Naples in transition: A multidimensional decision-making process for the Naples port area sustainable development

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Abstract: Current and increasing transformation makes it more than ever necessary to develop an ability to plan and manage the different changes. Nowadays in order to make cities more resilient, policymakers are required to consider the various challenges that climate change related to urban development can bring under conditions of uncertainty. Within the conceptual framework that defines the design process as a decision-making process (ED 2014/89, Maritime Spatial Planning), climate change focus is changing from a problem-oriented to a decision-oriented approach. Considering the interaction among the cities several dimensions and the multi-level governance, it is possible to understand the complex governance system as urban transition management, in order to evaluate and implement alternatives within uncertain, dynamic and complex socio-ecological systems. The study objective is to experiment a transition model, taking into account adaptation and mitigation to climate change of the whole city, addressing the commercial port of the city of Naples (Italy) with its potential sustainable development.

Keywords: decision-making process; transition; sustainable development; port-city system

Introduction

Natural disasters due to climate change impacts, ecological crises and growing socio-economic unrest are just some of the challenges that contemporary cities and territories are facing. Considering that over half of the world's population lives in cities, in order to address the challenges of climate change and urban development, new policy instruments are required (Rosenzweig *et al.*, 2011). According to recent literature, in the context of climate adaptation science, the decision-oriented approach to analytical focus is replacing the problem-oriented one. To manage the change of urban systems under deep uncertainty, indeed, the decision makers need increasingly robust and dynamic adaptive instruments, through which assess and implement long-term, flexible and sustainable policy options (Wise *et al.*, 2014). Taking into account several studies in landscape ecology, the key environmental transformation is recognised as the primary driver responsible for the changes (Wu and Robbs, 2002). In turn it is believed that the landscape is strictly influenced by the relationships between humans and nature (Burgi *et al.*, 2004), so much as to claim that the history of the production, as much as economic and social relationships of that place have determined the structure of the landscape (Echeverria *et al.*, 2012). Studying climate change mitigation and adaptation, several approaches (e.g. incremental, transformative or reformist adaptation) and conceptual models (e.g. Adaptation Action

Cycles, Transition Handbook) have been adopted in order to direct the transition toward sustainable urban development and make cities more resilient and sustainable (Park *et al.*, 2012). Sustainability transitions have been defined as long-term and multi-dimensional transformation processes in which the governance play a relevant role with the aim of orienting socio-technical system towards more sustainable models (Markard *et al.*, 2012). These are flexible processes susceptible to change over time (Garud *et al.*, 2010) and characterized by long-term goals, in which the institutional actors cover the major role in forming the direction of the transition. In literature, the transition is approached from two main perspectives: the transition community and the adaptation community. Although both communities address transition studies in urban context from the system theory perspective, whereas transition community, assuming transition as non-linear long-term process, analyses how societal and technical systems coevolve over time (Smith and Stirling, 2010), the climate adaptation community approach, anticipating long-term change, responding to immediate shocks and recovering from such events, aims at improving the adaptability and transformability of socio-ecological systems. Indeed, starting from the concept of resilience, instead, the climate adaptation community analyses the capacity of socio-ecological systems to maintain function under changing conditions (Rijke *et al.*, 2013). Considering interactions between social and natural dynamics, the concept of adaptive management (Willows and Connell, 2003) is formulated starting from the adaptive cycle (Park *et al.*, 2012) through which changes in socio-ecological systems are described as the result of natural or socio-economic or institutional responses (Pelling, 2011; Bosello *et al.*, 2013). The concept derives from the integration of two thematic areas (Gunderson and Light, 2006): natural resource management (Gunderson and Holling, 2001) and self-governing institutions (Ostrom *et al*., 1992). Adaptive management is considered more analytical and substantial than transition management, whereas the latter has a strong process orientation with a focus on sustainability (Williams *et al*., 2009).

According to the above perspective, the paper aims to elaborate a methodological approach to the transition of the port-city system, able to taking into account at the same time specific sectors (e.g. energy and waste), and identifying planning and design criteria they have in common (e.g. land use, urban geometry and morphology, governance, socio-demographic aspects) (Mendizabal *et al.*, 2018). The multidimensional theoretical framework of sustainability, in fact, enables to consider environmental, societal and economic aspects in a long-term vision for energy generation and consumption (Folke *et al.*, 2005; Bloesch *et al.*, 2015; Vergragt and Quist, 2011), but also leveraging on social and governance dimensions, where sustainability transition has been recently defined as a radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies (Grin *et al.*, 2010), integrating individual and societal perspectives. Port-cities, marked by natural and anthropic functions at once, is the pivotal hubs connecting coastline with the behind territory (Badami and Ronsivalle, 2008). The port areas are complex systems characterized by multiple functions, which involve multiple stakeholders, whose activities, relating to the environmental, social, economic and cultural dimensions, are able to have resonance both at the urban and territorial scale. The conditions of risk and uncertainty determined by the transformations of our time further problematize the already complex management of coastal areas compromising the balance of the ecosystem natural and therefore the quality of human life (Hein, 2014). The raised interest in urban transformation processes of port cities has recently opened new possible research fields on the risk conditions and on the anthropic pressures within port-cities planning. The growth of maritime commercial traffic, which is recorded due to the economies of scale triggered by globalization, has negative impacts/effects on the coastal areas. The data reported by The

First Global Integrated Marine Assessment, attest to a pressing state of decline that affects the health of the oceans (World Ocean Assessment I, 2015). "The seas and oceans have always played a predominant role in the evolution of human civilizations. [...] The twenty-first century will experience the most intense maritime activity in history. The economy will become increasingly maritime due to and due to globalization" (Global Ocean Science Report, 2017). In the light of all the above new policies are required that can manage change in a sustainable way. In this context, the paper provides a transition model approach, aiming to combine economic, environmental and social dimension, in order to pursue sustainable development. The paper analyses materials and methods in Section 1, describes the case-study in Section 2 and discusses the results in Section 3.

Materials and methods

Within the conceptual framework that defines the design process as a decision-making process (European Directive 2014/89, Maritime Spatial Planning), the governance of transitions is required to address complexity and uncertainty (de Lima *et al.*, 2016). Considering not only the interaction among the several dimensions of the cities, but also the wide range of stakeholders and multi-level governance involved in their process, we understand the complex governance system as urban transition management (Loorbach, 2010; Nevens *et al.*, 2013; Moallemi *et al.*, 2014), in turn framed within the adaptive governance approach (Timmermans *et al.*, 2015), with the aim of evaluate and implement alternatives within uncertain, dynamic and complex socio-ecological systems.

Assuming the stakeholder's engagement and collaboration with researchers as crucial in a successful adaptation process (Mimura *et al.*, 2014) the paper focuses on governance process and the methods and tools useful to support decision-makers in sustainability transition. The methodology adopted in pursuing the above-mentioned objective is the adaptive pathway assumed as a solid framework to manage city transition both from transition community and from the adaptation community. In order to support choice within the proposed adaptation pathway, a multi-methodological approach has been elaborated, taking into account four main phases (Figure 1).

The first phase, related to *knowledge structuring*, has been defined in two parts: the first one dedicated to the collection and elaboration of data, both quantitative and qualitative, that describe the territorial and socio-economic characteristics of the selected context and to the elaboration of a stakeholders map, able to identify the main interests of the possible key-players; the second focused on to the selection of some relevant good practices of port-city development strategies. This phase is relevant for the identification of evaluation criteria and related indicators necessary to formulate the alternative of transformation for the port-city system of Naples.

The second phase is focused on the *local actors' involvement* in order to identify their preferences. This phase has been articulated in two different steps. The first one oriented to enable the stakeholder's dialogue, with specific attention to Port Authority, Municipality of Naples, National Railway Company, Shipbuilding Company, and Shipowner Company. The second step was dedicated to the implementation of a role-playing tool involving traders, cultural associations and leadership.

In the third phase has an *assessment* process has been elaborated by the implementation of the Novel Approach to Imprecise Assessment and Decision Environments - NAIADE method (Munda, 1995) in order to identify the preferable choice. Among the multicriteria evaluation method, NAIADE allows the comparison of alternatives using uncertain information. Using a pairwise comparison technique

within a finite set of alternatives, NAIADE sorts the latter into ranking classes. Employing NAIADE two kinds of evaluation are carried on. Basing on the score of values assigned to the criteria of each alternative, the first evaluation is performed using an impact matrix (alternatives and criteria). The latter, expressed throughout equity matrix (linguistic evaluation of alternatives by each group of stakeholders), starting from conflicts among the different interest groups, aims at detecting the possible formation of coalitions according to the proposed alternatives. Basing on a comparison algorithm of the alternatives, the multicriteria analysis is carried out throughout the impact matrix, able to define a ranking of alternative. The process consists of successive phases: (i) defining impact matrix starting from criteria and alternatives; (ii) pairwise comparison of alternatives using preference relations; (iii) aggregation of all criteria; (iv) ranking of alternatives. From equity matrix, a similarity matrix is calculated with the purpose of undertaking the equity analysis. The equity matrix is the result of multi-group analysis and is oriented to identify a ranking of coalitions among the different stakeholders and face the possible conflicts that characterize their positions.

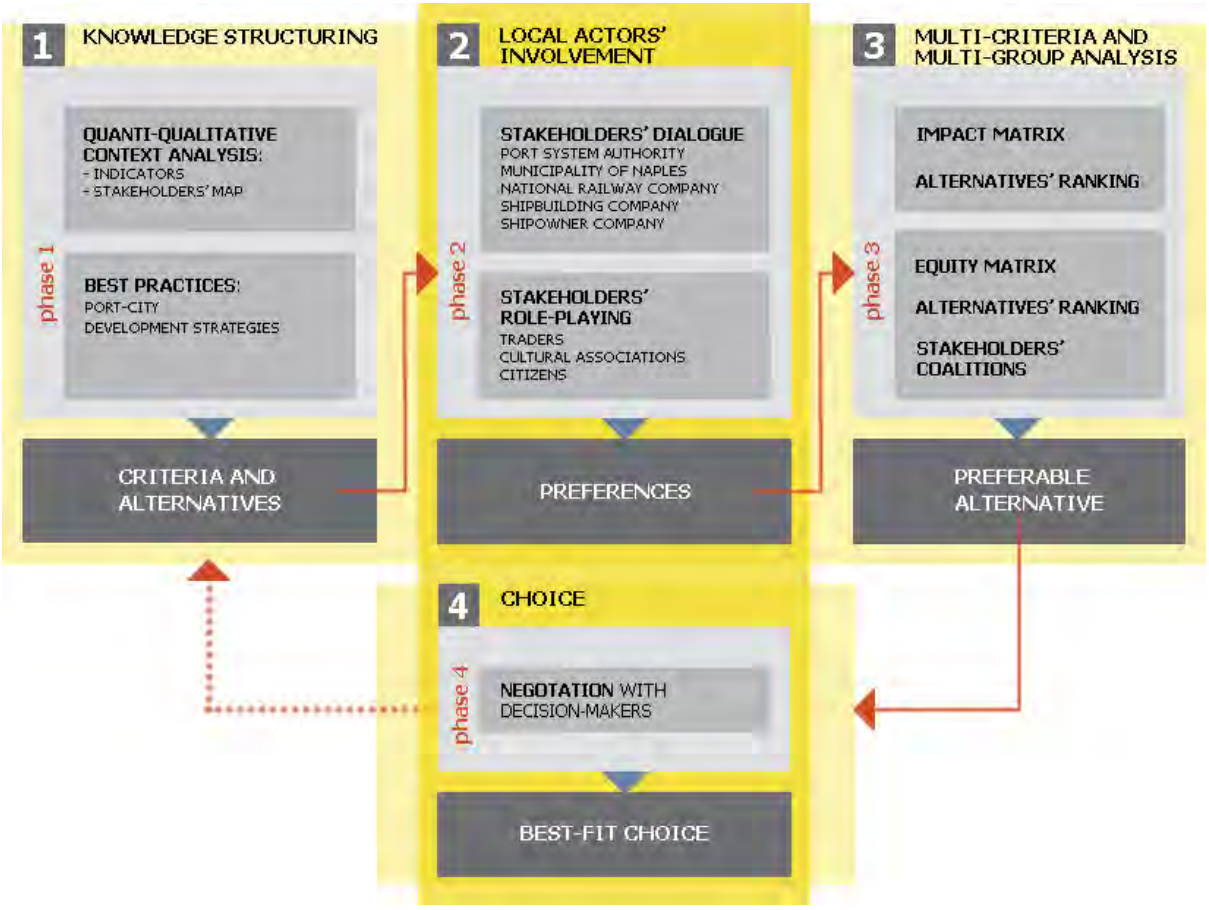

Figure 1. The multi-methodological approach

The fourth phase was that of *negotiation* with decision makers. In this phase, the results of the previous phases were discussed with the Port Authority and the Municipality of Naples in order to support the identification of the best-fit choice for the transformation of the Naples port-city. This last phase is particularly relevant because represents the conclusion of the decision-making process, but also the opportunity to improve the interaction among decision makers and the quality of the final choice.

Case of Study: Naples port-city system in transition

Over the last decades, various transformations have concerned Naples port-city, in the South of Italy, that is currently involved in the changing pattern of land uses. Owing to the process of de-industrialization, a strong decrease in demand for industrial activities has affected the productive fabrics of Neapolitan area, triggering an economic, social and cultural crisis of the city (Fusco Girard, 2012). The commercial port of Naples, located in the eastern part of the city, behind the industrial area, has been a driver for the whole urban settlement due to the economic and social connections that have crossed it. Nevertheless, the eastern side of the coastal strip has later become a parking area between the port and the surrounding districts. The area of interest is, indeed, currently marked by a large number of residential properties and abandoned industrial buildings and brownfields, making the coastline even more neglected and inaccessible. Located in the eastern part of the Gulf of the same name, it is bordered to the North by the industrial area, to the west by the central railway station of Naples and to the east by the Vesuvian municipalities, whereas to the South is bathed by the Tyrrhenian Sea. Nowadays the inhabitants are 11,159 and population density is approximately 6,841.9/Kmq. The unemployment rate is 36.5%, while the young unemployment rate is 69.4%. The administrative boundaries are regulated by policy systems of the Metropolitan City of Naples and Municipality of Naples and Port System Authority of the Central Tyrrhenian Sea (AdSP), which are the main stakeholders in force.

The present study, assuming planning as design-process is in line with national and European legislation on. Within the theoretical framework provided by the concept of Urban Transition Management (Drift, 2011), and recognising the policy guidelines prepared by the regulations, Maritime Spatial Planning could be regarded as a useful tool able to manage the transition, taking into account the interactions among the economic, social and environmental urban dimensions and the multi-level governance. More in-depth, Maritime Spatial Planning has been considered as a decision-making process (ED 2014/89, Maritime Spatial Planning), through which responding to real issues, through the definition of an appropriate management plan. Divided into several phases, the process includes the collection of information, decision-making, implementation, review or updating and enforcement control, within which different stakeholders are involved and the long-term transformations due to climate change are considered (Linee guida contenenti gli indirizzi e i criteri per la gestione dello spazio marittimo, Italy, 2017). Considering planning as a central tool for coastal zone management and maritime governance, the “Integrated Maritime Policy of the European Union”, recognises its character as a decision-making process and identifies it as a cross-sectoral policy instrument enabling public authorities and stakeholders to apply an integrated, coordinated and cross-border approach. In this context, a multi-methodological approach provided by integrated assessments is to be understood as a structured and simultaneously adaptive process, that guides and supports the decision process and the choice of preferable scenario (Cerreta, 2010).

According to the above perspective, within Master’s Degree Course Level II in “Sustainable planning and design of port areas”, Department of Architecture, University of Naples Federico II, starting from the adaptation pathway methodology (Mendizabal *et al.*, 2018), a cyclic and adaptive design-process has been elaborated with the aim of manage Naples port-city transition.

The study of the focus area has been approached according to the methodological process illustrated in the previous paragraph, with the aim of structuring the knowledge framework and identiying the

different stakeholders involved in the dynamics relating to the selected area of interest. Combining the information thus obtained with different city typologies pointed out under a preliminary desktop study, three strategic development scenarios have been defined. The latter ones, including also the development strategies underlying the project proposals allocated over time, are defined as no-intervention (A0), tourist port (A1) and commercial port (A2) (Figure 2).

Figure 2. The port-city system alternatives

The three above mentioned alternatives have been then presented to the stakeholders. The following phase related to stakeholders' analysis, has been addressed combining a top-down with a bottom-up approach. The applied methodology aims to build interaction between "common knowledge", which derives from experience, and "expert knowledge", deriving from scientific and technical knowledge. In order to detect social actors' preferences and their interactions with the context, a stakeholder dialogue (SD) (Terenzi, 2015) exercise has been carried on. Institutional stakeholders representing local authorities currently in force in the focus area, together with influent private companies have been involved. Each participant was asked to qualitatively evaluate alternatives. The results obtained from stakeholder dialogue have been successively combined with extracts from literature in order to simulate the sustainable transition on of port-city system. Assuming environmental and social issues as pivotal within transition management of the socio-ecological urban system, a review of the design-alternative proposed by Port Authority leveraging exclusively on the commercial development has been carried out. Has been therefore adopted a hybrid development strategy, taking on board, on the one hand, the principles underlying design-layouts proposed by government bodies, and the drivers of change identified from the desk analysis combined with literature extracts. Resulted scenarios have been, then discussed with citizenship. For this purpose, in the context of "City-port-System and the Waterfront as Common - IV International Workshop", role-playing approach (Adamatti *et al.*, 2005) has been applied. In particular, among the actors involved in local dynamics, some categories considered as the most significant have been selected: institutions (Port System Authority of the Central Thyrrenian Sea, Municipality of Naples), National Railway Company (RFI), shipbuilding companies, shipowner companies, traders, cultural associations and citizens.

In order to analyse the implications determined by the implementation of scenario alternatives in relation to the different social and economic groups, the game of role approach focuses on bringing out social actors' preferences related to alternative of intervention.

The information so far systematized has subsequently been used for the third phase of the process related to the evaluation of design alternatives. In this context, structuring results according to the

systemic relationships means defining management model within the decision-making processes, in order to address complex situations, marked by divergent points of view, where clarifying issues and orienting choices is required. More specifically, aiming at defining an overall assessment of the different solutions proposed, the NAIADE method has been implemented because it allows to compare and sort alternatives into ranking classes of preference among a finite set of ones and using uncertain information too. Analysing different groups of actors' preferences in relation to different alternatives, NAIADE method allows to test possible coalitions, and in accordance with the latter to rank the alternatives. In addition, it is considered that the level of consensus informs on the ability of the design alternative to responding satisfactorily to the demands of social groups, taking into account the different views and expectations.

The first kind of achievable evaluation employing NAIADE method has been carried on structuring the impact matrix, in which the score of values assigned to the criteria of each alternative is shown. Quantitative and qualitative indicators have been associated with each criterion, in turn, identified taking into account the guidelines of the Sustainable Development Goals. Each indicator is characterized by a unit of measurement for which a "positive direction" has been indicated, as it may occur that the preference of an alternative over the others is obtained in the event that the value associated with the criterion considered has the greater intensity (positive impacts to be maximized), or in the event that this value has the lowest intensity (negative impacts to be minimized). In the first case, the symbol "max" has been associated with the unit of measurement, in the second case the symbol "min". The impact matrix including 16 indicators grouped into 5 criteria classes has been structured as showed in figure 3. The final ranking (figure 4) identifies the alternative A2 as the preferable scenario according to the selected criteria. Then, a multi-group evaluation is allowed implementing NAIADE method. Through the equity matrix (linguistic evaluation of alternatives by each group) (figure 5), starting from conflicts among the different interest groups, possible coalitions according to the proposed alternatives have been detected. The different stakeholders have been described considering some main categories of clusters: governors, providers, influencers and users. Indicators of conflict between the different groups have been calculated, obtaining the "dendrogram of coalitions" which shows the views of the different groups on project proposals (figure 6).

In addition, through NAIADE method is obtained the so-called "veto diagram", which explains the alternative on which all social groups are willing to form a coalition and sort out the other alternatives on which, instead, they have expressed their veto. Indeed, each node in the graph of the dendrogram is associated with a conflict indicator which reports the aptitude of all groups for a coalition. The lowest node at the top of the dendrogram, through which veto diagram is obtained, shows how the likelihood of coalition occurring at the alternative recognizable as the "social compromise solution". On the other alternatives, on the whole, the various groups have vetoed. In particular, the veto diagram sorts out the three alternatives in a ranking structured according to the different groups' judgements. Alternative C, which corresponds to scenario A2, is preferable and represents the social compromise solution (figure 6). It may be pointed out that "expert knowledge" and "common knowledge" recognize the same alternative as preferable.

CRITERIA	INDICATORS	CODE	ALTERNATIVE 0	ALTERNATIVE 1	ALTERNATIVE 2	MAX/MIN VALUE
Economic Growth and Development	Construction costs	EGD1	0	77	653	-
	Job potential	EGD2	Very bad	Good	Good	+
	Unemployment rate	EGD3	Extremely bad	Good	Good	-
	Incidence of high-medium specialized jobs	EGD4	More or Less Bad	Very Good	Perfect	+
	Incidence of low specialized jobs	EGD5	More or Less Bad	Moderate	Moderate	+
Traffic Accessibility	Cargo handling (import)	TA1	536	536	1200	+
	Cargo handling (export)	TA2	499	499	1116	+
	Number of docks	TA3	200	828	500	+
Urban Metabolism	Air Quality Index (AQI)		40.9	40.9	150.3	+
	Comunity composting - OW-MSW recycled in the district	UM2	0	0	150	+
Society and Culture	Number of social-cultural association	SC1	0	0	390	+
	Number of cultural services	SC2	8	8	10	+
	Number of high school involved in cultural initiatives	SC3	10	10	18	+
Urban Landscape Quality	Walkability (lenght of pedestrian path)	ULQ1	2.23	1.32	5.29	+
	Drosscapes	ULQ2	62.03	27.05	1.91	-
	Green public spaces	ULQ3	3.66	4.36	9.7	+

Figure 3. The impact matrix

Figure 4. The ranking of alternatives

CLUSTERS	STAKEHOLDERS	ALTERNATIVE 0	ALTERNATIVE 1	ALTERNATIVE 2
GOVERNORS	Port System Authority of the Central Thyrrenyan Sea	More or Less Bad	Very Bad	Perfect
	Municipality of Naples	Bad	More or Less Good	Moderate
PROVIDERS	National Railway Company (RFI)	Moderate	More or Less Good	Very Good
	Shipbuilding companies	More or Less Good	Bad	Very Good
	Shipowners companies	More or Less Bad	Bad	Very Good
INFLUENCERS	Cultural Associations	Good	Very Good	Bad
USERS	Traders	More or Less Bad	More or Less Good	Good
	Citizens	More or Less Bad	Very Good	Bad

Figure 5. The equity matrix

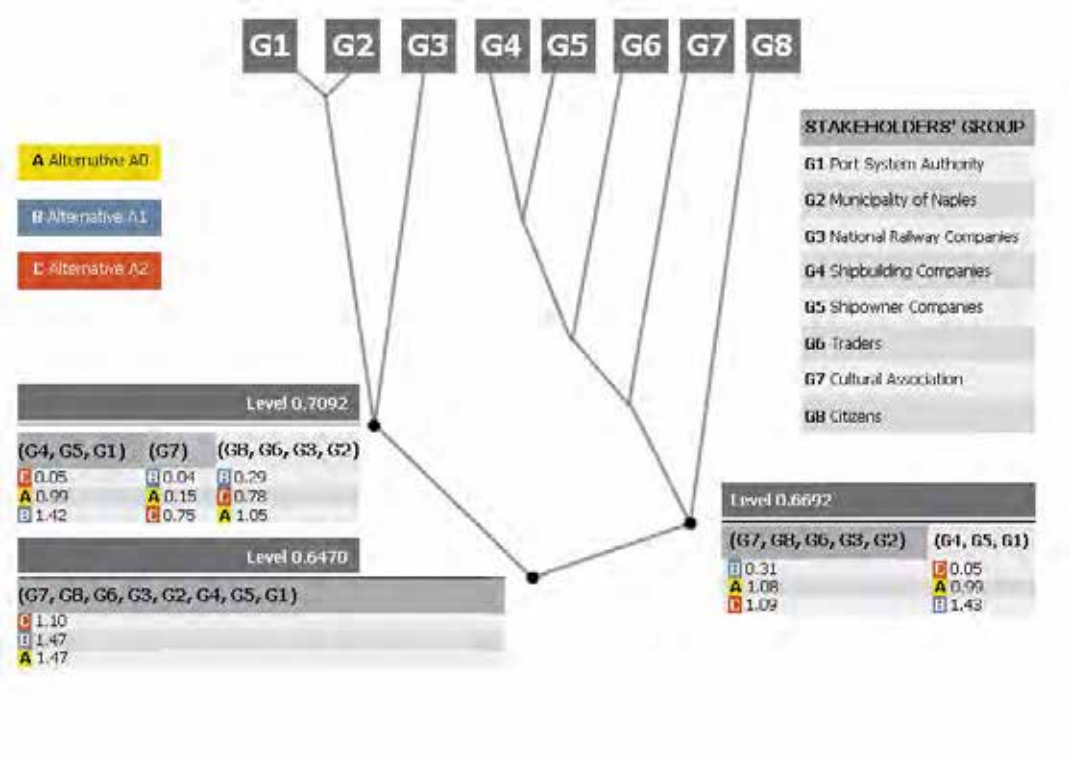

Figure 6. The dendrogram of coalitions and the ranking of alternatives by the veto diagram

Finally, the preferable design-alternative thus identified have been presented again to institutional actors, in order to obtain their approval. In short, starting from the identification of the stakeholders' preferences and their interaction with the context, within the wider framework provided by adaptation pathway methodology, an integrated and cycling conceptual model for transition have been employed.

Discussion and conclusions

A multi-methodological decision-making process can be conceived as an opportunity to integrate different knowledge and expertise, elaborating territorial strategies able to manage transformations over time and space. In this perspective, the ability to predict the trajectories of future development of the port-city is of fundamental importance for the definition of urban development plans. The current configuration of the territory has been significantly influenced by the economic, social and environmental dynamics at the urban, local and territorial scales. Therefore, a multi-dimensional approach is proposed for managing change in the context of a broader framework of a procedural nature, able to support the transition model. In this context. NAIADE method has been chosen with the purpose of rationalizing the decision problem and provide a framework for communication among stakeholders. Therefore it is deemed useful for policymakers in developing pairwise comparisons, which may reduce the degree of conflict between different social groups or stakeholders (Carbone et *al.*, 2000). In the absence of weighting being assigned to the criteria (Browne *et al.*, 2010), qualitative and quantitative data have been used to rank alternatives in order to identify the preferable scenario. The ranking alternatives basing on a set of evaluation criteria is performed by the use of an impact matrix (De Marchi *et al*., 2000). Nevertheless, the goal of NAIADE is not the definition of the optimal scenario, but the opportunity to allow "an actor taking part in a decision process either to shape, and/or to argue and/or to transform his preferences, or to make a decision in conformity with his goals" (Munda, 2006). According to Multicriteria Decision Aiding (MCDA) research field, indeed, the decision process is considered as important as the final solution and involves both substantive and procedural reality. Carried out evaluation has led to a clear preference for alternative C corresponding to the scenario A2. Employing a multi-methodological evaluation approach a twofold result has been achieved. If on the one hand the preferable alternative has been identified, on the other improved understanding of the negotiation process leading to conflict resolution, increasing the transparency of the decision-making process and of the evaluation path, and allowing to build the choice that is able to reflect the different needs and expectations. In this perspective is intended to help local communities to become more aware both of their own opinions and preferences and of those of other stakeholders, building collaborative and shared solutions.

References

Adamatti, D.F., Sichman, J.S., Rabak, C., Bommel, P., Ducrot, R., and Camargo, M.E.S.A., 2005. JogoMan: A prototype using multi-agent-based simulation and role-playing. Proceedings of the Joint Conference on Multi-Agent Modelling for Environmental Management (Cabm-Hema-Smaget-2005); Bourg St.-Maurice, France, March, pp.25–28.

Badami, A., and Ronsivalle, D., 2008. Città d'acqua. Risorse culturali e sviluppo urbano nei waterfront. (Rome, Italy: Aracne).

Bloesch, J., Von Hauff, M., Mainzer, K., Mohan, S.V., Renn, O., Risse, V., Song, Y., Takeuchi, K., and Wilderer, P., 2015. Sustainable development integrated in the concept of Resilience. *Problemy Ekorozwoju–Problems of Sustainable Development*, 10(1), 7-14.

Bosello, F., Carraro, C., and De Cian, E., 2013. Adaptation can help mitigation: an integrated approach to post-2012 climate policy. *Environment and Development Economics*, 18, pp 270-290. HTTP://DX.DOI.ORG/10.1017/S1355770X13000132

Browne, D., O'Regan, B., and Moles, R., 2010. Use of multi-criteria decision analysis to explore alternative domestic energy and electricity policy scenarios in an Irish city-region. *Energy*, 35(2), 518-528.

Burgi, M., Hersperger, and A.M., Schneeberger, N., 2004. Driving forces of landscape change-current and new directions. *Landscape Ecology*, 19 (8), pp. 857-868.

Carbone, F., De Montis, A., De Toro, P., and Stagl, S., 2000. MCDA methods comparison: environmental policy evaluation applied to a case-study in Italy. Proceedings of the Third International Conference of the European Society for Ecological Economics on Transitions towards a Sustainable Europe. Ecology, Economy, Policy, Vienna, Europe, May, pp. 3-6.

Cerreta, M., 2010, Thinking through complex values. In: Making Strategies in Spatial Planning. Knowledge and values, edited by M. Cerreta, G. Concilio, V. Monno (Dordrecht: Springer), pp 381-404.

de Lima, G. T. N. P., dos Santos Hackbart, V. C., Bertolo, L. S., and dos Santos, R. F., 2016, Identifying driving forces of landscape changes: Historical relationships and the availability of ecosystem services in the Atlantic forest. *Ecosystem services*, 22, 11-17.

De Marchi, B., Funtowicz, S.O., Cascio, S.L., Munda, G., 2000, Combining participative and institutional approaches with multicriteria evaluation: an empirical study for water issues in Troina, Sicily. *Ecological Economics*, 34 (2), 267-282

Drift - Dutch Research Institute for Transitions, Erasmus University Rotterdam, 2011, Urban Transition Management Manual. 'Navigator' of the MUSIC project. Dutch Research Institute for Transitions, Erasmus University Rotterdam, 1-30.

Echeverría, C., Newton, A., Nahuelhual, L., Coomes, D., Rey-Benayas, J. M., 2012, How landscapes change: integration of spatial patterns and human processes in temperate landscapes of southern Chile. *Applied Geography*, 32(2), 822-831.

Nevens, F., Frantzeskaki, N., Gorissen, L., and Loorbach, D., 2013, Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, 50, 111-122.

Folke, C., Hahn, T., Olsson, P., and Norberg, J., 2005, Adaptive governance of social-ecological systems. *Annu Rev Environ Resour*, 30, 441–473.

Fusco Girard, L., 2012, Per uno sviluppo umano sostenibile nel Mezzogiorno: come gestire la transizione verso una nuova base economica urbana. In: AA.VV., Nord e Sud a 150 anni dall'Unità d'Italia. Report Svimez, Rome, Italy, March, pp. 759-779.

Garud, R., Gehman, J., and Karnøe, P., 2010, Categorization by association: Nuclear technology and emission-free electricity. In: Institutions and Entrepreneurship, edited by Emerald Group Publishing Limited (United Kingdom: Emerald Publishing Limited), pp. 51-93.

Grin, J., Rotmans, J., and Schot, J., 2010, Transitions to sustainable development: new directions in the study of long term transformative change (New York/London: Routledge).

Hein, C., 2014, Port cities and urban wealth: between global networks and local transformations. *International Journal of Global Environmental Issues*, 13(2-4), 339-361.

European Parliament, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Developing the international dimension of the Integrated Maritime Policy of the European Union, COM/2009/0536 final, Document 52009DC0536.

Gunderson, L.H., and Holling, C.S., 2001, *Panarchy: understanding transformations in human and natural systems* (Washington, Stati Uniti: Island Press).

Gunderson, L., and Light, S.S., 2006, Adaptive management and adaptive governance in the everglades ecosystem. *Policy Science*, 39 (4), 323–334. http://dx.doi.org/10.1007/ s11077-006-9027-2.

Mendizabal, M., Heidrich, O., Feliu, E., García-Blanco, G., and Mendizabal, A., 2018, Stimulating urban transition and transformation to achieve sustainable and resilient cities. *Renewable and Sustainable Energy Reviews*, 94, 410-418.

Park, S. E., Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., and Fleming, A., 2012, Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, 22(1), 115-126.

Italian Parliament, Tavolo interministeriale di coordinamento presso la Presidenza del Consiglio dei Ministri - Dipartimento per le politiche europee, 2017, Linee guida contenenti gli indirizzi e i criteri per la gestione dello spazio marittimo, Decreto legislativo 17 ottobre 2016, n. 201 «Attuazione della direttiva 2014/89/UE che istituisce un quadro per la pianificazione dello spazio marittimo».

Loorbach, D., 2010, Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance*, 23(1), 161-183.

Markard, J., Raven, R., and Truffer, B., 2012, Sustainability transitions: an emerging field of research and its prospects. *Res Policy,* 41:955–967. http://dx.doi.org/10.1016/j. respond.2012.02.013.

Mimura, N., Pulwarty, R.S., Duc, D.M., Elshinnawy, I., Redsteer, M.H., Huang, H.Q., et al. 2014. Adaptation Planning and Implementation. Clim. Change 2014 Impacts Adapt. Vulnerability Part Glob. Sect. Asp. Contrib. Work. Group II Fifth Assess. Rep. Intergovernmental Panel Clim. Change, United Kingdom and New York: Cambridge University Press, p. 869–898.

Moallemi, E. A., Ahamdi, A., Afrazeh, A., and Moghaddam, N. B., 2014, Understanding systemic analysis in the governance of sustainability transition in renewable energies: the case of fuel cell technology in Iran. *Renewable and Sustainable Energy Reviews*, 33, 305-315.

Munda, G., 1995, Multicriteria Evaluation in a Fuzzy Environment. Theory and Applications in Ecological Economics (Heidelberg, Germany: Physica-Verlag).

Munda, G., 2006, Social multi-criteria evaluation for urban sustainability policies. *Land use policy*, 23(1), 86-94.

Ostrom, E., Walker, J., and Gardner, R., 1992, Covenants with and without a sword: Self-governance is possible. *American political science Review*, 86(2), 404-417.

Park, S. E., Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., and Fleming, A., 2012, Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, 22(1), 115-126.

Pelling, M., 2011, Adaptation to climate change: from resilience to transformation (Oxon, UK: Routledge).

United Nations, First World Ocean Assessment, Date of access 31/05/2019. https://www.un.org/regularprocess/content/first-world-ocean-assessment

United Nations, Global Ocean Science Report, Date of access 31/05/2019. https://unesdoc.unesco.org/ark:/48223/pf0000250428

Rijke, J., Farrelly, M., Brown, R., and Zevenbergen, C., 2013, Configuring transformative governance to enhance resilient urban water systems. *Environmental Science & Policy*, 25, 62-72.

Rosenzweig, C. W. D., Solecki, S. A., Hammer, S., and Mehrotra, 2011. Urban Climate Change in Context. Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network, edited by C. Rosenzweig, W. D. Solecki, S. A. Hammer, S. Mehrotra (Cambridge: University Press), pp. 3-11.

Rosenzweig, C., Solecki, W. D., Hammer, S. A., and Mehrotra, S., 2011: Urban Climate Change in Context. Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network, Cambridge, UK, 3–11.

Smith, A., and Stirling, A., 2008, Social-ecological resilience and sociotechnical transitions: critical issues for sustainability governance, STEPS. Working Paper, Brighton: STEPS Centre.

Smith, A., and Stirling, A., 2010, The Politics of Social-ecological Resilience and Sustainable Socio-technical Transitions. *Ecology and Society, 15*(1). http://www.jstor.org/stable/26268112

Terenzi, A., 2015, RAMSES Stakeholder Dialogue «Drawing Pathways towards the Resilient City: Identifying vulnerabilities, empowering decisionmaking, fostering change». Workshop Report. The Work Leading to These Results Has Received Funding from the European Community's Seventh Framework Programme under Grant Agreement No. 308497 (Project RAMSES).

Timmermans, J. S., Haasnoot, M., Hermans, L., Kwakkel, J. H., Rutten, M. A. R. T. I. N. E., and Thissen, W. A., 2015, Adaptive delta management: Roots and branches. E-Proceedings of the 36th IAHR World Congr., Hague Neth, 28.

Williams, B. K., Szaro, R. C., Shapiro, C. D., 2009, Adaptive management: The U.S. Department of the Interior technical guide. Report, Washington, D.C., United States, Dept. of the Interior, Adaptive Management Working Group.

Willows, R.; Reynard, N.; Meadowcroft, I.; and Connell, R., 2003, Climate Adaptation: Risk, uncertainty and decision-making. UKCIP Technical Report. Oxford, UK Climate Impacts Programme, Part 41-87.

Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., and Campbell, B., 2014, Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, 28, 325-336.

Wu, J., and Hobbs, R., 2002, Key issues and research priorities in landscape ecology: an idiosyncratic synthesis. *Landscape Ecology*, 17(4), 355-365.

Vergragt, P.J., and Quist, J., 2011, Backcasting for sustainability: introduction to the special issue. *Technological Forecasting and Social Change*, 78(5), 747–755. http://dx.doi.org/10.1016/j. tech for.2011.03.010.