

A Multidimensional Approach for Cultural Ecosystem Services (CES) Assessment: The Cilento Coast Case Study (Italy)

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Abstract. The evaluation of the Cultural Ecosystem Services represents an evolving research field that analyses the processes of enhancing the landscape and its components. The contribution presents a multidimensional approach for identifying and evaluating the Cultural Ecosystem Services that characterize the coastal strip of Cilento and, specifically, within the Municipality of Camerota, in the South of Italy, and developing a culture-led enhancement strategy.

The methodological framework consists of three main phases: the first, knowledge and interpretation, the second evaluation, and the third elaboration of a situated strategy for the Baia degli Infreschi, a natural inlet of great interest in landscape and tourism in the Municipality of Camerota. A Decision Support System has been structured by developing a hybrid evaluative process that combines the SODA approach, the GeoTOPSIS spatial multi-criteria analysis and the ANP multi-criteria method by integrating the principles of Maritime Spatial Planning and the Cultural Ecosystem Services (CES) framework.

Keywords: Coastal landscape · Landscape assessment · Cultural Ecosystem Services · SODA approach · GeoTOPSIS method · ANP method

1 Introduction

Coastal areas appear as complex entities in continuous evolution, osmotic interfaces [1] natural seats of conflict between the two meanings of the word "border": limit and frontier. The transformations that occur along this line of demarcation are dictated simultaneously by the impulses of the hinterland and by what happens on the land-sea interface, both in physical-morphological and socio-cultural terms. The coastal strip of Campania, in southern Italy, is a landscape of great social, economic and cultural importance. With its 430 km of extension, it is configured as a place of continuous exchanges and flows that, on the one hand, contribute to feeding the metabolism of the territory; on the other hand, highlight its fragility.

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The coastal cities, on a semantic level, express the fusion of urban and maritime culture [2], defined by Konvitz as "Urban maritime culture" [3]. The natural headlands, coves and beaches are counterbalanced by urban infrastructure links such as roads, highways and railways, those purely coastal as ports and lighthouses and finally, the great maritime cities and ancient fishing villages.

In this perspective, the coastal landscape can be considered a "cultural ecosystem" [4, 5], characterized by the naturalistic and environmental components and cultural features, expression of local identity, and the system of material and immaterial relationships.

The ecosystem, in ecological terms, is defined as a fundamental unit formed by a community of living organisms in a specific area and the specific physical environment to which complex relationships link organisms. Usually, they are open and therefore have exchanges of materials and energy with other ecosystems. This definition, translated from ecology to the urban context, allows to include, in addition to the system itself, the inflows and outflows that pass through it, the "ecosystem services" [6, 7] and the "landscape services" which pay special attention to the multiple functions that the landscape can develop [8–10]. Several classification systems for Ecosystem Services have been proposed internationally, including the MEA (Millennium Ecosystem Assessment) [7], TEEB (The Economics of Ecosystems and Biodiversity) [11], and CICES (Common International Classification of Ecosystem Services) [12]. Four main categories of ES can be deduced from the text of the MEA, which have subsequently been taken up and enriched by the other classifications:

- Provisioning, that includes products obtained from natural and semi-natural ecosystems such as food, pure water, fibre, fuel, medicine;
- Regulating, that contains many services with direct and indirect human benefits such as climate stabilization, waste recycling, usually not recognized until they are lost or degraded;
- Supporting, that collects all those services necessary for the production of all other ES and contribute to the conservation (in situ) of biological and genetic diversity and evolutionary processes;
- Cultural, which is conceived as the set of non-material benefits obtained from ecosystems, such as spiritual, ethical, recreational, aesthetic sense, and social relations.

According to the above perspective, the primary purpose is to investigate the cultural ecosystem potential of the Cilento coastal strip, a sub-region of Campania (Fig. 1), and propose its reactivation and enhancement. Integrating the principles of Maritime Spatial Planning (Directive 2014/89/EU) [13] the Cultural Ecosystem Services (CES) framework, the different components of this environment have been analyzed with specific methods and tools. First, thematic maps have been elaborated through the software Q-Gis, whose aggregation has allowed to explore the spatial distribution of the phenomena and then return density maps related to the presence of CES along the entire coastal strip of Cilento. Subsequently, applying the multi-criteria method GeoTOPSIS, it was possible to create a map of the ecosystem potentials of the Municipality of Camerota. Finally, the attention has been turned to the Baia degli Infreschi, a natural inlet of the Municipality of Camerota. To address this step and obtain proposals for the enhancement of the area, a survey was conducted on social networks among the inhabitants of

the municipality and neighbouring ones, members of associations operating in the area and tourists. The data obtained by the survey were first processed through the Decision Explorer software with the Strategic Options Development and Analysis (SODA) approach to obtain cognitive maps related to the categories of stakeholders interviewed, and then analyzed with the Analytic Network Process (ANP) method to get the preferred alternative of enhancement for the bay.

2 Cultural Ecosystem Services: An Open Debate

The debate about Cultural Ecosystem Services (CES) has developed recently. Although research on this topic offers many insights, there is still a struggle to give it an unambiguous definition. The benefits that this category of services provided to people are generally intangible, generated by natural or semi-natural physical environments, and can affect people's emotional state. In the 1997 publication by Costanza and Folke [6], CES are defined as the aesthetic, artistic, educational, spiritual, and/or scientific values offered by a given environment. Cultural services are covered in the three main classifications of ES and allow for the identification of several value categories [14]:

1. Spiritual and religious value, cultural diversity, aesthetic value, knowledge and education systems, recreation, and ecotourism values (MEA classification) [7];
2. Culture and arts, information for cognitive development, spiritual experience, aesthetic information, recreation, and tourism (TEEB classification) [11];
3. Spiritual, aesthetic, informational, community activity, and recreational value (CICES classification) [12].

The main characteristics of CES are intangibility, subjectivity and the difficulty of quantification in biophysical and primarily monetary terms [15]. Their value, linked to the emotional sphere of the individual, depends on individual and cultural assessments [16, 17].

3 The Case Study

Located in the southern end of the Campania region, Cilento is the second largest national park by extension and a UNESCO World Heritage Site since 1998. During Prehistory and the Middle Ages, the Cilento region was used as the central passage for cultural, political and commercial communications between peoples. These communications took place through the mountain ranges running from east to west, which created a very diversified cultural landscape made of contaminations and flows that have fertilized the whole territory.

Moreover, in some critical moments of the development of the Mediterranean human society, the Cilento area has been the only communication corridor between the Adriatic and the Tyrrhenian Sea in the central Mediterranean region. This is evident if we analyze what remains today of the cultural landscape. Thus, the environment is configured as a "cultural landscape", understood as a natural landscape forged by the work of a cultural group.

The culture represents the agent, the natural elements the means, the cultural landscape is the result [18]. The area selected for the study and evaluation of CES is the coastal strip of this sub-region, administratively divided into fifteen municipalities occupying 462 sq. km and hosting 76,540 resident inhabitants.

The ancient rural economy characterized by rather productive agriculture is flanked by thriving seaside tourist activity, the main economic driver of the coast and the entire Cilento territory.

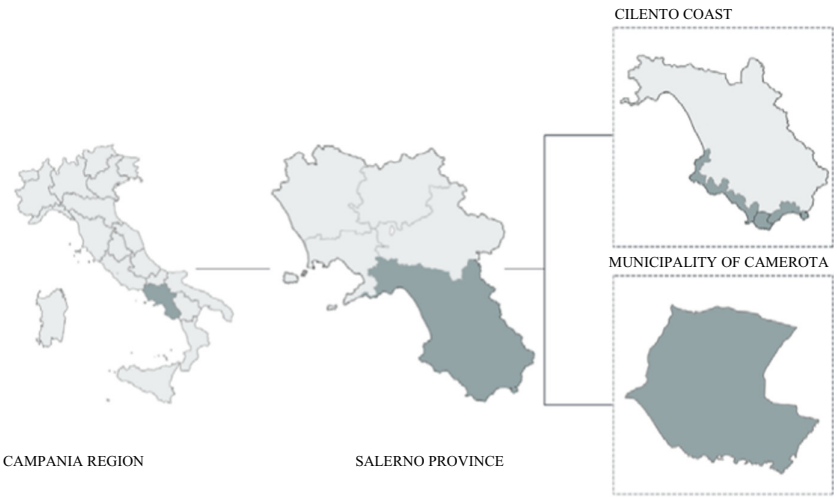

Fig. 1. The localization of the case study and the scales of the analysis

In a second phase of the work, the study focused on the municipality of Camerota and the Infreschi Bay, a natural harbour of great cultural, tourist and identity interest for the area. The bay falls within the Marine Protected Area "Costa degli Infreschi e della Masseta". It extends between the villages of Marina di Camerota to the north and Scario to the south. Salient features of this stretch of coast are the low population density and the total absence of major industrial settlements: the anthropic pressure is closely linked to seasonal tourism. In contrast, the "industrial" activities are concentrated around the stores of local artisans, engaged for centuries in the production of ceramics and woodworking.

4 Materials and Methods

The process followed for elaborating the proposal consists in a multidimensional approach divided in three main phases: the first one of knowledge and interpretation, the second one of evaluation, and the third one aimed at identifying a valorization strategy [19] for the Baia degli Infreschi (Fig. 2).

The first phase consists of the elaboration of interpretative maps at regional and sub-regional scales. Among the results of this phase are the definition of the driving polarities

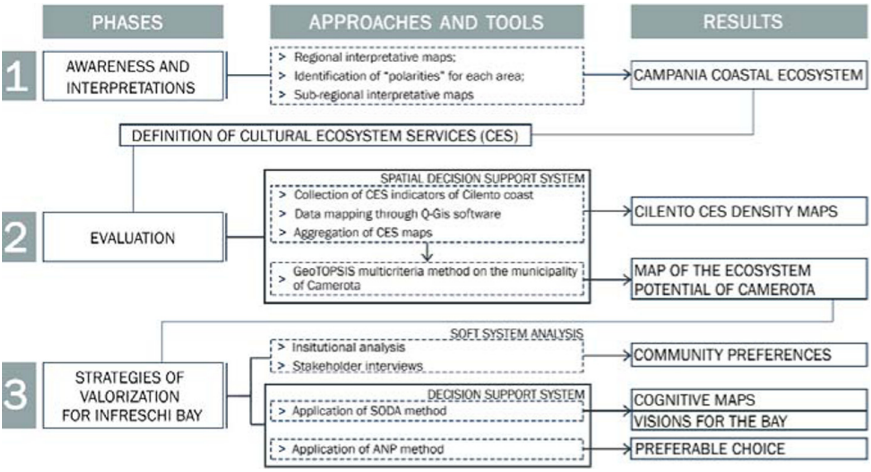

Fig. 2. The methodological framework: steps, tools and results

for each area and the representation of the "Campania coastal ecosystem", characterized by the naturalistic and environmental components.

After a first step of scale from the coast of Campania to that of Cilento, the analysis of the different components of the CES were addressed within a methodological framework of evaluation divided into several steps.

The first step involved data collection from institutional databases, including the "Parco Nazionale del Cilento Vallo di Diano e Alburni", the Geoportal of the Campania region and ISTAT databases and from informal sources such as social networks and Google pages. The selected data were aggregated into six classes of CES: Scientific/Educational, Historical/Cultural, Tourist/Recreational, Spiritual/Religious, Identitarian and Aesthetic.

The second step consisted of structuring a Spatial Decision Support System [20].

Through the software Q-Gis the data have been geo-referenced individually and then aggregated. This process made it possible to analyze the spatial distribution of the phenomena and, therefore, to return density maps of the presence of CES along the entire coastal strip of Cilento. The analysis was then reported on the municipality of Camerota and specifically on the single census sections that compose it. Finally, with the use of the multi-criteria method GeoTOPSIS, it was possible to draw up a map of the ecosystem potential of the Municipality of Camerota.

In the third and final step, the investigation moved to a "bridge" area of the municipality, i.e. a specific section on the map is located halfway between the sections with the highest and lowest ecosystemic potential: the Infreschi area.

To arrive at the definition of a valorization strategy capable of using culture as a natural lever, a Soft Decision Support System articulated in three steps has been structured. First, this system, proper primarily to address broad and unstructured decision-making problems, has allowed to include within the whole process different categories of citizens [21].

The first step involved elaborating an Institutional Analysis [22] on the territory. It was possible to define a map of the stakeholders, i.e. the actors potentially interested in an enhancement project for the Bay of Infreschi. Three groups of actors have been defined: promoters, operators and users, which differ according to their possible degree of involvement within the project. To these people, including inhabitants of the municipality and neighboring municipalities, members of associations active in the area, tourists and experts were administered a survey that allowed the respondents to explore the CES of the area and express their opinions about the hypothesis of enhancement for the bay. From this first step, it was possible to extract the preferences and perceptions of the community.

The second step involved applying the Strategic Options Development Analysis (SODA) approach [23] within the Decision Explorer software to the results obtained from the survey. In particular, the data processing for each category was carried out thanks to elaborating a cognitive map for each group to which a Central Analysis and a Domain Analysis were applied.

The first analysis aims to bring out the complexity of the links around each concept, of the second one to show the influence of the concept in the model context. The results of the two analyses were compared with each other and with the results obtained from the other maps and this allowed to arrive at the definition of the visions of future for the bay for each group.

Finally, the application of the Analytic Network Process (ANP) method [24, 25] [26] has allowed defining the absolute preferable alternative for the bay. This method articulates that the decision problem is decomposed into nodes (or elementary parts), and then the same nodes are aggregated into homogeneous series and connected. After having constructed this model inside the software Super Decision, it has been applied to compare the single elements of the net. In particular, the judgments have been expressed through the "scale of Saaty" [24]. From the definition of the priority, it has emerged the preferable alternative for the bay, able to satisfy the maximum needs and necessities of every class of stakeholders [27, 28].

4.1 The Spatial Decision Support System

In this phase, each set of CES elements were first geo-referenced individually and then classified according to natural intervals through the software Q-Gis. From this first analysis, density maps were obtained, one for each class of CES (Fig. 3).

The aggregation of all the maps showed that the area with the highest number of CES is the municipality of Camerota, followed by Agropoli and Castellabate.

The result obtained led the analysis to move to the municipality of Camerota and, in particular, to the census sections of which the locality is composed. To obtain a map of the ecosystem potentials that take into account not only the CES classes but also their value, a multi-criteria Geo-TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) analysis was carried out [29, 30] through the Vector MCDA plug-in of Q-Gis (Fig. 4).

The method is based on the concept that the chosen alternative should have, in Euclidean space, the shortest distance to the positive ideal solution and the longest geometric distance to the negative ideal solution. Thus, every geographic object, in our

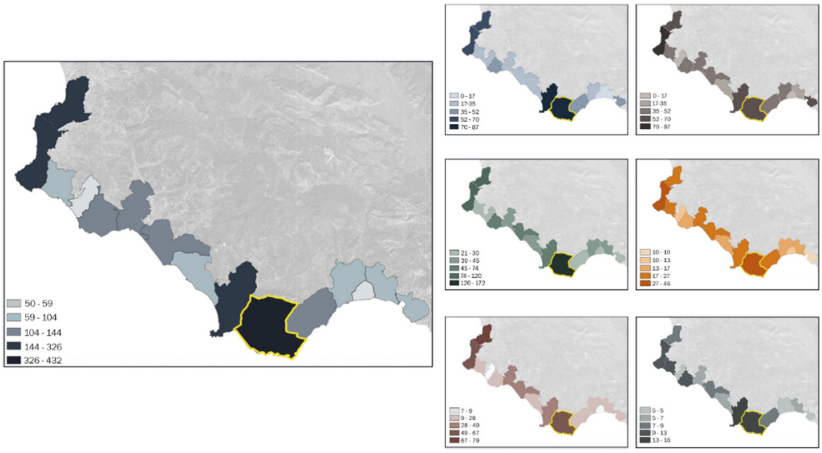

Fig. 3. Cultural ecosystem services density maps

case, every single CES described by an alphanumeric value in the table of attributes of Q-Gis, is a geo-alternative. In the plug-in's table, the columns are constituted by CES classes that become criteria to each of which weight must be assigned. Subsequently, the descriptive attributes of each geo-alternative are treated as evaluation criteria and processed through implemented algorithms of the plug-in.

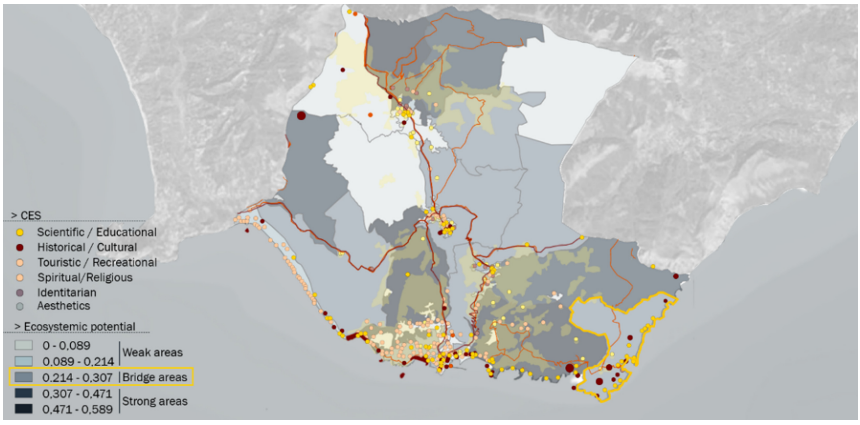

Fig. 4. Ecosystem potential of Camerota: The results of Geo-TOPSIS method application.

The last phase of this application provides the return of synthetic indices of preference for each element that translated into gradations of colour on the GIS map allows to identify, within the municipality, three different types of areas depending on their ecosystem potential. There are, specifically, areas with low potential, bridge areas and areas with high ecosystem potential. For the following analysis, we chose to study a

location falling in a bridge area, precisely the Bay of Infreschi, inlet and first natural harbour of the municipality.

4.2 The Soft Decision Support System

The third and final phase of the work made use of different tools to reach the appropriate conclusions. The survey administered to the stakeholders allowed, first of all, to obtain information about the preferences of the community on the process to be implemented in the area. Members of local communities were asked to respond to 20 open-ended and multiple-choice questions regarding the bay.

The data obtained from the survey have been elaborated by the Strategic Options Development and Analysis (SODA) approach. Four cognitive maps have been structured, one for each interviewed group (Fig. 5):

- Map 1 for the citizens of Camerota;
- Map 2 for the associations active on the territory;
- Map 3 for the inhabitants of the neighbouring municipalities;
- Map 4 for the tourists.

The questions were divided into concepts, each of which was assigned a colour. At the end of the analysis, based on the preferences expressed, each group was associated with a vision of the future for the bay. In particular, for the group of citizens of Camerota, the vision was "Infreschi as a Cilento landing place for ecotourism"; for the members of the associations "Infreschi: a safe harbour for culture"; for the citizens of the neighbouring municipalities "Infreschi: slow natural park"; and for the tourists "Infreschi: a lonely oasis of the tourist".

The Analytic Network Process (ANP) method [24, 25] has been applied to define the preferable alternative among the four listed above (Fig. 6). After setting up the decision problem and establishing the appropriate connections between the elements of the nodes (criteria, stakeholders and visions of the future) and the clusters (objectives and actions for each objective), a pairwise comparison was made between all the elements present [31].

The preferred vision of the future for the bay turns out to be, according to the results of ANP analysis, the number 2, which sees Infreschi as "Cilento landing place of ecotourism". From the definition of priorities, moreover, it emerges that the actions/projects that achieve higher scores are: workshop activities linked to tradition (52.8%), environmental education activities (48.6%), outdoor food and wine itineraries (47.1%), accessible and safe trekking trails (38%), guided tours (36.7%), docking points for boats outside the bay (36.1%), shift entry in summer (35%), viewpoints and belvedere (35%), info points and services for tourists (34.2%).

5 Discussions

This paper has tried to investigate a new approach for evaluating Cultural Ecosystem Services, based not on their possible quantification in monetary terms but on their importance for the communities that conserve them.

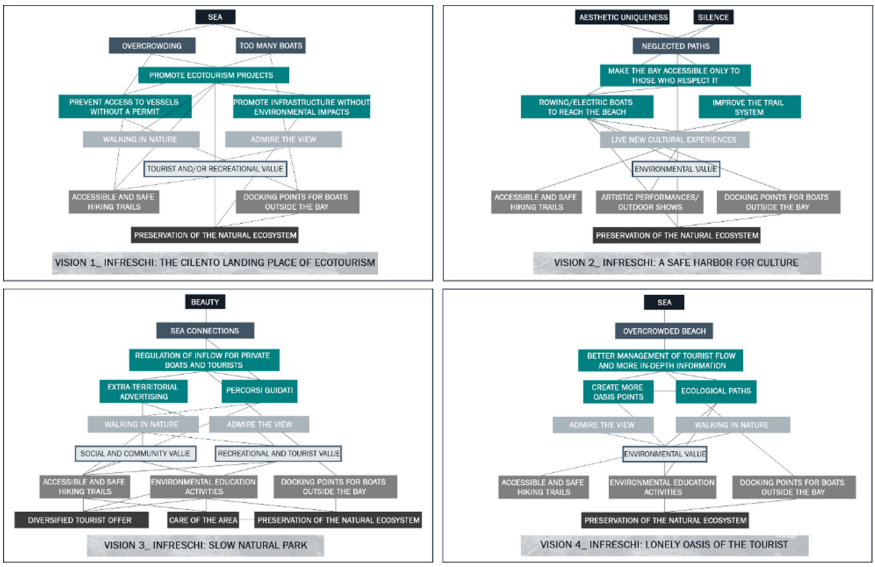

Fig. 5. Cognitive maps with SODA approach

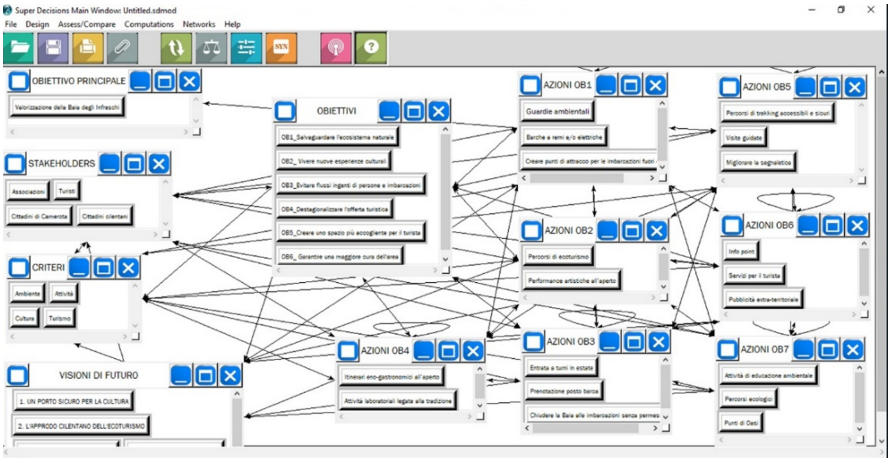

Fig. 6. The structure of the decision-making process with ANP method

The non-monetary methods referred to in this study are used when it is intended to assess the impact of hypothetical changes in the ecosystem and the provision of its services, producing an ex-ante helpful estimation to understand the possible scenarios and where it is necessary to act. These methods are usually applied to identify the socio-cultural values of a resource without a market [14, 32]. Especially in cultural landscapes, and therefore also in the study area of lower Cilento, socio-cultural assessment has offered a better understanding of the perception that people have of ecosystem services,

which could lead to the activation of less conflictual, more supportive and cooperative behaviours.

The methodological hypothesis follows a process of planning-evaluation that takes into account, on the one hand, the assessment of the main cultural ecosystem services of the Cilento coast and, on the other hand, the planning of the coastal ecosystem itself through the activation of a model of collaborative governance on the area under study [33].

The potentials of such an approach find themselves to fill, at the same time, the role of significant criticalities. For example, suppose the identification of groups of local stakeholders favours the participation of communities in a bottom-up model that allows the project not to remain detached from the context, on the other hand. In that case, it requires a great communicative capacity by those who propose it.

For the discussion to be positive, it is essential to build a pact of trust between the parties. The main difficulty lies in making the community members understand that activating an enhancement project for an area of great value does not mean distorting it or exploiting it to make money. It means, on the contrary, transforming the material and immaterial resources to enhance the specificity and regenerate the existing capital [34, 35]. In this sense, culture can become a driving force for the sustainable regeneration of territory, being able, among other things, to give a new face to the landscape, to strengthen the feeling of belonging to the place by those who live there, to shape the flows and types of tourism that are sometimes harmful to fragile areas like ours.

The analyses of the first phase of the work have allowed a complete knowledge of the territory from the environmental and infrastructural perspective. The results obtained have constituted a solid base on which it has been possible to build and model the following phases.

The second phase, structured according to a spatial decision support system, has allowed instead to analyze the corpus of CES that connotes the Cilento coast. Starting from a decision tree, a set of indicators was structured, populated both by data already present in shapefiles in institutional databases and by raw data subsequently geo-referenced in Q-Gis. It was evident the almost total absence within the institutional sites of municipal authorities of sections dedicated to the cultural heritage of the places. The criticality just highlighted is the symbol of a failure to adapt to the times and the new challenges of digitization by a part of the country that is still experiencing significant difficulties in economy and inclusion.

The subsequent application of the Geo-TOPSIS multi-criteria method on the municipality of Camerota has allowed dividing the municipal area according to the "ecosystem potential" of each census section. This kind of evaluation permits understanding which areas to implement policies and projects of valorization and which are; instead, the services to improve and implement in the different sections.

The tested approach could be further enriched by the direct participation of citizens in the collection of data, made impossible by the current pandemic situation. Based on the knowledge and experience of each, the CES set could be significantly implemented. The third phase involved, as a first step, the distribution of interviews to stakeholders from which community preferences emerged. Also, in this case, the restrictions imposed by the pandemic wave have prevented the organization of working tables and co-planning.

Therefore, it was necessary to use a Google Form, which made it possible to reach people from different Italian provinces but prevented a direct relationship between the parts. The interviewees provided valid answers to the questions, but a direct discussion would have allowed them to touch on more issues and link them with greater ease. An attempt in this direction was made in the immediately following phase, during which, using the SODA approach, cognitive maps were constructed. While not proper to evaluate, this method offered the first set of solutions to the problem faced. The cognitive maps reproduce in graphic form the conceptualization of the nodal questions and the links between them. Through this approach, it was possible to understand which were the most critical issues for the respondents. It was interesting to note how the answers of the groups of stakeholders, who did not have the opportunity to confront themselves on the subject, converged towards the same points, allowing the elaboration of four different strategic maps to explain as many visions of the future for the bay. Finally, step four, during which the ANP method was applied, allowed for an understanding of which of the four proposals was preferable for the bay. Again, especially for the pairwise comparison step, direct group participation in the discussion would have been more effective (Fig. 7).

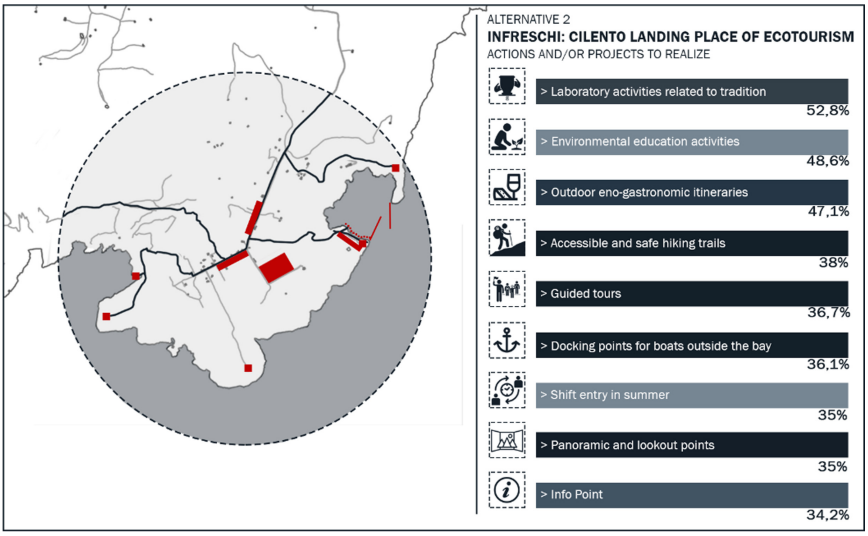

Fig. 7. Preferable choice, actions and projects for Infreschi

6 Conclusions

The study of the literature and applying the procedure described above have shown that the evaluation of CES can still be subject to experimentation and development. The fact that there is still no conventional methodological framework to refer to makes it possible to examine the issues on a case-by-case basis and with the most appropriate tools.

At the end of the study, what becomes evident is the importance of citizen participation and collaboration in decision-making processes if we want to implement choices

capable of satisfying the needs and requirements of each individual and, therefore, of being accepted and absorbed by the population. To date, what seems to be missing for this hybrid approach to be standardized and become common practice is awareness on the part of institutions and trust on the part of citizens [36].

The proposed approach could be applied to other contexts to guide and support processes of enhancement that have as their purpose the activation of the cultural ecosystem potential of coastal areas and beyond.

The following steps of this research could be applying the methodology studied at different points of the coastal strip of Cilento to identify a network of coastal ecosystem nodes that can give rise to a virtuous process of revitalization of the territory that has culture and sustainability as its foundations.

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References

1. Carta, M.: Dal waterfront alla città liquida. Patologie relazionali e nuovi orizzonti del progetto. In: De Luca, G., Lingua, V. (eds.) Arcipelago Mediterraneo. Strategie di riqualificazione e sviluppo nelle città-porto delle isole, Alinea, pp. 27–40 (2012)
2. Clemente, M.: Sea and the city: maritime identity for urban sustainable regeneration. TRIA Territorio Della Ricerca Su Insediamenti e Ambiente **11**(2), 19–34 (2013)
3. Konvitz, J.: Cities and the sea: port city planning in early modern Europe. Urban History **7**, 113 (1978). https://doi.org/10.1017/S0963926800004582
4. Ostrom, E.: A general framework for analyzing sustainability of social-ecological systems. Science **325**(5939), 419–422 (2009)
5. Antrop, M.: The language of landscape ecologists and planners: a comparative content analysis of concepts used in landscape ecology. Landsc. Urban Plan. **55**(3), 163–173 (2001)
6. Costanza, R., Folke, C.: Valuing ecosystem services with efficiency, fairness and sustainability as goals. Nature's Services: Societal Dependence on Natural Ecosystems, pp. 49–68 (1997)
7. Millennium Ecosystem Assessment (MEA): Ecosystems and Human Well-Being: Synthesis. Island, Washington (2005)
8. Wu, J.: Landscape sustainability science: ecosystem services and human well-being in changing landscapes. Landscape Ecol. **28**(6), 999–1023 (2013)
9. Bastian, O., Grunewald, K., Syrbe, R.-U., Walz, U., Wende, W.: Landscape services: the concept and its practical relevance. Landscape Ecol. **29**(9), 1463–1479 (2014). https://doi.org/10.1007/s10980-014-0064-5
10. Cerreta, M., Poli, G.: Landscape services assessment: a hybrid multi-criteria spatial decision support system (MC-SDSS). Sustainability **9**(8), 1311 (2017)
11. The Economics of Ecosystems and Biodiversity (TEEB): The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations. Pushpam Kumar. Earthscan: London and Washington (2010)
12. European Environment Agency (EEA): Common International Classification of Ecosystem Services (CICES): 2011 Update. EEA/BSS/07/007, November 2011, pp. 1–14 (2011)

13. European Union: Maritime Spatial Planning 2014/89/UE (2014). https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:32014L0089&from=EN
14. Haines-Young, R., Potschin, M., Fish, R.: Classifying ecosystem services: an ecosystems knowledge network briefing paper. ecosystems knowledge network (2012). https://ecosystemsknowledge.net/sites/default/files/wpcontent/uploads/2012/10/
15. Arias-Arévalo, P., Gómez-Baggethun, E., Martín-López, B., Pérez-Rincón, M.: Widening the Evaluative Space for Ecosystem Services: A **T**axonomy of Plural Values and Valuation Methods. The White Horse Press, Cambridge (2015)
16. Cerreta, M., Daldanise, G., Regalbuto, S.: Collaboriamo per Crapolla: una strategia di governance innovativa per una gestione integrata e adattiva. In: AA.VV. Supporto tecnico-scientifico a programmi di conservazione, miglioramento della fruizione e valorizzazione dell'Abbazia di San Pietro a Crapolla (2017)
17. Coccossis H., Nijkamp P.: Planning for our cultural heritage. Aldershot, Avebury (1995)
18. Sauer, C.O.: The morphology of landscape. Univ. Calif. Publ. Geogr. **2**, 19–54 (1925)
19. Selicato, M., Torre, C.M., La Trofa, G.: Prospect of integrate monitoring: A multidimensional approach, Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 7334 LNCS (PART 2), pp. 144–156 (2012)
20. Cerreta, M., Panaro, S., Poli, G.: A spatial decision support system for multifunctional landscape assessment: a transformative resilience perspective for vulnerable inland areas. Sustainability **13**(5), 2748, 1–23 (2021)
21. Cerreta, M., di Girasole, E.G., Poli, G., Regalbuto, S.: Operationalizing the circular city model for naples' city-port: a hybrid development strategy. Sustainability **12**(7), 2927 (2020)
22. Funtowicz S. O., Martinez-Alier J., Munda G., Ravetz J.: Multicriteria-based environmental policy. In: Abaza H., Baranzini A. (ed.), Implementing sustainable development. UNEP/Edward Elgar, Cheltenham, UK, pp. 53–77 (2002)
23. Eden, C., Simpson, P.: SODA and cognitive mapping in practice. In: Rosenhead, J. (ed.) Rational analysis for a problematic world, pp. 43–70. John Wiley and Sons, Chichester, UK (1989)
24. Saaty T.L.: The Analytic Hierarchy Process, Planning, Priority Setting, Resource Allocation. McGraw-Hill, New York (1980)
25. Saaty T.L., Vargas L. G.: Decision making with the Analytic Network Process. Springer Science, New York (2006). https://doi.org/10.1007/978-1-4614-7279-7
26. Saaty, T.L., Vargas, L.G.: The analytic network process. in: decision making with the analytic network process. International Series in Operations Research & Management Science, vol 195. Springer, Boston (2013)
27. Cerreta, M., Panaro, S.: Deliberative spatial multi-criteria evaluation (DSM-CE): forming shared cultural values. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 10406 LNCS, pp. 77–90 (2017). https://doi.org/10.1007/978-3-319-62398-6_53
28. Torre, C.M., Morano, P., Tajani, F.: Social balance and economic effectiveness in historic centers rehabilitation. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics) **9157**, 317–329 (2015). https://doi.org/10.1007/978-3-319-21470-2_22
29. Hwang CL., Yoon K.: Methods for multiple attribute decision making. in: multiple attribute decision making. Lecture Notes in Economics and Mathematical Systems, 186. Springer, Heidelberg (1981). https://doi.org/10.1007/978-3-642-48318-9_3
30. Olson, D.L.: Comparison of weights in TOPSIS models. Math. Comput. Model **40**, 721–727 (2004)
31. Cerreta, M., Malangone, V.: Valutazioni multi-metodologiche per il paesaggio storico urbano: la valle dei mulini di Amalfi. BDC Bollettino del Centro Calza Bini **14**, 39–61 (2014)

32. Chan, K.M.A., Satterfield, T., Goldstein, J.: Rethinking ecosystem services to better address and navigate cultural values. Ecol. Econ. **74**, 8–18 (2012)
33. 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, pp. 77–108 (2012)
34. Daily, G.C., et al.: Ecosystem services in decision making: time to deliver. Ecol. Environ. **7**(1), 21–28 (2009)
35. Daldanise, G.: From place-branding to community-branding: a collaborative decision-making process for cultural heritage enhancement. Sustainability **12**, 10399 (2020)
36. Cerreta, M., Poli, G., Regalbuto, S., Mazzarella, C.: A multi-dimensional decision-making process for regenerative landscapes: a new harbour for Naples (Italy). In: Misra, S., et al. (eds.) ICCSA 2019. LNCS, vol. 11622, pp. 156–170. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-24305-0_13