environmental, social and economic transformations of the neighborhood [82]. Nonetheless, the simulation process, through which participants become characters and play a role, poses itself as an abstraction of reality, Ryan [83] has demonstrated that the players attach real-life values to RPG outcomes and trigger knowledge exchanges also beyond the playground.

The main outcome of RPG has been focused on putting the designers and their ideas in the context of social change so that the interaction with citizens living in the district could address more circular and sustainable design actions [84]. In this study, RPG has been used to evaluate opportunities and threats about the three above-mentioned alternatives for the commercial port development and urban waterfront of San Giovanni a Teduccio neighborhood.

The operational purpose of the game has been addressed to get the preference order of the alternatives, computing the scoring of the participants' judgments. The simulation has been performed in the district of San Giovanni a Teduccio at the theatre, named "NEST", that has been representing for ten years a relevant point of cultural and social aggregation for the residents. Twelve people have been engaged in the game, and, thus, the same number of relevant actors has been selected from the four categories of the Stakeholders Map (Fig.4). The selected stakeholders are the followings:

- The president of the Port System Authority of the Central Tyrrhenian Sea (ADSP);
- The Mayor of Naples;
- The president of a cultural association;
- The president of the National Railway Company;
- The president of the Agency for Environmental Protection in Campania Region (ARPAC);
- The president of CONATECO (ship-owner);
- The director of Apple Academy in San Giovanni a Teduccio neighborhood;
- The president of Tirrenia Power factory;
- The tourist 1;
- The tourist 2;
- The journalist;
- The citizen.

A set of rules has been conceived by the promoters and conveyed to all the participants. The RPG lasted a total of an hour and thirty minutes divided into 3-time steps. The first time step - five minutes lasting - required game rules explanation; the second time step - one hour lasting - consisted in carrying out the game; while the third time step - twenty minutes lasting - led to the discussion and judgments aggregation. In a nutshell, the simulation has been focused on the following rules:

- Having the participants sit in a circle;
- Electing two facilitators with the task of moderating the discussion and reporting the results on a board;
- Asking participants to choose one role to be interpreted among selected eight stakeholders;
- Starting the first game round by having each participant declare at least three potentials and criticals in pursuing the three scenarios;
- Encouraging participants to express their concordance and discordance about each alternative through the Likert scale, ranging between 1 to 5; where 1 represents "strongly disapproving", 5 means "strongly approving", while 3 expresses indecisiveness;
- Stimulating a final debate in order to foster new ideas.

The results showed a convergence of preferences towards Alternative 1 - Tourist Port and Alternative 3 - Hybrid Port, which respectively reached 34 and 36 scores. It means that the strong need for economic development and public services for the neighborhood has been felt by participants. Furthermore, they imagined, through these alternatives, potentialities of urban regeneration not only for the harbour but also for the surrounding urban fabrics.

Finally, Alternative 2 - Commercial Development has been low scored since the players perceived strong economic interests for harbour operators and few benefits for citizens and the city. Moreover, they concerned about environmental costs in terms of urban congestion, marine, and air pollutions, waterfront abandoning and further closure of sea view from the mainland.

#### 4.2 The PROMETHEE method for top-down evaluation and scenarios analysis

Since strong conflicting values and interests among stakeholders coexist, and the decision-making problem needs to be structured involving multiple criteria, an optimisation method, that allows solving complex problems, has been chosen. The best-fit multicriteria method to achieve single and global preferences of alternatives within this type of decisional environment consists of an outranking method. Therefore, the “Preference Ranking Organization METHod for Enriched Evaluation” (PROMETHEE) has been adopted to elicit the alternative which outranks the others through a pairwise comparison procedure, also setting preference, indifference and incomparability thresholds among alternatives respect to each criterion [85,86].

As above mentioned, the set of selected criteria corresponds to Sustainability Indicators (Table 1), which have been used as proxies to measure Sustainability and Circular Economy values. Moreover, applying PROMETHEE to real-world cases allowed to quantify how much one alternative outranks the others according to the main institutional stakeholders' preference degree, with the purpose of selecting a compromise solution.

Problem formulation and outcomes have been achieved through the open-source software referred to as Visual PROMETHEE [53]. Four scenarios have been produced taking into account the visions of the most influential stakeholders engaged, which are:

- Port System Authority;
- Municipality of Naples;
- National Railways Company (RFI);
- Environmental Protection Agency (ARPAC).

Since it has not been feasible eliciting of precise weights per each criterion respect to the alternatives, the assessment has been performed setting the preference functions and threshold values according to the position of each stakeholder respect to the five domains and related indicators per each alternative. The stakeholders' visions have been inferred by public debate, lectures and focused meetings during the Second Level Master's course. The results highlight that Alternative 3 outranks the other into all the four scenarios, reaching positive scores both in the net outranking flows (Fig.6) and in aggregated flows visualization (Fig.7).

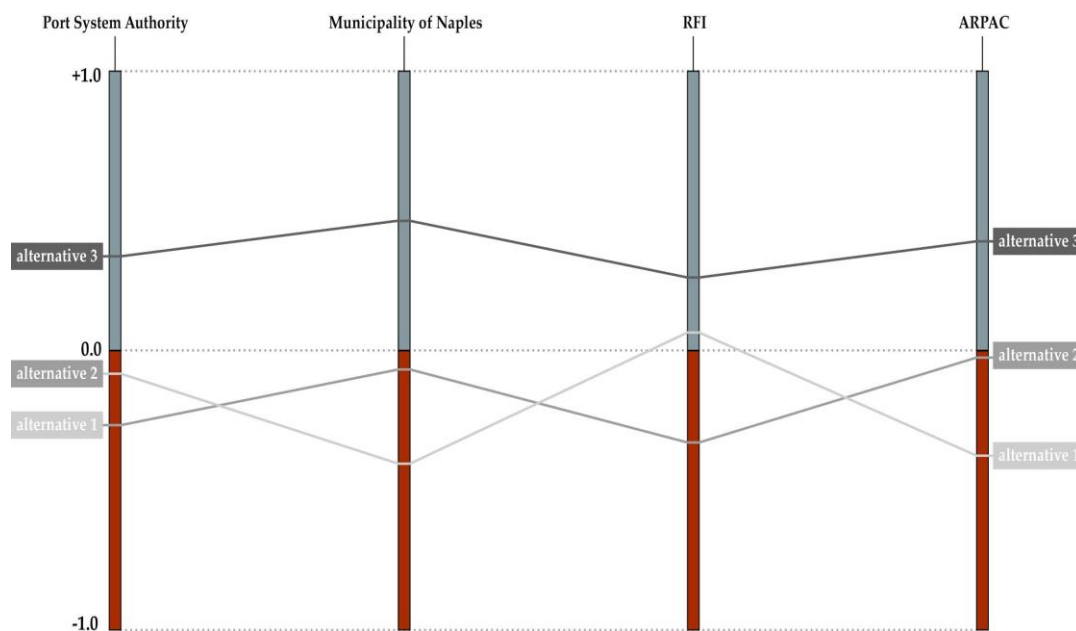
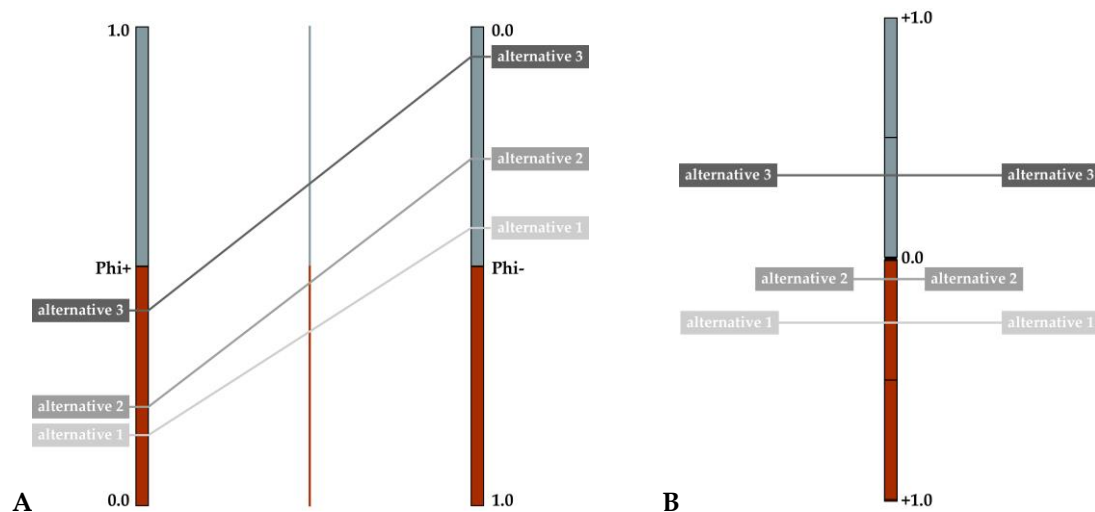
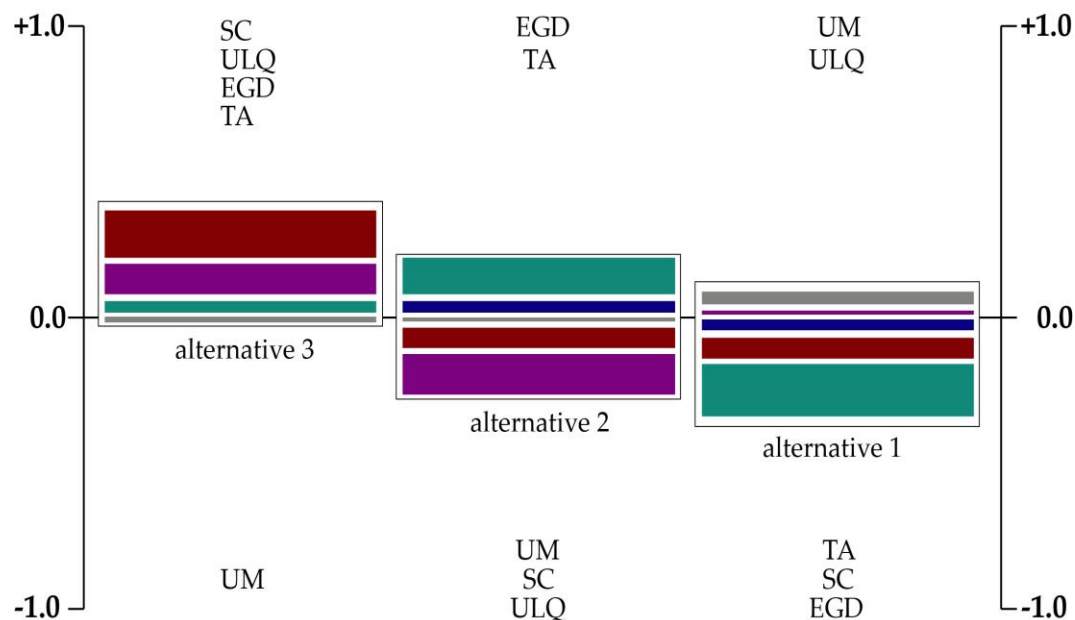


Figure 6. Net outranking flows diagram related to three alternatives scoring for the four scenarios.



**Figure 7.** PROMETHEE II outranking flows. Uni-criterion positive flow (f+) and uni-criterion negative flow (f-) [A]; net outranking complete flow as subtraction of negative flows from positive ones [B].

The bar chart in Figure 8 allowed to quantitatively define those criteria which determine the opportunities and threats for A1, A2, A3 alternatives (Figure 8). It is clear that Alternative 3 maximizes four of five criteria belonging to Society and Culture (SC), Urban Landscape Quality (ULQ), and Economic Growth and Development (EGD) dimensions, while Urban Metabolism (UM) dimension is located into a negative quadrant, as well as for Alternative 2. It means that almost all the stakeholders expect air quality index (UM1) worsening, which is supposedly correlated with the extension of the dock and increasing of big ships berthing. This critical issue related to UM into Alternatives 2 and 3 is compensated by positive flows of the other indicators.



**Figure 8.** Bar chart for criteria: opportunities and threats for A1, A2, A3 alternatives

Finally, the GAIA plane shows the similarities between alternatives and opportunities/threats of each in relation to one another, depicting respectively the criteria as lines and the alternatives as dots. The spatial distribution of criteria in the Euclidean space of the plane allows evaluating concordance among criteria in order to better visualize conflicts or synergies (Figure 9). In the GAIA plane is evident that Alternative 3 fosters synergies among criteria and it tries to reduce social, environmental and economic conflicts among the main stakeholder's scenarios.



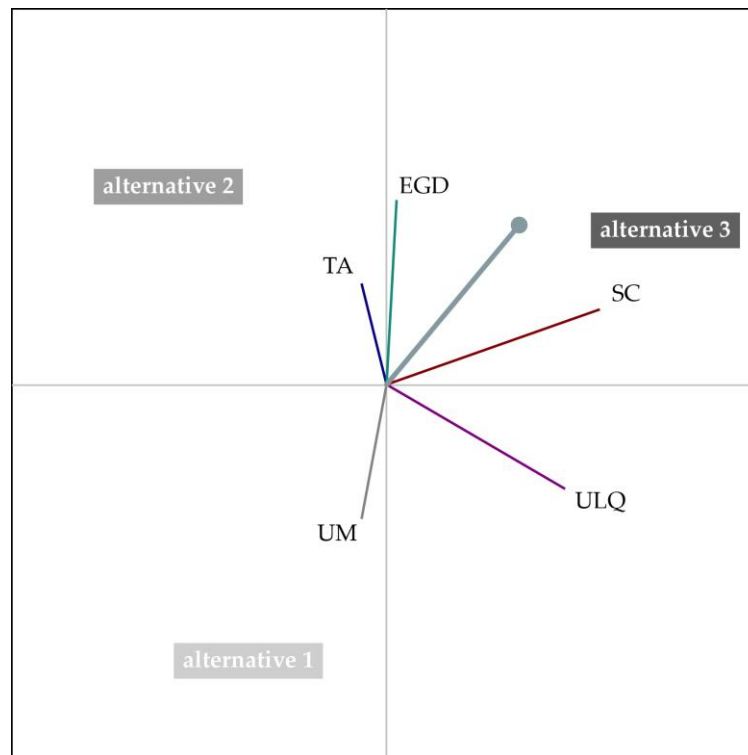


Figure 9. GAIA plane: A1, A2, A3 alternatives and synergies among criteria

In conclusion, the best-fit scenario that relates to Alternative 3 - Hybrid Development has been assumed as a guideline for the master plan drawing by observing the values of global flows per each alternative.

#### 4.3 San Giovanni a Teduccio development strategy: the masterplan

Within the interdisciplinary Second Level Master working group, the hybrid development strategy has been then further developed up to the masterplan definition. According to the aim of reconnecting urban fabric to the coastline, assuming urban layout as project grid, the localization of new attractive centralities, some of which located in correspondence of pre-existing urban landmarks, alongside the construction of driveway, pedestrian, cycle, rail, and port accessibility system has been expected. The master plan concept leverages the realization of a filtering area both uniting and separating urban and port functions through an infrastructure in which nature and construction coexist. The project area, indeed, stretching from “Via Marina dei Gigli” to “Via Pietrarsa”, developed itself on “Via San Giovanni a Teduccio”, including both some enclosed areas into the urban fabric and the coastline. “Via Vigliena”, “Corso Nicolangelo Protopisani”, “Viale Due Giugno” and “Via Principe di San Nicandro”, crossed by “Corso San Giovanni a Teduccio”, are the main lines of entry from urban pattern to the coastline and return. Behind the facade of buildings overlooking “Corso San Giovanni a Teduccio” largely residential, a passenger railway station served by areas used for interchange parking have been planned. Beyond the area on which extends the passenger railway, developing along the ancient Naples-Portici railway line, urban functions are expected. More generally, in addition to urban functions, the project includes a series of interventions also attributable to port and hybrid functional macro-categories. Below is a more detailed description.

Starting from the left, close to the former Cirio factory, recently redeveloped and currently used for San Carlo theater laboratory activities, an inner harbor area with distripark is envisaged in order to support all the activities related to logistics, rail gateway, import, and export.

Alongside the redevelopment of the ancient “Vigliena Fort”, the demolition of some residential buildings there located and the re-construction with the same functional purpose, as well as the

realization of an urban park has been planned. The ensuing stretch of coast has instead been intended for tertiary activities.

For the adjacent complex of buildings known as the ex Corradini factory, redevelopment work with the following settlement of an innovation hub has been envisaged. Including both working spaces and research centers, it is believed that hubs enable active knowledge transfer between researchers and business experts, on the one hand, and industry, government, and representatives of academia, on the other hand. The above-mentioned innovation hub has been moreover designed as part of a new local network. Within urban fabric, along “Corso Nicolangelo Protopisani”, and more specifically in Federico II University of Naples seat, indeed, Apple Academy center of innovation in research and industrial field is already situated. An innovative function has been also expected in the building placed on the upper side of the terminal container, facing the channel that separates the urban area from the port one. The building, connected to the coastal strip throughout a system of pedestrian crossings as well as cycle paths, develops itself along the edge of the terminal container, and arranges spatial flows, welcoming the urban ones, while separating them from trade port ones.

As part of the filtering area, located in front of the ex Corradini factory, the Tirreno Power electricity plant maintains its localization, although its access system has been significantly modified due to the new configuration of the coastline as per the blueprint.

Immediately East of the power plant, a leisure area that extends until the stretch of coast between the ex Corradini factory and the former treatment plant, has been planned. Not far from there, the already existing Massimo Troisi park within the urban fabric as well as the urban technological park on the right side of the terminal container as previewed by the plan are sited.

Going eastward stands the former treatment plant for which demolition, as well as redevelopment interventions, have been planned. Successively the realization of an eco-gym, an outdoor space provided with equipment capable of converting kinetic energy deriving from gymnastic movement into electrical energy, is expected.

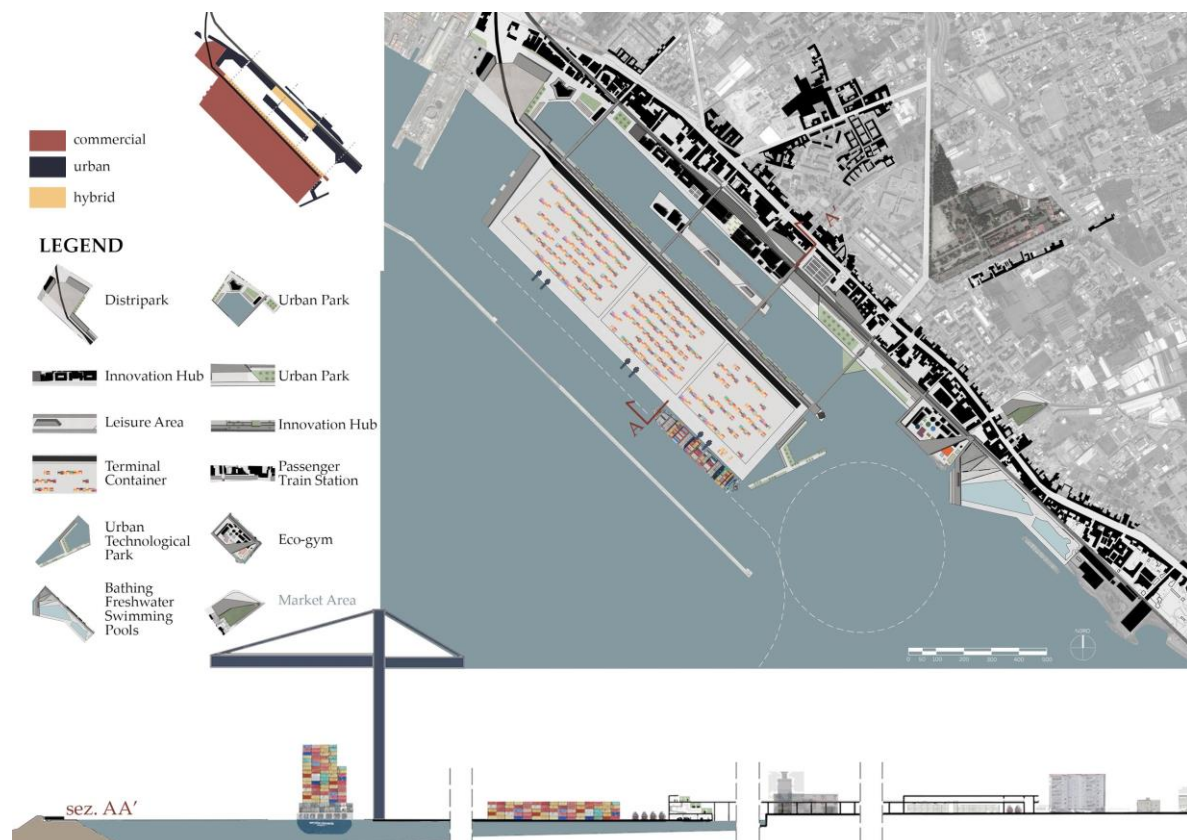


Figure 10. San Giovanni a Teduccio development strategy: the masterplan

In the successive stretch of coast between the former treatment plan and the current Pietrarsa Railway Museum, in response to user requests arisen from the local population, the construction of freshwater swimming pools is expected. In the evening hours of warm seasons, the same structure is intended to be also used as an outdoor theater. From there, traveling along “Via Principe di San Nicandro” located between the former treatment plant and the outdoor theater, a market area with covered parking can be attained. The masterplan also contemplates the construction of infrastructures in support of trade port functions. More in-depth, the expansion of the commercial quay is expected up to 1.2 km in length, i.e. from “Darsena di Levante” up to “Viale Due Giugno”. In order to facilitate cargo handling, indeed, in addition to terminal container extension, the quay is envisaged to be equipped with a lookout tower as well as with a devoted freight railway.

## 5. Discussion and Conclusions

The adaptive and multi-methodological decision-making process for the Naples city-port strategies development has made it possible to identify the significant components that can influence the construction of place-based choices, with attention to the specific reality of the context analyzed in order to implement the CCM. The goal of the methodological path, processing an integrated methodology to define and evaluate new solutions for a circular city-port, joining hard and soft knowledge, was implemented by combining a multidimensional evaluation approach, the selection of SIs and the development of the stakeholders' map.

Among the four operational steps that characterize the process, the first, the problem structuring, represents the most complex one, in which the premises of the decision-making process were built and the dynamics that influenced the choices were explored. In this phase, the existing conflicting issues were analyzed, the SIs were chosen within the SDGs domains, the stakeholders 'map and the stakeholders' internalization process were elaborated, and the decisional flows were identified. In particular, the selection of the indicators with which to analyze the city-port system and evaluate the impacts of the intervention alternatives has made it possible to integrate the SDGs with the SIs, taking into account both the categories relevant to the issues consistent with the general objectives of the process and specificities of the context, identifying place-based indicators useful for describing how to make the CCM operational. The selection of the relevant domains (Economic Growth and Development, Traffic Accessibility, Urban Metabolism, Society and culture, Urban Landscape Quality) and the related indicators has made it possible to structure an evaluation matrix with which to analyze the critical areas and potential of the study area and, subsequently, to verify the impacts determined by the three alternatives.

In the second operational step, defining alternatives, the interaction between multidisciplinary skills (planning, urban design, port infrastructure engineering, transport and logistics, hydraulics, and urban economy) allowed to identify three main alternatives of transformation and regeneration of the area in examination, highlighting the different opportunities that each is capable of generating and, at the same time, the ways in which to resolve both urban and territorial critical issues. In this phase, the identification of the project actions that make up each alternative was particularly significant because it allowed the different knowledge to compare and interact, identifying win-win potentials.

In the third operational step, the evaluation of alternatives made it possible to integrate the bottom-up approach with the top-down one, taking into account feed-backs deriving from each one, capable of improving the technical evaluation and the social evaluation. The technical assessment was developed through a multi-criteria analysis, using the PROMETHEE method, and was structured in order to take into account the criteria and indicators selected in the first operational step, but also to bring together the points of view of the main stakeholders, in the attempt to identify the opportunities of coalitions and alliances.

The social assessment was carried out using the RPG approach, which made it possible to make explicit the key role of interaction with stakeholders and to verify the need to accompany the decision-making process with constant opportunities for discussion and integration between interests and skills to reach a shared vision, which reflects the needs of the players involved, their

ability to influence the decision-making process and to feel an active and proactive part of territorial transformations.

In the fourth step, the preferences comparison made it possible to integrate the PROMETHEE method with the RPG approach, analyzing with the first the impacts of the alternatives with respect to the domains of the selected SDGs and identifying with the second the scoring attributed by the main stakeholders of the decision-making process (Port System Authority; Municipality of Naples; National Railways Company (RFI); Environmental Protection Agency (ARPAC). The results of this phase have allowed outlining the actions that characterize the masterplan, in which the CCM strategy becomes operational, highlighting how the interventions they represent not only an opportunity for urban and territorial regeneration but also a way to activate a process of collaborative engagement and involvement among the different stakeholders.

The structured decision-making process allows testing how an adaptive approach is appropriate to expand the information and knowledge base underpinning policy design and decisions with the goal of achieving better outcomes and cultivating broad civic and technical engagement that can enhance the political legitimacy of policy action [48]. Indeed, adaptive decision-making takes into account the complexity of interlinked social, technological, ecological and economic development relating to the contingency of human action in a context of long-term systems change [87], in which nonlinear, interdependent and pervasive processes entail the continuous monitoring and modulation of ongoing processes, with the revision of planning and policy tools and recalibration of goals. Through and experimentation so structured, decision-makers can pragmatically appraise how various options perform in the field and thus draw on strategies that are appropriate to specific circumstances and tailored to unfolding developments [88].

Incorporating evaluation methods, able to combine top-down and bottom-up approaches, into adaptive decision-making and governance processes is a crucial point and can be essential for identifying the change in a transition context. An adaptive approach becomes flexible to meet the challenge of that change and enable progressive and mutual learning on the individual, community, institutional, and policy levels, while seeking to overcome the substantial gap between theory and practice [48, 89]. At the same time, the CE, as a relevant topic for the city-port future, recognizes the environmental and sustainable values as essential to support the transition. Within the Integrated Maritime Policy of the European Union [19,20,39], Maritime Spatial Planning is identified as a central tool for managing coastal areas and maritime governance, recognizing planning as a decision-making process and as a cross-sectoral political tool that allows public authorities and stakeholders to apply an integrated, coordinated and cross-border approach. Through the Maritime Spatial Planning process, within a coherent and transparent decision-making framework, able to take into account the multi-dimensional, multi-actor and multi-disciplinary nature of the port system, it is intended to implement appropriate policies for city-port sustainable development.

In this perspective, Maritime Spatial Planning can support the implementation of CCM, expression of the circular city-port, characterized by high connectivity and smart infrastructure, enabling high-quality services, with a low environmental footprint, good city design, sustainable lifestyles, empowered local actors and participatory approaches [43]. This approach implicates the need of a different governance, capable of developing long-term integrated and multidimensional shared sustainable development programs, in which public institutions and the government work with active civil society, researchers, entrepreneurs, NGOs [10,56,90], where circular transition, as sustainable transition, requires broader engagement, empowerment, and breakthrough strategies, able to enable, facilitate, and direct social innovation processes towards adaptive and innovative urban future [91]. The city-port is the context where the different types of integration take place, and where it is possible to manage the circular transition, stimulating territorial productivity, economic development and social cohesion. In this perspective, the Port Authorities and the Municipalities are therefore called to carry on circular transformation operations and to build processes of dialogue and interaction between the different stakeholders, in order to guide and support the port's development in a perspective of recomposition and integration with the city.



**Author Contributions:** The authors jointly conceived and developed the approach and decided on the overall objective and structure of the paper. In particular, conceptualization and methodology, Maria Cerreta; formal analysis, investigation, and validation, Eleonora Giovane di Girasole; methodology, software, and validation, Giuliano Poli; investigation, data curation, and software, Stefania Regalbuto. The authors jointly contributed to the writing of the paper and have read and approved the final version.

**Funding:** This research received no external funding.

**Acknowledgments:** The research presented in this paper has been developed within the Second Level Master in "Sustainable Design and Planning of Port Areas", Department of Architecture (DiARC), University of Naples Federico II, and it is part of the Italian research Project of Relevant National Interest (PRIN, 2015), "Metropolitan cities: territorial economic strategies, financial constraints, and circular regeneration", coordinated by the Polytechnic of Milan.

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

## References

1. European Commission. *Urban agenda for the EU Multi-level governance in action*; European Union: Brussels, Belgium, 2019.
2. Annoni, P.; Dijkstra, L. *The EU Regional Competitiveness Index 2019*; European Union: Luxembourg, Luxembourg, 2019.
3. ENEL (Ente nazionale per l'energia elettrica). *Circular cities Cities of tomorrow*. 1<sup>st</sup> ed.; [https://www.enel.com/content/dam/enel-com/media/document/cities-of-tomorrow\\_en.pdf](https://www.enel.com/content/dam/enel-com/media/document/cities-of-tomorrow_en.pdf), 2018.
4. ENEL (Ente nazionale per l'energia elettrica). *Circular cities Cities of tomorrow*. 2d ed.; [https://corporate.enel.it/content/dam/enel-it/media/documenti/circular-cities-cities-of-tomorrow\\_en.pdf](https://corporate.enel.it/content/dam/enel-it/media/documenti/circular-cities-cities-of-tomorrow_en.pdf), 2019.
5. Eurocities. *Full Circle. Cities and the Circular Economy*; Eurocities: Brussels, Belgium, 2017.
6. Ellen MacArthur Foundation. *Circular Economy in Cities: Project Guide*. [https://www.ellenmacarthurfoundation.org/assets/downloads/CE-in-Cities-Project-Guide\\_Mar19.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/CE-in-Cities-Project-Guide_Mar19.pdf), 2019.
7. Fusco Girard, L.; Nocca, F. Moving Towards the Circular Economy/City Model: Which Tools for Operationalizing This Model?. *Sustainability* **2019**, 11(22), 6253. doi.org/10.3390/su11226253.
8. Fusco Girard, L. Toward a Smart Sustainable Development of Port Cities/Areas: The Role of the Historic Urban Landscape Approach. *Sustainability* **2013**, 5, 4329–4348. doi.org/10.3390/su5104329.
9. Jonker, J.; Montenegro Navarro, N. *Circular City Governance. An explorative research study into current barriers and governance practices in circular city transitions across Europe*. <https://circulareconomy.europa.eu/platform/sites/default/files/circular-city-governance-an-explorative-research-study-into-current-barriers-and-governance-practices-in-circular-city-transitions-across-europe-2018.pdf>.
10. Predeville, S.; Cherim, E.; Bocken, N. Circular Cities: Mapping Six Cities in Transition. *Environmental Innovation and Societal Transitions* **2018**, 26, 171–194. doi.org/10.1016/j.eist.2017.03.002.
11. Bonato, D.; Orsini, R. Chapter 12 - Urban Circular Economy: The New Frontier for European Cities' Sustainable Development. In *Sustainable Cities and Communities Design Handbook. Green Engineering, Architecture, and Technology*, 2nd ed., Clark, W.W., Ed.; Elsevier, 2018, pp. 235–245.
12. Hein, C. *Port Cities. Dynamic Landscapes and Global Networks*, 1st ed.; Routledge: Milton Park, Abingdon, Oxfordshire, 2011.
13. Hein, C. *Adaptive Strategies for Water Heritage. Past, Present and Future*; Springer: Cham, Switzerland, 2020.
14. Geissdoerfer, M.; Savaget, P.; Bocken, N.M.P.; Hultink, E.J. The Circular Economy - A new sustainability paradigm? *J. Clean. Prod.* **2017**, 143, 757–768.
15. Clemente, M.; Demarco, D.; Giovane di Girasole, E. Rigenerazione delle città dal mare per una crescita sostenibile. *Planum. The Journal of Urbanism* **2013**, 2(27), [www.planum.net](http://www.planum.net).
16. Clemente, M. *Città dal mare. L'arte di navigare e l'arte di costruire le città*. Editoriale Scientifica: Napoli, 2011.

17. Ducruet, C. The port city in multidisciplinary analysis. In *The port city in the XX1st century: New challenges in the relationship between port and city*, Alemany, J.; Bruttomesso, R., Eds., RETE, pp.32-48, 2011. ffhalshs-00551208f
18. Hoyle, B.S. The Port-city Interface: Trends, Problems and Examples, *Geoforum* **1989**, 20, 429-435.
19. Commission for Territorial Cohesion Policy and EU Budge (COTER-VI/018). 121st plenary session, 8 and 9 February 2017, Opinion, Regeneration of Port Cities and Port Areas; European Committee of the Regions: Bruxelles, Belgium, 2017, <http://edz.bib.uni-mannheim.de/edz/doku/adr/2016/cdr-2016-5650-en.pdf>.
20. European Commission. Ports 2030. Gateways for the Trans European Transport Network; Communication from the Commission, COM(2013)295, [https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/brochures\\_images/ports2013\\_brochure\\_lowres.pdf](https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/brochures_images/ports2013_brochure_lowres.pdf).
21. Russo, M. Waterfront portuale. Paesaggi e potenzialità di uno spazio conteso/Harbour waterfront: landscapes and potentialities of a con tended space. *TRIA* **2014**, 7(2), 235-250.
22. Cerreta, M.; De Toro, P. Integrated Spatial Assessment (ISA): A Multi-Methodological Approach for Planning Choices. In *Advances in Spatial Planning*; Burian, J. Ed; IntechOpen: Rijeka, Croatia, 2012; pp. 77-108. doi: 10.5772/35417. Available from: <https://www.intechopen.com/books/advances-in-spatial-planning/integrated-spatial-assessment-isa-a-multi-methodological-approach-for-planning-choices>.
23. Carta, M. Nuovo dividendo culturale per le politiche di sviluppo del Mediterraneo. *Economia della Cultura* **2016**, 26, 57-62.
24. Fonti, L. Porti-città-territori. Processi di riqualificazione e sviluppo; Alinea Editrice: Roma, 2010.
25. Bruttomesso, R. Waterfronts. A new frontier for cities on water; Edizioni Città d'acqua: Venice, 1993.
26. European Commission. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Closing the Loop - An Eu Action Plan For The Circular Economy; COM(2015) 614 final: Brussels, Belgium, 2015.
27. Murray, A.; Skene, K.; Haynes, K. The Circular Economy: An interdisciplinary exploration of the concept and application in a global context. *Journal of Business Ethics* **2017**, 140, 369-380. doi: 10.1007/s10551-015-2693-2.
28. Ayres, R.U.; Ayres, L.W. A handbook of industrial ecology; Edward Elgar: Cheltenham, UK, 2002.
29. Prendeville, S.; Cherim, E.; Bocken, N. Circular cities: Mapping six cities in transition. *Environmental Innovation and Societal Transitions* **2018**, 26, 171-194.
30. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development; A/RES/70/1, 2015. Available online: [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E) (accessed on 30 November 2019).
31. Ellen MacArthur Foundation. Cities in the Circular Economy: An Initial Exploration; 2017.
32. Haas, W.; Krausmann, F.; Wiedenhofer, D.; Heinz, M. How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005. *Journal of Industrial Ecology* **2015**, 19(5), 765-777.
33. Lahti, T.; Joakim Wincent, J.; Parida, V. A Definition and Theoretical Review of the Circular Economy, Value Creation, and Sustainable Business Models: Where AreWe Now and Where Should Research Move in the Future? *Sustainability* **2018**, 10, 2799; doi:10.3390/su10082799.
34. Mat, N.; Cerceau, J. Economie circulaire et stratégies portuaires, *Note Stratégique et Prospective*, Fondation Sefacil, 2015.
35. Merk, O.; Dang, T. The Effectiveness of Port-City Policies; a comparative approach. OECD Regional Development Working Papers **2013**, 25, 1-36, <http://search.oecd.org/cfe/regional-policy/WP%20Effectiveness%20port-city%20policies.pdf>
36. Gravagnuolo, A.; Angrisano, M.; Fusco Girard, L. Circular Economy Strategies in Eight Historic Port Cities: Criteria and Indicators Towards a Circular City Assessment Framework. *Sustainability* **2019**, 11, 3512.
37. Di Palma, M. L'economia Circolare: una sfida culturale per le città portuali creative. *BDC* **2017**, 17(1), 99-124.
38. United Nations (UN). Implementation of Agenda 21, the Programme for the Further Implementation of Agenda 21 and the outcomes of the World Summit on Sustainable Development and of the United Nations Conference on Sustainable Development. Report of the Secretary-General. 2018. [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/73/204&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/73/204&Lang=E)
39. European Parliament EP). Directive 2014/89/EU of the European parliament and of the council of 23 July 2014 establishing a framework for maritime spatial planning, 2014. Available online: <http://eur->

- lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\_.2014.257.01.0135.01.ENG%20 (accessed on 30 November 2019).
40. Cerreta, M.; Poli, G.; Regalbutto, S.; Mazzarella, C.A Multi-dimensional Decision-Making Process for Regenerative Landscapes: A New Harbour for Naples (Italy). In *Computational Science and Its Applications – ICCSA 2019. ICCSA 2019. Lecture Notes in Computer Science*; Misra, S. et al., Eds.; Springer: Cham, Switzerland, 2019; Volume 11622, pp. 156-170.
  41. World Bank. Atlas of Sustainable Development Goals 2017: World Development Indicators. Washington, DC: World Bank, 2017. doi:10.1596/978-1-4648-1080-0.
  42. Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G. Sustainable Development Report 2019. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN), (2019).
  43. TWI2050. The World in 2050. The Digital Revolution and Sustainable Development: Opportunities and Challenges. Report prepared by the World in 2050 initiative. International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, 2019. www.twi2050.org.
  44. Wackernagel, M.; Hanscom, L.; Lin, D. Making the Sustainable Development Goals Consistent with Sustainability. *Front. Energy Res* **2017**, 5(18), 1-5. doi: 10.3389/fenrg.2017.00018.
  45. Ministero delle Infrastrutture e dei Trasporti. Decreto legislativo n. 201 del 17/10/2016. Attuazione della direttiva 2014/89/UE che istituisce un quadro per la pianificazione dello spazio marittimo. <https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2016-10-17;201>
  46. European MSP Platform. Maritime Spatial Planning Country Information. Italy. EU MSP Platform, 2018. www.msp-platform.eu.
  47. Cerreta, M.; Concilio, G.; Monno, V. Making Strategies in Spatial Planning: Knowledge and Values; Springer: Berlin, Germany, 2010.
  48. Cerreta, M.; Diappi, L. Adaptive Evaluations in Complex Contexts: Introduction. *Italian Journal of Regional Science* **2014**, 13(1), 5-22.
  49. Jordan, A.J.; Turnpenny, J.R. The Tools of Policy Formulation: Actors, Capacities, Venues and Effects; Edward Elgar Publishing: Cheltenham, UK, 2015.
  50. Boess, S.; Saakes, D.; Hummels, C. When is role playing really experiential?: case studies. In Proceedings of the 1st international conference on Tangible and embedded interaction; pp. 279-282.
  51. Ackermann, F.; Eden, C. Strategic management of stakeholders: Theory and practice. *Long range planning* **2011**, 44, 179-196.
  52. Bana e Costa, C. *Readings in Multiple Criteria Decision Aid*. Springer-Verlag: Berlin, Germany, 1990.
  53. Mareschal, B. (2013) Visual PROMETHEE 1.4 Manual. Available at: www.Promethee-Gaia.Net (accessed: 20 September 2019).
  54. Brans, J.P.; Mareschal, B.; Vincke, Ph. How to select and how to rank projects: The PROMETHEE method. *European Journal of Operational Research* **1986**, 24(2): 228–238.
  55. Berger, A. Drosscape: wasting land urban America; Princeton Architectural Press: 2007.
  56. Daamen, T. Sustainable development of the European port-city interface. In Proceedings of ENHR-conference. June; pp. 25-28.
  57. Van de Ven, F.; Tjallingii, S.; Baan, P.; Van Eijk, P.; Rijsberman, M. Improving urban water management planning. In Proceedings of Proceedings of the international symposium on lowland technology, Saga; pp. 573-578.
  58. Cerreta, M.; Poli, G. Landscape services assessment: a hybrid multi-criteria spatial decision support system (MC-SDSS). *Sustainability* **2017**, 9, 1311.
  59. United Nations (UN). Agenda 21. United Nations Conference on Environment & Development Rio de Janeiro, Brazil, 3 to 14 June 1992. <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.
  60. United Nations (UN). 66/288. The future we want. Resolution adopted by the General Assembly on 27 July 2012, [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/66/288&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E).
  61. Hák, T.; Janoušková, S.; Moldan, B. Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators* **2016**, 60, 565-573.
  62. Eurostat. Getting messages across using indicators. A handbook based on experiences from assessing Sustainable Development Indicators; Luxembourg, 2014.
  63. Rodriguez-Anton, J.; Rubio-Andrada, L.; Celemin-Pedroche, M.; Alonso-Almeida, M. Analysis of the relations between circular economy and sustainable development goals. *International Journal of Sustainable Development & World Ecology* **2019**, 1-13.
  64. Ward, S.; Chapman, C. Stakeholders and uncertainty management in projects. *Construction management and economics* **2008**, 26, 563-577.
  65. Rose, K.H. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition. *Project management journal* **2013**, 44, e1-e1.

66. Brown, R.R.; Clarke, J.M. Transition to water sensitive urban design: The story of Melbourne, Australia; Facility for Advancing Water Biofiltration, Monash University Melbourne: 2007; Vol. 7.
67. De Graaf, R.; Van Der Brugge, R. Transforming water infrastructure by linking water management and urban renewal in Rotterdam. *Technological Forecasting and Social Change* **2010**, *77*, 1282-1291.
68. Rijke, J.; Farrelly, M.; Morison, P.; Brown, R.; Zevenbergen, C. Towards improved urban water governance in Adelaide, Australia. In Proceedings of 12th International Conference on Urban Drainage, Porto Alegre, Brazil; pp. 11-16.
69. Eden, C.; Huxham, C. Action research for the study of organizations. *British Journal of Management* **1996**, *7*(1), 75-86.
70. Freeman, R.E. Strategic Management: A Stakeholder Approach. Pitman Publishing: Boston, MA, 1984.
71. Freeman, R.E.; McVea, J. A stakeholder approach to strategic management. The Blackwell handbook of strategic management 2001, 189-207.
72. Greenwood, M. Stakeholder Engagement: Beyond the Myth of Corporate Responsibility. *J Bus Ethics* **2007**, *74*, 315-327. doi:10.1007/s10551-007-9509-y
73. Burchell, J.; Cook, J. Stakeholder dialogue and organisational learning: changing relationships between companies and NGOs. *Business Ethics: A European Review* **2008**, *17*(1), 35-46.
74. Danker, M. Understanding Stakeholder Activism, Managing Transparency Risk. In The Governance of Risk (Developments in Corporate Governance and Responsibility, Vol. 5), Crowther, D.; Aras, G., Eds., Emerald Group Publishing Limited, Bingley, 2013, pp. 33-72. doi.org/10.1108/S2043-0523(2013)0000005006.
75. Esben Rahbek Pedersen, E.R. Making Corporate Social Responsibility (CSR) Operable: How Companies Translate Stakeholder Dialogue into Practice. *Business and Society Review* **2006**, *11*(2), 137-163.
76. Van De Ven, A.H.; Poole, M.S. Alternative approaches for studying organizational change. *Organization Studies* **2005**, *26* (9), 1377-1404.
77. Nared, J.; Bole, D. Participatory Research and Planning in Practice, Eds.; Springer: Berlin, Germany, 2020.
78. Waddock, S. Integrity and mindfulness: foundations of corporate citizenship. In Perspectives on Corporate Citizenship, Andriof, J.; McIntosh, M., Eds; Greenleaf Publishing: Sheffield, 2001, pp. 25-38.
79. Burchell, J.; Cook, J. CSR, Co-optation and Resistance: The Emergence of New Agonistic Relations Between Business and Civil Society. *Journal of Business Ethics* **2013**, *115* (4): 741-754. doi: 10.1007/s10551-013-1830-z.
80. McNamee, S.; Gergen, K.J. Relational responsibility: Resources for sustainable dialogue, Eds.. Sage Publications, Inc.: Newbury Park, California, 1999.
81. Salvini, G.; van Paassen, A.; Ligtenberg, A.; Carrero, G.C.; Bregt, A.K. A role-playing game as a tool to facilitate social learning and collective action towards Climate Smart Agriculture: Lessons learned from Apuí, Brazil. *Environmental Science & Policy* **2016**, *63*, 113-121, doi: https://doi.org/10.1016/j.envsci.2016.05.016.
82. Arias, E.G. Bottom-up neighbourhood revitalisation: a language approach for participatory decision support. *Urban Studies* **1996**, *33*, 1831-1848.
83. Ryan, T. The role of simulation gaming in policy-making. *Systems Research and Behavioral Science: The Official Journal of the International Federation for Systems Research* **2000**, *17*, 359-364.
84. Franqueira, T. Creative Places for Collaborative Cities: Strategies to enable the convergence of groups of people and organizations for a sustainable urban reactivation. Unpublished PhD Thesis, Politecnico di Milano, Milan, 2009.
85. Figueira, J.; Greco, S.; Ehrgott, M. Multiple criteria decision analysis: state of the art surveys; Springer Science & Business Media: Berlin, Germany, 2005; Vol. 78.
86. Ishizaka, A.; Nemery, P. Multi-criteria decision analysis: methods and software; John Wiley & Sons: Hoboken, New Jersey, 2013.
87. Voß J.P.; Kemp R. Sustainability and Reflexive Governance: Introduction. In Reflexive Governance for Sustainable Development, Voß J.P., Bauknecht D., Kemp R., Eds., Cheltenham: Edward Elgar., 2006, 3-28. doi: 10.4337/9781847200266.00009.
88. Michel D. Foxes, Hedgehogs, and Greenhouse Governance: Knowledge, Uncertainty, and International Policy-making in a Warming World. *Applied Energy* **2009**, *86*(2): 258-264. doi: 10.1016/j.apenergy.2008.05.004.
89. Arvai J.L.; Froschauer A. Good Decisions, Bad Decisions: the Interaction of Process and Outcome in Evaluations of Decision Quality. *Journal of Risk Research* **2010**, *13*(7): 845-859. doi: 10.1080/13669871003660767.
90. Loorbach, D.; Wittmayer, J.M.; Shiroyama, H.; Fujino, J.; Mizuguchi, S. Governance of Urban Sustainability Transitions. European and Asian Experiences; Eds., Springer: Germany, 2016.
91. Avelino, F.; Wittmayer, J. Shifting Power Relations in Sustainability Transitions: A Multi-actor Perspective. *Journal of Environmental Policy and Planning* **2016**, *18*(5): 628-649.