An SMCE Approach for Developing Integrated and Shared Strategies for the Port City of Brindisi

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Abstract. Within port cities, marine and coastal resources' exploitation is strongly influenced by interaction patterns existing among the actors living, working and managing such territories. This complexity raises questions about how the physical space can be regulated and how relational configurations between agents can be agreed and formalised.

In the port city of Brindisi (Southern Italy), strategic development and planning choices are marked by constant tensions: the community's aspiration to recover from decades of top-down industrialisation face the separation between port and urban planning policies, thus resulting in a conflictual decision-making. Port city planning and policymaking need to be supported by evaluation practices in order to face the complexity both in terms of sustainable port economy, coastal territory uses, and in terms of building a fair, participatory and effective decision-making process. The application of SOCRATES tool, implementing the principles of the Social Multi-Criteria Evaluation (SMCE) methodological framework, allows the identification of the most favourable sustainable development scenario for the Brindisi context, and takes into account the points of view and the possible alliances arising among the different social groups and actors involved. Adopting evaluation as an ex-ante support tool for spatial and maritime planning makes it possible to identify objectives, design site-specific scenarios and select the most preferable alternative. This valuation approach helps to combine a complex and multidimensional strategy, integrating economic, social, environmental and cultural values, and favours the building of shared transformative policies, engaging all actors involved into a participatory decision-making process.

Keywords: Port City Planning · SOCRATES · SMCE

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1 Introduction

The port city concept has evolved over time. Initially characterised by a spontaneous development symbiosis, it was transformed by the port industrialisation process, which resulted in the separation between settlements and coastal infrastructure [1, 2].

Despite their economic importance, port operations generate significant environmental externalities and pressure, including air and noise pollution, soil degradation, habitat loss, and traffic congestion [3–6]. The increasing functional specialization of ports has also led to a rupture in public perception, diminishing their recognizability and integration within the urban fabric. This detachment has contributed to a fragmentation in governance between ports and cities, intensifying conflicts among the various stakeholders who influence, or are affected by, port-driven transformations [7–11].

Port cities thus offer exemplary contexts for studying economic activities and anthropogenic effects on the natural environment, and at the same time considering public-private-social agreements through which coastal management and transformative decisions are taken. Consequently, port cities represent key areas for rethinking transformation and development paradigms, addressing the complexity of their dimensions and interests, and meeting international sustainability frameworks [12–14].

The International Association for Port Cities (AIVP) has specifically contextualized the SDGs, a comprehensive reference for reorienting development policies, for port cities' context, identifying key challenges and levers for promoting sustainability [15]. Among these are energy transition processes to safeguard natural resources and ecosystems–Goals 2; the development of soft mobility strategies enhancing access to port areas and supporting maritime cultural heritage valorisation–Goals 3 and 6; finally innovative, participatory governance models fostering joint pathways combining port and urban development–Goals 4 and 8.

Following the examination of sustainability frameworks in port cities, two key issues emerge: first, the economic models that underpin port productivity and efficiency; and second, the governance mechanisms through which stakeholders plan, manage, and make decisions affecting the broader coastal and urban territory.

The New Approach for a Sustainable Blue Economy in the EU (2021) proposes a novel economic model for ports, identifying sectors such as renewable marine energy, blue biotechnology, sustainable fisheries, aquaculture, and coastal tourism as main activities for the sustainable use of marine and coastal resources [16]. Among these, tourism could represent a strategic and socially favourable economic sector for coastal communities, although its uncontrolled spread could cause environmental degradation and tensions among residents [17]. In response, various studies [18–20] and international organizations [21], have proposed the concept of Circular Tourism, which seeks to minimize externalities and reorient port-city development strategies toward the enhancement of both tangible and intangible heritage.

Looking at port governance, ESPO [22] also emphasised the role of engagement and participation as crucial tools to improve the effectiveness and soundness of policy-making. Best practices include the use of public art, spatial activation, and multimedia communication to foster public support for port activities, strengthen citizen collaboration in improving port-city interface areas, and educate younger generations who may enter the maritime sector [23].

The wide range of emerging themes and strategic insights on the global stage contrasts with the still fragmented approach to port city planning, which oscillates between the imperative to maximise port productivity and the need to restore coastal and urban environments. Furthermore, the spatial scales at which these planning efforts operate are diverse, ranging from narrow, infrastructure-focused approaches to broader territorial considerations that account for the port's regional influence [24].

In this context, evaluation methods, particularly Multi-Criteria Decision Analysis (MCDA) [25–27], can serve as a valuable tool to reconcile competing planning objectives. By integrating economic, social, environmental, and cultural values, these methods support the ex-ante development of sustainable transformation scenarios [28]. In particular, this contribution intends to underline the valuable role that Social Multi-Criteria Evaluation (SMCE) [29] could play in port city planning. The SMCE framework enables the integration of operational evaluation criteria with the value preferences expressed by social groups engaged in the decision-making process. The objective is to explore how the inclusion of multiple actors and value systems [30] in a real-world context can generate synergistic, place-based, and sustainable solutions, challenging conventional development models and contributing to the innovation of urban-port policy. The main focus is on the ability to integrate SMCE into spatial planning in order to produce shared strategies for the transformation of complex port territories.

This research—part of the E.E.CO Culture Brindisine project, developed within the Second-Level Master's Program in Sustainable Planning and Design of Port Areas (MPPSAP) and doctoral research activities at the Department of Architecture, University of Naples "Federico II"—explores the opportunities offered by adopting an SMCE approach through the SOCRATES (Social Multi-Criteria Assessment of European Policies) tool [31], applied to the specific context of policy-making in Brindisi concerning port and city planning.

Brindisi, located in Southern Italy, is a significant case study, characterised by pronounced conflicts among stakeholders and the contradiction between coastal environment potential and industry-based port economy. Brindisi represents a potentially paradigmatic case for other Mediterranean port cities, that are currently struggling between maritime economic growth and enhancement of landscape and ecological heritage, as they address port-city interaction.

The contribution is structured as follows: Sect. 2 describes the case study of Brindisi; Sect. 3 focuses on the adopted methodology and its phases; Sect. 4 presents the results of the SMCE application; Sect. 5 offers a discussion of the findings and the conclusions.

2 Case Study: The Port City of Brindisi

In order to understand how evaluation can support the planning processes of port cities, contributing to the integration of different development objectives and considering the ambitions and trends expressed by the involved stakeholders, the SMCE evaluation model [29] has been applied to the case study of Brindisi, Apulia Region, Italy.

Brindisi is historically tied to its port, representing, since its pre-Roman origins, a strategic hub for Mediterranean maritime trade. In Roman times, the Via Appia reached its endpoint in the port of Brindisi, highlighting the port's commercial and military

importance through the Middle Ages. In the 19th century, the port regained strategic relevance, becoming a main commercial hub for routes toward the Suez Canal and the East, strengthening connections between Europe and its Asian colonies [32, 33]. As a result, the city retains a rich historical-archaeological heritage, including evidence of urban settlement such as the historic center and the "Punta delle Terrare" archaeological area, as well as the rural masseria system. These heritage assets are currently threatened by industrial pressure and peripheral urban expansion.

From an environmental perspective, the territory of Brindisi features a flat, agriculturally oriented landscape shaped over time by waterways that have deeply carved the coastal profile, leading to the presence of coastal wetlands. The erosive action of these watercourses contributed to the formation of the port's unique configuration: an inner bifurcated basin surrounding the historic city. The hydrographic system of surface and groundwater is severely compromised by ecological degradation, morphological alteration, artificialization, and pollution, resulting in the port and its surrounding areas being designated as a Site of National Interest (SIN) [34, 35].

From an infrastructural standpoint, Brindisi has a complex intermodal system integrating the port, railway network, road arteries, and airport. The port is organized into three basins with distinct functions, serving passengers, recreational, logistical, and freight activities. It is supported by a specialized industrial hinterland focused on fossil-fuel energy and chemical production. The interface areas between port and city are partially compromised by military zones and airport facilities, limiting accessibility and the full enhancement of the urban waterfront and coastal landscape.

This case study was selected for its distinctive features, which make it particularly relevant for the adoption of evaluation tools and methods capable of capturing and enhancing its inherent complexity. Firstly, the implementation of industrialization policies from the second half of the 20th century, which led to a significant expansion of port infrastructure driven by top-down decisions, contributed to sea and coast pollution through predominantly fossil-fuel and chemical-based activities. Secondly, a high level of conflict among stakeholders is observed, both at an institutional level, between port and urban planning authorities, and at social one, as citizens tend to perceive port facilities as an environmental detractor and seek pathways toward more landscape, human health and ecosystem-oriented development. Moreover, the current progress of port sector planning, with the approval of the Port Regulatory Plan (PRP) scheduled for January 2025, has defined new infrastructure interventions aligned with operational forecasts [36].

In this complex panorama, Brindisi thus emerges as a city with a strong logistical and industrial identity, where recent transformations pose complex challenges linked to integrating economic development with environmental protection and historical-cultural heritage preservation.

3 Methodology

The methodological approach illustrated in this contribution is aimed at structuring a possible framework for the decision-making process related to the transformation of port cities. To this end, the approach is articulated in three distinct phases, with the objective

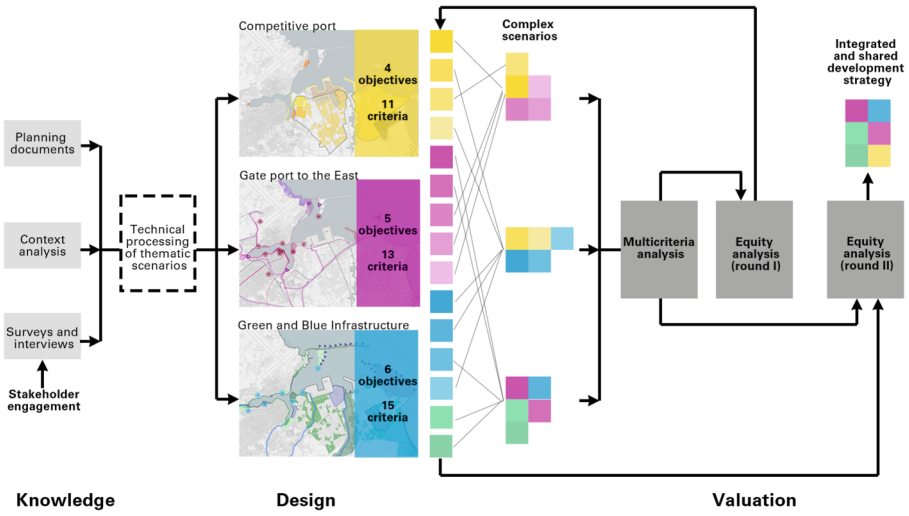


Fig. 1. Methodological scheme of the decision-making process

of implementing an evaluation model that is closely integrated into the planning process of the port city of Brindisi (Fig. 1).

The first phase consists of an in-depth understanding of the context, based on the analysis of territorial governance tools and official documents issued by sectoral institutions–such as the Port System Authority–as well as by public bodies– including the Apulia Region and the Municipality of Brindisi. These documents constitute the primary sources of institutional and regulatory knowledge. In parallel, more informal forms of knowledge were also considered, including non-scientific publications, online content, blogs, and social media platforms. These alternative sources were essential for empirically reconstructing a socio-economic and cultural profile of the case study. This knowledge phase includes the engagement of local stakeholders through a variety of methods aimed at capturing their opinions and preferences: an online survey; the observation of public meetings organised by actors within the port cluster—particularly during the final approval phase of the Port Regulatory Plan; and unstructured interviews [37] conducted with representatives of the Southern Adriatic Sea Port System Authority [38] and the Propeller Club Brindisi [39] between December 2024 and February 2025. This process of dialogue with territorial actors enabled the approximation of the viewpoints of various social groups, thereby contributing to the creation of a knowledge base that incorporates both expert and non-expert perspectives.

The second phase involved the design of preliminary alternative scenarios, developed through the technical elaboration of data gathered during the knowledge phase. Three mono-thematic scenarios were constructed, each focusing respectively on: the port's economic transition, the enhancement of mobility and attractiveness, and the environmental restoration of the sea and coastline. These scenarios represent distinct thematic clusters in which the main issues and critical elements identified in the previous phase are concentrated. A comparative analysis of these scenarios facilitated the construction

of three more complex and integrated alternatives, which hybridise the elementary components of the mono-thematic dimensions based on their levels of compatibility and incompatibility.

Lastly, the evaluation phase enables the selection and articulation of a preferred scenario for the port city. The evaluation was conducted through a progressive process involving a multi-criteria analysis of the alternatives, followed by an initial multi-group assessment. Inconsistencies between the results of these two steps were addressed by conducting a second multi-group analysis focused on the elementary components of the scenarios. This allowed for a more nuanced interpretation of the preferences expressed by the different social groups and enabled a further recombination of the most favourable alternatives. The outcome of this decision-making process is a spatial planning strategy that integrates multidimensional development objectives, grounded in the preferences and values of the diverse social actors involved.

3.1 Knowledge Phase

The first methodological phase involves understanding the case study, aiming to formulate a framework of criticalities and potentials useful for defining strategic transformative objectives. Three types of knowledge sources were considered:

- Context analysis of the territory, especially regarding its environmental, historical-urban, and economic-infrastructural components, through the study of the Regional Territorial Landscape Plan (PPTR, 2015), and non-scientific sources such as newspapers, websites, and blogs;
- Review of projects and forecasts contained within the planning instruments and programming documents in force in the urban and port context;
- Information derived from stakeholder engagement, via informal and unstructured interviews, and data gathered from the compilation of a digital questionnaire.

The use of these diverse sources of knowledge has made it possible to highlight how the port city of Brindisi is currently engaged in a comprehensive planning and reorientation process concerning both port-related activities and urban economic development. Specifically, while the port development agenda includes infrastructure expansion, increased operations in logistics and cruise services, and the strengthening of linkages and functions supporting the industrial platform; the public sector is instead oriented toward de-industrialisation, urban regeneration, environmental restoration, and the enhancement of historical and architectural heritage.

Furthermore, the area's dense infrastructural network is widely recognised as a potential asset, not only for improving port and industrial logistics, but also for enhancing urban mobility and increasing the city's attractiveness as a tourist destination. This complex body of knowledge highlights the importance of adopting a transdisciplinary and integrated approach to address complex challenges [40], with the aim of designing strategic scenarios that both preserve the system's inherent complexity and support its interpretation, thereby facilitating informed decision-making.

3.2 Design Phase

The interpretation of the results from the previous phase led to the elaboration of strategic objectives during the second design phase. These objectives were grouped into three thematic clusters forming three transformative scenarios based on sustainable port development policies and frameworks (Fig. 2).

Scenario 1: Competitive Port.

Focusing on economic and industrial development, this scenario addresses energy transition issues and proposes the rethinking of port economies towards Blue Economy sectors. It includes 4 objectives and 11 actions:

- Objective 1.1 – Shift the energy sector to renewables
  - 1.1.a: Photovoltaic installations on industrial rooftops
  - 1.1.b: Development of a near-shore wind farm
  - 1.1.c: Electrification systems for port docks to reduce fossil fuel use by docked ships
- Objective 1.2 – Make the industrial hinterland sustainable
  - 1.2.a: Removal of high-impact energy industries
  - 1.2.b: Creation of sustainable economic zones for green and low-impact industries
- Objective 1.3 – Innovate port-related businesses
  - 1.3.a: Water surfaces for algae farming
  - 1.3.b: Centers for biofuel production and blue biotechnology
  - 1.3.c: Centers for marine robotics and technology research
- Objective 1.4 – Strengthen port activities
  - 1.4.a: Development of shipbuilding
  - 1.4.b: Expansion of logistics areas in the port hinterland
  - 1.4.c: Construction of new port yards for cargo handling

Scenario 2: Gate Port to the East.

Focused on tourism and intermodal infrastructure, this scenario proposes rethinking mobility as well as urban cultural attractors to increase urban vibrancy and tourism supply. It includes 6 objectives and 13 actions:

- Objective 2.1 – Develop intermodal transport

  2.1.a: Rail links between port, airport, and train station
  2.1.b: Enhanced bus connections among the same
- Objective 2.2 – Develop coastal tourism

  2.2.a: Cultural infrastructure network

2.2.b: Coastal areas equipped for beach and leisure services
2.2.c: Facilities for water sports
2.2.d: Soft mobility paths (cycling, trekking) for sustainable enjoyment of coastal and rural areas

- Objective 2.3 – Expand tourist port facilities

2.3.a: Cruise terminals with proper services
2.3.b: Moorings and facilities for recreational boating

- Objective 2.4 – Repurpose port buildings for hospitality functions

2.4.a: Centers for migrant reception
2.4.b: Cultural hubs to foster social interaction between residents and newcomers

- Objective 2.5 – Connect the port with city and region

2.5.a: Public transport links along the historic waterfront
2.5.b: Boat-based public transport routes
2.5.c: Public transport services to connect the port with inland tourist attractions

Scenario 3: Green and Blue Infrastructure.
This scenario focuses on the environmental regeneration of the port, restoring its ecological components and cultural heritage, allowing citizens to recover from the impacts of pollution and reclaim access to the coastal landscape. It is divided into 6 objectives and 15 criteria:

- Objective 3.1 – Public use of the waterfront

  - 3.1.a: Remediation of contaminated or waste soils
  - 3.1.b: Creation of green waterfront areas for leisure, sports, events, and socializing
  - 3.1.c: Conversion of restricted areas into public spaces

- Objective 3.2 – Requalify historical heritage in port areas

  - 3.2.a: Restoration of anthropic and cultural assets
  - 3.2.b: Protection buffers for heritage conservation

- Objective 3.3 – Restore and protect the port's water systems

  - 3.3.a: Wetland restoration
  - 3.3.b: Re-naturalization of waterways and estuaries

- Objective 3.4 – Fight climate change

  - 3.4.a: Installation of desalination plants

  - 3.4.b: Conversion of the gas power plant into a Hydrogen Valley

- Objective 3.5 – Enhance marine and coastal heritage

  - 3.5.a: Remediation of marine areas
  - 3.5.b: Re-naturalization of coastal areas
  - 3.5.c: Active protection of marine and coastal ecosystems

- Objective 3.6 – Develop the fishing economy

  - 3.6.a: Sustainable aquaculture facilities
  - 3.6.b: Devices to repopulate marine fauna
  - 3.6.c: Sustainable fishing and seafood processing centers

Pairwise comparisons of thematic scenarios identified conflicts and compatibilities among cluster objectives, enabling their recombination into three complex scenarios.

3.3 Valuation Phase

The three resulting complex scenarios have been evaluated to identify a preferable synthetic scenario using the SOCRATES tool, developed by the Joint Research Centre for ex-ante impact assessment. This method supports decision-makers in understanding the technical and social performance of alternative options [41].

First, the multi-criteria evaluation employed an impact matrix. The rows of the matrix represent the evaluation criteria, which are defined by the objectives within the three dimensions (i.e. the monothematic scenarios) that break down the decision problem. The columns of the matrix, on the other hand, correspond to the complex alternative scenarios, which are evaluated concerning their performance against the aforementioned criteria. Given the wide spatial scale of problem definition, this particular application of SOCRATES tool used a 7-point semantic scale [42], in order to offer an evaluation commensurate with the qualitative nature of alternative scenarios. The output identifies the most preferable alternative, which represents the solution that objectively maximises performance with respect to the assessment criteria.

Due to the multi-actor nature of the problem, the SMCE also includes two cycles of multi-group evaluation phase. A prior analysis of stakeholder power/interest was conducted, based on administrative competence (as defined by legislation) and observation of public meetings (e.g., PRP 2025 presentation) and unstructured interviews with stakeholders such as the Southern Adriatic Port Authority (AdSP MAM) and the Propeller Club Brindisi.

Stakeholders were divided into three groups according to their relative influence, reflecting the distribution of interest and power within the real decision-making problem. The weights have been assigned to the groups according to criteria of balance and proportionality, so that each group weighs half as much as the next and twice as much as the previous one, and in such a way that the achievement of a decision-making majority is bound to the establishment of alliances between the groups (Fig. 3).

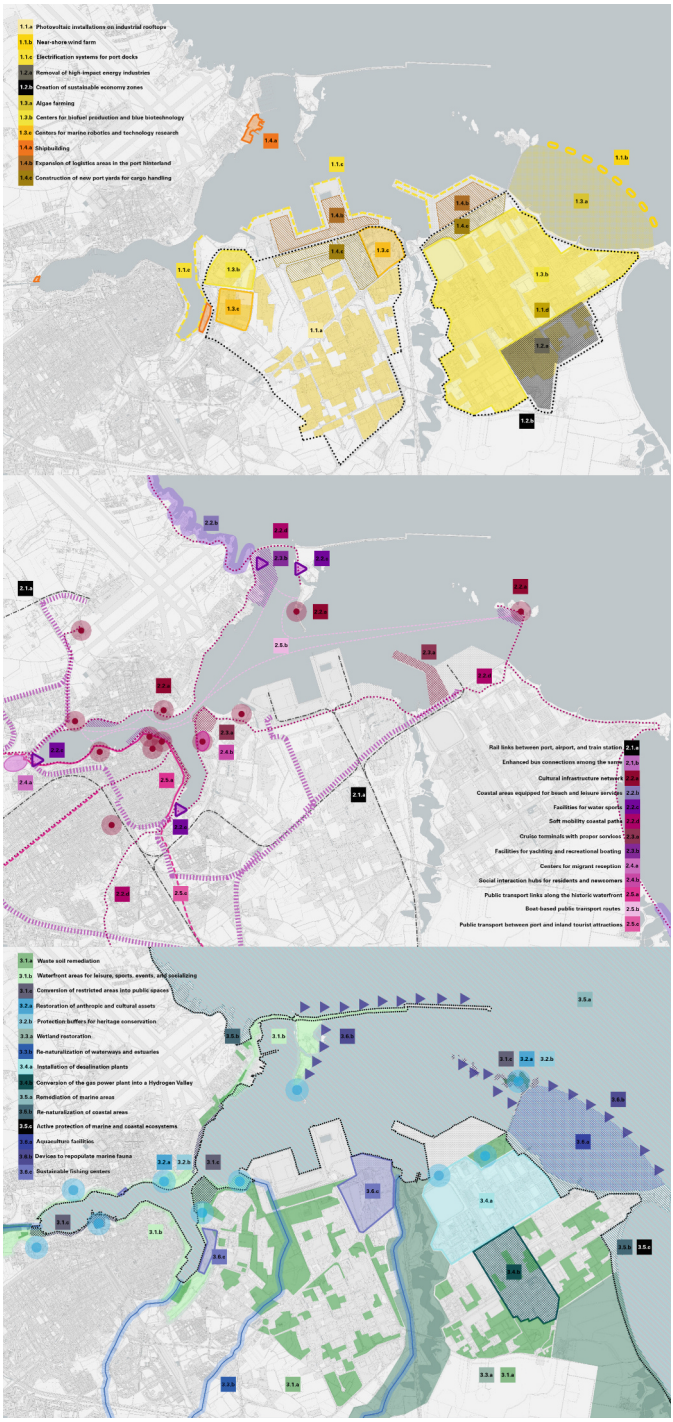


Fig. 2. Scenarios 1, 2, 3

- Cluster 1 – High influence (23%):
  - Port authorities (AdSP),
  - Public administrators (City of Brindisi, Apulia Region)
- Cluster 2 – Medium influence (12%):
  - Port workers,
  - Citizens,
  - Fishermen,
- Cluster 3 – Low influence (6%):
  - Activists,
  - students from the Nautical Technical Institute "Carnaro",
  - occasional users, such as visitors and tourists

This structure ensures decision-making balance and necessitates coalition-building while incorporating multiple stakeholder perspectives, including younger generations and tourists.

Next, a first multi-group analysis attempt was conducted, evaluating all three complex scenarios according to the perspectives expressed by the eight identified social groups, by employing an equity matrix. The results of this round revealed incompatibility with the results of the multi-criteria evaluation; therefore, a second round of multi-group analysis was conducted, which resulted in an unconventional iteration of the method compared to the standard protocol [41].

The repetition of the multi-group analysis is aimed at assessing the strategic objectives in a disaggregated form, and not aggregated into scenarios as in the first round, in order to highlight stakeholder preferences at a higher degree of definition thus increasing clarity and refinement of the evaluation. The second equity matrix, in which the alternatives considered are the individual strategic objectives initially identified, makes it possible to highlight the objectives for which social groups express a high degree of cross-party consensus, and thus to reintegrate them into the decision-making process, instead of discarding them in the selection of scenario clusters, arriving at a solution that reduces divergences and comes closest to the multi-criteria solution.

4 Results

The results presented in this section derive from the application of the Social Multi-Criteria Evaluation (SMCE) method, implemented through the SOCRATES tool, as outlined in the methodology. The evaluation phase was conceived as an integral complement to the design of alternative scenarios, with the aim of supporting a transparent and inclusive decision-making process. This approach enabled the comparison of complex, multidimensional development strategies by incorporating both quantitative criteria and the value preferences of diverse stakeholder groups. The evaluation process unfolded across three key steps, which are detailed below.

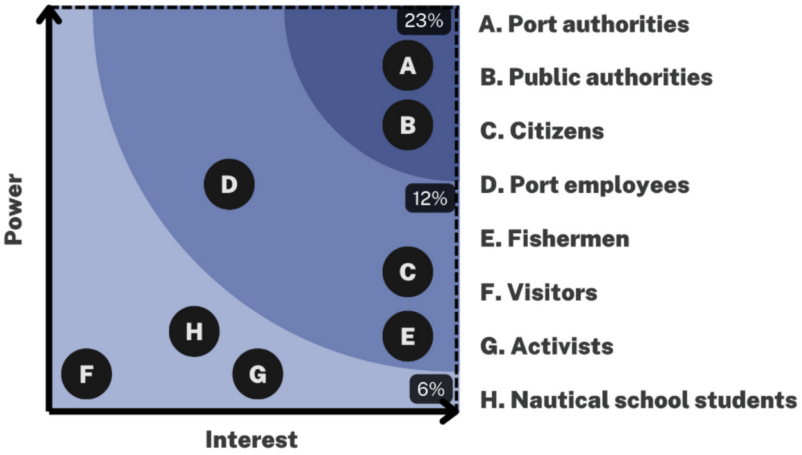


Fig. 3. Actors' map

4.1 Multicriteria Analysis

The multi-criteria evaluation identified the Green and Tourist Port scenario as the most preferable alternative. The global sensitivity analysis [41], conducted by varying the weights of each criterion, confirmed the robustness of this result, as Green and Tourist Port ranked first in 91.87% of the cases (Fig. 4).

The results from the impact matrix reflect the technical performance of the alternative in relation to the adopted evaluation criteria, highlighting how Green and Tourist Port emerges as the scenario most compatible with the dimensions of the decision-making problem. This is because it integrates ecosystem restoration strategies while also identifying economic activities capable of ensuring the port's economic development.

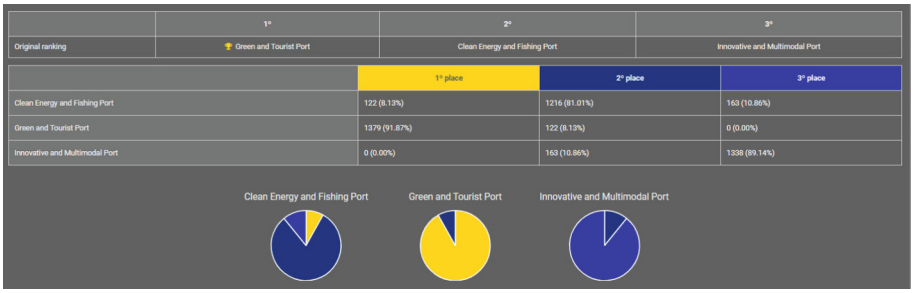


Fig. 4. Global Sensitivity analysis

4.2 Multigroup Valuation I

The first round of multi-group evaluation was carried out. The alternatives, consisting of the complex scenarios, were assessed based on the judgments expressed by the social

groups involved in the decision-making process. The equity matrix enabled the creation of a coalition dendrogram (Fig. 5)–a graph that clearly illustrates convergence dynamics and alliances among the actors as they express a preference for one scenario over another.

The dendrogram reveals that Activists and Citizens are the first actors likely to ally, later joined by Fishermen and Visitors, all sharing a preference for the Green and Tourist Port scenario. At the same time, Port Administrators and Port Employees converge toward the Innovative and Multimodal Port alternative. Meanwhile, Public Authorities and Students of the Nautical Technical Institute lean toward the Clean Energy and Fishing Port, likely because it is perceived as a balanced scenario relative to the status quo. The civil cluster represented by G, C, E, and F is also inclined to support the Clean Energy and Fishing Port scenario, as it considers environmental values.

At the end of the process, actors A and D also manage to align with the other stakeholders, making Clean Energy and Fishing Port the socially preferable alternative, as it successfully reflects the value system shared by all actors involved.

After the first round of multi-group analysis, the results revealed a divergence between the technically most effective solution and the one preferred by the social groups. The best-performing scenario identified through the impact matrix prioritized environmental restoration and tourism development, whereas the ranking of social preferences favored the scenario that integrates clean energy and fishing.

Credibility	Coalition	1°	2°	3°
0.800	G [Attivisti], C [Cittadini]	Green and Tourist Port	Clean Energy and Fishing Port	Innovative and Multimodal Port
0.741	A [Amministratori portuali], D [Lavoratori portuali]	Innovative and Multimodal Port	Clean Energy and Fishing Port	Green and Tourist Port
0.714	E [Pescatori], F [Fruitori occasionali]	Clean Energy and Fishing Port	Green and Tourist Port	Innovative and Multimodal Port
0.714	G [Attivisti], C [Cittadini], E [Pescatori], F [Fruitori occasionali]	Green and Tourist Port	Clean Energy and Fishing Port	Innovative and Multimodal Port
0.690	B [Amministratori Pubblici], H [Studenti]	Clean Energy and Fishing Port	Green and Tourist Port	Innovative and Multimodal Port
0.690	G [Attivisti], C [Cittadini], E [Pescatori], F [Fruitori occasionali], B [Amministratori Pubblici], H [Studenti]	Clean Energy and Fishing Port	Green and Tourist Port	Innovative and Multimodal Port
0.588	A [Amministratori portuali], D [Lavoratori portuali], G [Attivisti], C [Cittadini], E [Pescatori], F [Fruitori occasionali], B [Amministratori Pubblici], H [Studenti]	Clean Energy and Fishing Port	Innovative and Multimodal Port	Green and Tourist Port

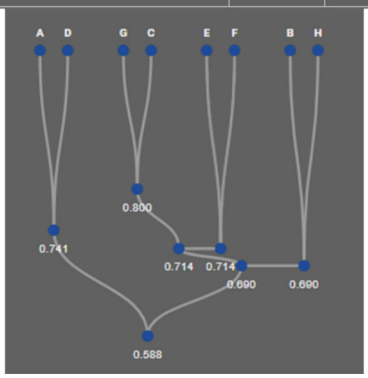


Fig. 5. Dendrogram of coalitions round I

4.3 Multigroup Valuation II

To resolve this inconsistency and determine a single, synthesized solution for the decision-making problem, a second multi-group analysis round was conducted. This phase directly compared the objectives underlying the scenarios with the stakeholder groups, identifying the true preferences of the actors involved at a more disaggregated and detailed level.

Credibility	Coalition	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°
0.143	C [Cittadini], B [Amministratori pubblici]	3.5	2.2	2.3	2.4	2.5	3.1	3.2	1.1	1.2	3.3	1.3	2.1	3.4	3.6	1.4
0.143	H [Studenti], C [Cittadini], B [Amministratori pubblici]	3.5	2.2	2.3	2.4	2.5	3.1	3.2	1.1	1.2	1.3	2.1	3.3	3.4	3.6	1.4
0.125	F [Fruitori occasionali], H [Studenti], C [Cittadini], B [Amministratori pubblici]	3.2	2.2	2.3	2.4	2.5	3.1	3.5	1.1	2.1	3.3	1.2	1.3	3.4	3.6	1.4
0.100	E [Attivisti], F [Fruitori occasionali], H [Studenti], C [Cittadini], B [Amministratori pubblici]	3.2	2.4	3.1	3.5	2.2	2.5	2.3	1.1	3.3	1.2	3.4	2.1	3.6	1.3	1.4
0.077	A [Amministratori portuali], D [Lavoratori portuali]	2.1	1.1	1.4	1.3	2.3	2.2	2.5	3.2	2.4	3.5	3.4	3.1	3.6	1.2	3.3
0.056	E [Attivisti], F [Fruitori occasionali], H [Studenti], C [Cittadini], B [Amministratori pubblici], A [Amministratori portuali], D [Lavoratori portuali]	1.1	2.2	2.5	3.2	2.3	2.1	2.4	3.5	1.3	3.1	3.4	1.4	3.3	1.2	3.6
0.050	G [Pescatori], E [Attivisti], F [Fruitori occasionali], H [Studenti], C [Cittadini], B [Amministratori pubblici], A [Amministratori portuali], D [Lavoratori portuali]	1.1	3.2	2.2	2.5	2.3	2.1	2.4	3.5	3.1	1.3	3.4	3.3	1.4	3.6	1.2

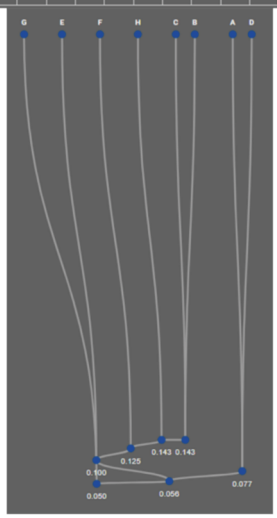


Fig. 6. Dendrogram of coalitions round II

The second dendrogram (Fig. 6) highlighted a tendency among the actors involved to polarize around two main interest coalitions. The first, composed of public authorities, citizens, visitors, and activists, shares a vision focused on environmental protection and the enhancement of the area's tourism potential. The second coalition brings together port

authorities and port employees, who are primarily interested in strengthening the port's industrial, logistical, and energetic role to promote economic growth and job creation. Fishermen appear marginal in relation to the two main coalitions, although they maintain potential ties with both, as they represent both environmental and economic interests.

This particular iterative evaluation process made it possible to identify Objective 1.1, concerning the installation of wind and photovoltaic systems within the port area for production, and onshore power supply for breaking down docked ships' emissions, as the one goal capable of uniting all stakeholders.

The final scenario thus emerges as a synthesis between the technically preferred option, Green and Tourist Port, and Objective 1.1 (shifting the energy sector towards renewables) which was the most favored by the social groups.

5 Discussion and Conclusions

The evaluation process provided significant evidence of the advantage of integrating social perspectives with technical assessments in the development of port planning strategies. The multi-criteria and multi-group analyses revealed that, while the technically optimal scenario—focused on environmental restoration and tourism development—was favored by the impact matrix, the social evaluation leaned toward a scenario that emphasizes clean energy solutions. This divergence highlights a crucial transition: the general preference for renewable energy-based development marks a clear break from the past, which was characterized by polluting, high-impact economic models. Therefore, the case study is actively seeking a new balance, able to ensure alignment with international agendas and the achievement of sustainable development goals. The iterative evaluation process, which included successive rounds of multi-group analysis and the construction of equity matrices and coalition dendrograms, ultimately identified renewable energy production as the unifying goal that reconciles technical performance with social preferences. This finding illustrates that, when technical excellence is combined with social insights, it becomes possible to formulate strategies that are both innovative and reflective of community values. The final outcome of this integrated evaluation process is a robust, consensus-driven strategy that synthesizes environmental, social, economic and cultural objectives into a coherent port development model. This strategy not only connects diverse stakeholder interests but also marks a definitive move away from traditional business-as-usual policy-making practices, favoring bottom-up decision-making processes supported by an integrated and shared methodology. Moreover, the promotion of a tourism-based economy, which leverages both tangible and intangible cultural resources of the territory, is recognized as a vital element for reactivating port functions. However, this tourism development should also be guided by sustainable principles to ensure long-term resilience.

The results highlighted that the application of a multi-criteria and multi-group evaluation methodology to the definition of spatial planning strategies within the complex context of port cities not only enables the selection of preferable alternatives but also supports the progressive refinement of transformative strategies. These strategies integrate diverse objectives and foster shared ownership of planning decisions.

This contribution offers a test case for the application of SMCE within the decision-making process of a port city, highlighting the need for further development, particularly

in enhancing and expanding public engagement. It opens the path for future research involving field-based participatory experiments, more extensive data collection through wider distribution of surveys, and more accurate and effective stakeholder analysis, with the aim of operationalising the outcomes of this initial simulation.

Indeed, the proposed methodology supports the definition of participatory and open decision-making processes, particularly in highly conflictual contexts marked by divergent viewpoints. In the specific case of port cities, it enables the reorientation of decision-making—typically dominated by economic objectives—towards a more shared and sustainable management and transformation of the territory. The process of selecting and refining the final preferred scenario facilitates the development of a planning strategy that can be implemented and further developed within the framework of public policies and planning instruments.

In conclusion, the proposed methodology offers policymakers a practical and replicable tool for intervention in complex and conflictual environments, while providing practitioners and evaluators with a scientific basis for integrating diverse values into participatory governance processes in port cities, transforming port planning from isolated, sector-specific interventions to an integrated, territorially oriented framework.

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